PROSIDING
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"Transformasi Matematika dan Teknologi Menuju Generasi Matematika Unggul untuk Pendidikan Indonesia Maju"

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"Transformasi Matematika dan Teknologi Menuju Generasi Matematika Unggul untuk Pendidikan Indonesia Maju"

Universitas Negeri Medan, 09 November 2023

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KATA PENGANTAR
KETUA PANITIA

Segala puji dan syukur kepada Allah SWT atas terbitnya Prosiding Seminar Nasional Jurusan Matematika (SEMNASTIKA) FMIPA Universitas Negeri Medan. Prosiding ini merupakan kumpulan artikel ilmiah yang telah dipresentasikan pada kegiatan SEMNASTIKA 09 November 2023 di Aula Gedung Prof. Syawal Gultom, Universitas Negeri Medan. Adapun cakupan bidang kajian yang disajikan dalam prosiding ini meliputi Matematika, Statistika, Ilmu Komputer, dan Pendidikan Matematika.

Dengan mengangkat tema seminar, "Transformasi Matematika dan Teknologi Menuju Generasi Matematika Unggul untuk Pendidikan Indonesia Maju", kami mengharapkan SEMNASTIKA dapat turut serta berkontribusi bagi perkembangan ilmu pengetahuan jurusan matematika sebagai wadah bagi para peneliti, praktisi, penggiat pendidikan matematika dan pengguna untuk terjalinnya komunikasi dan diseminasi hasil-hasil penelitian.

Kegiatan SEMNASTIKA dan prosiding ini dapat diselesaikan dengan baik tidak terlepas dari bantuan berbagai pihak, oleh sebab itu kami mengucapkan banyak terimakasih kepada:

1. Pimpinan Universitas Negeri Medan
2. Dekan FMIPA dan para Wakil Dekan FMIPA Universitas Negeri Medan
3. Para Narasumber yaitu Bapak Prof. Dr. Janson Naiborhu, M.Si., Bapak Mangara Marianus Simanjorang, M.Pd., Ph.D dan Bapak Ahmad Isnaini, M.Pd.
4. Ketua Jurusan Matematika FMIPA Universitas Negeri Medan
5. Para Ketua Program Studi di Jurusan Matematika Universitas Negeri Medan
6. Panitia SEMNASTIKA
7. Pemakalah dan Peserta SEMNASTIKA
8. Semua pihak yang terlibat dalam pelaksanaan SEMNASTIKA

Kami menyadari bahwa buku prosiding ini masih jauh dari kata sempurna, karena itu kami mengharapkan kritik dan saran yang membangun dari para pembaca untuk perbaikan selanjutnya. Akhirnya, kami menghaturkan maaf jikalau ada hal-hal yang kurang berkenan bagi para pembaca serta ucapan terimakasih kepada semua pihak yang telah berkontribusi bagi terbitnya buku prosiding ini. Semoga buku prosiding ini dapat memberikan manfaat sesuai dengan yang diharapkan.

Medan, November 2023
Ketua Panitia,

Susiana, S.Si., M.Si.
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KATA PENGANTAR
DEKAN FAKULTAS MATEMATIKA DAN ILMU PENGETAHUAN ALAM
UNIVERSITAS NEGERI MEDAN

Puji dan Syukur kepada Allah SWT atas segala rahmat dan anugerah-Nya sehingga Prosiding Seminar Nasional Jurusan Matematika dengan tema "Transformasi Matematika dan Teknologi Menuju Generasi Matematika Unggul untuk Pendidikan Indonesia Maju" yang diselenggarakan oleh Jurusan Matematika FMIPA Universitas Negeri Medan pada hari Kamis, 09 November 2023 di Medan dapat diselesaikan.

Publikasi prosiding ini bertujuan untuk memperluas wawasan pengetahuan yang berasal dari para akademisi baik dari Universitas Negeri Medan maupun yang berasal dari luar Universitas Negeri Medan. Selain itu, prosiding ini juga sebagai sarana untuk mengkomunikasikan hasil penelitian dengan menyajikan topik-topik terbaru yang meliputi bidang Pendidikan Matematika, Statistika, Ilmu Komputer dan Matematika.

Kami mengucapkan terimakasih dan apresiasi yang setinggi-tingginya kepada semua pihak yang telah berkontribusi dalam Seminar Nasional Jurusan Matematika, baik sebagai keynote speakers yaitu Prof. Dr. Janson Naiborhu, M.Si., Mangara Marianus Simanjorang, M.Pd., Ph.D dan Ahmad Isnaini, M.Pd., reviewer makalah, peserta dam panitia yang terlibat. Akhir kata, semoga Prosiding Seminar Nasional Jurusan Matematika ini bermanfaat bagi kita semua sehingga dapat memberikan kontribusi maksimal bagi negara dan bangsa.

Medan, November 2023
Dekan

Prof. Dr. Fauziyah Harahap, M.Si
NIP. 196607281991032002

KATA PENGANTAR
KETUA JURUSAN MATEMATIKA
FMIPA UNIVERSITAS NEGERI MEDAN

Dengan penuh rasa syukur kepada Allah SWT, prosiding Seminar Nasional Jurusan Matematika FMIPA Universitas Negeri Medan ini dapat diselesaikan. Kemajuan ilmu pengetahuan dan teknologi di era ini sangat berdampak bagi kehidupan manusia. Kajian penelitian terkait perkembangan ilmu pengetahuan dan teknologi serta terapannya perlu disosialisasikan kepada khalayak. Seminar Nasional Jurusan Matematika merupakan forum diskusi ilmiah yang sangat penting dalam pengembangan dan penyebaran pengetahuan di bidang matematika yang meliputi pendidikan matematika, statistika, ilmu komputer dan matematika (non pendidikan). Melalui buku prosiding ini, kami berupaya untuk menyajikan rangkuman makalah-makalah yang telah dipresentasikan, serta memberikan wadah bagi pembaca untuk menjelajahi gagasan-gagasan cemerlang yang ditawarkan dan penelitian-penelitian terkini yang dihasilkan oleh para akademisi, peneliti, dan praktisi matematika.

Tema seminar kali ini, "Transformasi Matematika dan Teknologi Menuju Generasi Matematika Unggul untuk Pendidikan Indonesia Maju", mencerminkan komitmen kami untuk terus menghadirkan diskusi yang relevan dan mendalam mengenai isu-isu terkini dalam dunia matematika. Melalui buku ini, kami berharap pembaca dapat m engeksplorasi berbagai sudut pandang, temuan, dan pemikiran-pemikiran baru yang dapat memperkaya wawasan serta menginspirasi penelitian dan pengembangan dan ilmu matematika.

Secara khusus, kami mengucapkan terimakasih kepada para narasumber, yaitu : Prof. Dr. Janson Naiborhu, M.Si., Mangara Marianus Simanjorang, M.Pd., Ph.D dan Ahmad Isnaini, M.Pd., yang telah membagikan ilmunya dalam kegiatan seminar. Terimakasih yang tulus juga kami sampaikan kepada semua pihak yang telah mendukung kegiatan ini, para pimpinan Universitas Negeri Medan dan para pimpinan FMIPA Universitas Negeri Medan. Apresiasi yang tinggi juga saya ucapkan teruntuk para penulis, reviewer, dan panitia yang telah berperan aktif dalam pembuatan buku prosiding ini. Kontribusi dari setiap individu adalah pondasi kesuksesan acara ini, dan semangat kolaboratif ini sangat berharga bagi perkembangan ilmu matematika.

Akhirnya, kami berharap buku prosiding ini dapat menjadi sumber pengetahuan yang bermanfaat dan memotivasi pembaca untuk terus menggali potensi dalam bidang matematika. Mari kita bersama-sama memperkuat dan memajukan ilmu matematika demi keberlanjutan pembaruan pengetahuan.

Medan, November 2023

Ketua Jurusan Matematika

Dr. Pardomuan Sitompul, M.Si
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SUSUNAN ACARA

Waktu	Kegiatan	**PIC**
08.00 - 08.30	Pendaftaran Ulang	Panitia
08.30 - 09.00	Acara Pembukaan 1. Salam Pembuka 2. Menyanyikan Lagu Indonesia Raya 3. Doa 4. Laporan Ketua Pelaksana 5. Sambutan dan Pembukaan acara seminar oleh Dekan Fakultas Matematika dan Ilmu Pengetahuan Alam 6. Foto Bersama	MC: Putri Maulidina Fadilah, S.Si., M.Si Nurul Ain Farhana, M.Si Khairuddin, M.Pd. Susiana, S,Si., M.Si. Prof. Dr. Fauziyah Harahap,M.Si
09.00 - 10.00	Pembicara I Prof. Dr. Janson Naiborhu, M.Si (Guru Besar Matematika ITB)	Moderator: Yulita Molliq Rangkuti, M.Sc., Ph.D
10.00 - 11.00	Pembicara II Mangaratua Marianus Simanjorang, M.Pd. Ph.D (Dosen Jurusan Matematika UNIMED)	Moderator: Andrea Arifsyah Nasution, S.Pd., M.Sc.
11.00 - 11.45	Pembicara III Ahmad Isnaini, M.Pd (Guru berprestasi Nasional)	Moderator: Dinda Kartika, S.Pd., M.Si.
11.45 - 13.00	ISOMA	
13.00 - 14.30	Sesi I : Seminar Paralel	Moderator Pemakalah Pendamping
14.30 - 16.00	Sesi II: Seminar Paralel	Moderator Pemakalah Pendamping
16.00	Penutupan acara oleh Dekan FMIPA	MC

KEYNOTE SPEAKER

KEYNOTE SPEAKER 1

Prof. Dr. Janson Naiborhu, S.Si., M.Si.

Prof. Janson Naiborhu memiliki dua gelar doktor yang ia peroleh dari Keio University (Jepang) dan Institut Teknologi Bandung. Kariernya sebagai dosen dimulai sejak tahun 1991, sejak ia bergabung sebagai Dosen FMIPA ITB, dengan Kelompok Keahlian Matematika Industri dan Keuangan. Ia menjadi Guru Besar sejak 1 Desember 2014 dan Pembina Utama Muda/Gol IV C sejak 1 April 2011.

Prof. Janson aktif dalam melakukan riset dan telah banyak menghasilkan jurnal ilmiah baik nasional maupun internasional. Namanyapun telah dikenal luas di dunia pendidikan dan industri, khususnya dalam bidang Matematika.

KEYNOTE SPEAKER 2

Mangaratua M Simanjorang, M.Pd., Ph.D

Mangaratua M Simanjorang, M.Pd., Ph.D adalah dosen Pendidikan Matematika di Universitas Negeri Medan. Beliau meraih gelar sarjana di Universitas HKBP Nomensen tahun 2003, dan di tahun 2007 beliau mendapat gelar magister dari Universitas Negeri Surabaya. Beliau melanjutkan program doktor di Murdoch University, Australia dan memperoleh gelar Ph.D tahun 2016. Fokus pada pendidikan matematika, beliau melaksanakan tridarma universitas, beliau mendapatkan penghargaan sebagai dosen muda terbaik tahun 2009.

Dengan menjadi reviewer dan narasumber dibanyak kegiatan seminar, beliau berbagi ilmu dalam bidang pendidikan matematika, pendidikan karakter dan media pembelajaran seperti *augmented reality*.

KEYNOTE SPEAKER 3

Ahmad Isnaini M.Pd.

Ahmad Isnaini, M.Pd adalah seorang pendidik yang memiliki dedikasi tinggi terhadap dunia pendidikan. Ia meraih gelar Sarjana Pendidikan Matematika dari Universitas Negeri Medan pada tahun 2010, kemudian melanjutkan studi pascasarjana dan meraih gelar Magister Pendidikan Matematika pada tahun 2019 dari universitas yang sama. Saat ini, Ahmad sedang mengejar gelar Doktor dalam bidang yang sama di Universitas Negeri Medan.

Ahmad Isnaini juga telah mengukir prestasi gemilang dalam berbagai kompetisi dan olimpiade. Sebagai Finalis Apresiasi GTK 2023 BBGP Sumatera Utara Tingkat Provinsi dan penerima berbagai medali emas, perak, dan perunggu dalam Olimpiade Guru tingkat Nasional dan Provinsi, Ahmad Isnaini memperlihatkan dedikasinya dalam pengembangan kemampuan diri dan juga siswanya.

Tidak hanya aktif di dunia akademis, Ahmad Isnaini juga telah berkontribusi dalam literatur pendidikan. Karya-karyanya yang terpublikasi dalam jurnal nasional dan internasional, serta buku-buku seperti "Guru Merdeka" (2020) dan "Inovasi Pembelajaran" (2018), mencerminkan pemikiran dan wawasan yang mendalam dalam bidang Pendidikan.

DAFTAR ISI

IMPLEMENTATION OF RECIPROCAL TEACHING LEARNING MODEL TO IMPROVE STUDENTS' MATHEMATICAL REPRESENTATION ABILITY IN GRADE VII AT SMP NEGERI 37 MEDAN

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Abstract

This study aims to measure the increase in mathematical representation ability and classical completeness of VII grade students of SMP Negeri 37 Medan through the Reciprocal Teaching learning model on data presentation material. This research is a Classroom Action Research (CAR) conducted in three cycles. The subjects in this study were students of class VII-B SMP Negeri 37 Medan T.A 2022/2023, totaling 32 students. The research results obtained in the initial test before the Reciprocal Teaching model was applied, classically, there were seven students (21.8%) completed with an average score of 54.68 in the deficient category. In cycle I, there was an increase in classically obtained as many as 20 students (62.5%) completed with an average score of 71.09 in the medium category. In cycle II, increased again classically as many as 24 students (75%) were complete with an average score of 79.37. Then, in cycle III, increased classically as many as 28 students (87.5%) completed with an average score of 82.18 in the high category. The ability of seventh-grade students at SMP Negeri 37 Medan to accurately represent mathematical concepts can be enhanced by implementing the Reciprocal Teaching learning model.

Keyword: *Improvement in Mathematical Representation Ability, Mathematial Representation Ability, Reciprocal Teaching*

1. INTRODUCTION

As one of the math skills that students should master, representation ability is a crucial component developed in every mathematics learning activity. According to Jones and Knut (in Sabirin, 2014), there are several reasons for the need for representational abilities, one is to develop good concepts that can be used in problem-solving. The ability of mathematical representation will simplify and clarify mathematical problems to turn abstract ideas into concrete images, for example, symbols, graphs, pictures, words, tables, and others. So that complex problems can be seen more simply and presented more efficiently. Representational abilities in learning mathematics will help students communicate and think (Mulyati, 2016). This shows that representation is one of the standard capacities that should exist in learning science (Syafri, 2017).

Based on TIMSS *(Trends in International Mathematics and Science Study)* results in mathematics, Indonesia is still below the international level. TIMSS 2015 study results Indonesia was ranked 46th out of 51 countries with an average score of 397, and it can be concluded that from 2003 – 2015, Indonesia's ranking in TIMSS continued to decline. In addition to TIMSS, a survey of international student abilities was conducted by PISA *(Program for International Student Assessment)*. This survey was conducted to assess students' ability to solve problems, reason, and communicate. Based on a survey from PISA in 2018, it was found that Indonesia was ranked 73 out of 79 participating countries or ranked 6th from the bottom, with a math ability score of 379 (Tohir, 2019). This score is still far below the OECD average score of 487. This score has also decreased from 2015 where the math ability score in 2015 was 386. Wardhani et al (2011) stated that TIMSS questions more specifically measure students' abilities in selection, representation, modeling, application, and problem solving. Based on the characteristics of the TIMSS questions, it can be seen that students' mathematical representation ability in Indonesia is still low compared to other countries.

Mudzakir (2006) states that mathematical representation ability is grouped into three types. First, the ability of representation expressed through images, diagrams, graphs, and tables is a visual representation. Second, the ability of representation expressed through mathematical expressions or equations is a symbolic representation. Third, the ability of representation described in the form of narrated sentences to explain the object of the problem is a verbal representation (Nur et al., 2020). In this study, the authors used a type of representational ability based on Mudzakir's opinion that mathematical representation ability has 3 kinds of representations, namely visual, symbolic, and verbal representations.

However, mathematical representation skills have not been fully developed explicitly in the learning process. The reality in the field shows that students' mathematical representation skills are still low, and many students experience difficulties in learning mathematics. Many factors cause students' low ability to learn mathematics, one of which is the learning approach used by the teacher, for example, learning towards traditional methods that place students only as listeners. As a result, students are bored with learning math and are not motivated to explore math as a fun and challenging subject (Nurbadriah, 2018). In the learning process there is still a tendency to minimize the role and involvement of students, although we have long realized that learning requires the active involvement of the learner, the reality still shows a different trend. In traditional mathematics classrooms, teachers typically rely on conventional teaching methods. They start by providing explanations and examples of problems, and then move on to assigning practice questions for the students to work on. The learning experience is largely teacher-centric, with students being expected to passively listen to the teacher's lectures. Almost the majority of students experience difficulties in learning and mastering mathematics so that mathematics is considered a difficult, uninteresting and unpleasant subject, even students are pessimistic about mathematics. In this regard, it is unsurprising that students today struggle to learn mathematics.

Based on the preliminary observation's findings conducted at SMP Negeri 37 Medan on Wednesday, November 16, 2022, obtained information from the results of interviews with Mr. Aritonang, who is a VII grade mathematics teacher, that the learning model applied at the school is still educator focused, where the educator assumes a functioning part in making sense of the material before the class. He also stated that the mathematical representation skills of seventh-grade students at the school still needed to improve. Students tend to memorize mathematical concepts while their application to problems still needs to be improved. Students are only oriented toward using formulas and calculating. The students will find it very easy to calculate using the formulas they memorize, but to direct the problem to the stages of solving mathematical problems still needs to be solved. Students are less able to translate mathematical sentences into mathematical models or vice versa, especially when given story problems. It is common for students to struggle with interpreting graphs in both practical and abstract contexts. Furthermore, they may find it difficult to respond to questions that deviate from the examples provided during instruction, resulting in guesswork, so in the end they only guess answers. These indicators show a low mathematical representation.

This is also evidenced by the results of student diagnostic tests given on Saturday, December 3, 2022. This mathematical representation diagnostic test was given to class VII-B SMP Negeri 37 Medan students, totaling 32 students. This diagnostic test question measures three aspects of representation indicators: visual, symbolic (expressions or mathematical equations), and verbal (written tests or words). Based

on the test results given, it was obtained that 7 students had representation skills in the medium category (21.8%), 12 students had representation skills in the low category (37.5%), and 13 students had representation skills in the very low category (40.6%).

Based on the above problems, improving the teaching and learning process is necessary to enhance students' mathematical representation skills. This improvement can be as a functioning learning model, where educators are supposed to carry out a discovery that focuses on understudy contribution in learning and gives potential open doors to them to build their insight. In line with Legi (in Yosephina & Maria, 2022) and Suryowati (2015), These two studies suggest that teachers can develop representation skills in their students by selecting and utilizing the appropriate learning strategy to ensure optimal learning and that students can develop mathematical representation skills. Teachers and educators always need innovative teaching methods. Cooperative learning is one of the learning methods by the characteristics of mathematics subjects to improve mathematics learning outcomes by mastering the standards of the mathematics learning process. Cooperative learning is also student-centered. The Reciprocal Teaching model is a practical, suitable learning model to enhance students' mathematical representation ability. Through the Reciprocal Teaching model, students are expected to learn through experiencing rather than memorizing.

Reciprocal Teaching is one of the learning models carried out to accomplish learning goals through autonomous learning, and students can introduce it before the class. In Reciprocal Teaching, four procedures are utilized, specifically making questions (question creating), explaining terms that are challenging to comprehend (clarifying), foreseeing further material (predicting), and summing up (summarizing). In the Reciprocal Teaching model, students must always participate in learning activities. Applying the Reciprocal Teaching model will be more effective in creating learning that can make student learning independent (Susiyati, 2018). The author aims to enhance students' mathematical representation skills by employing the Reciprocal Teaching cooperative learning approach. As such, they propose conducting a study titled "Implementing the Reciprocal Teaching Learning Model to Enhance Mathematical Representation Ability Among Grade VII Students at SMP Negeri 37 Medan during the Academic Year 2022/2023."

2. METHOD

This research is a Classroom Action Research (CAR) which aims to determine the difficulties of students' mathematical representation skills in learning mathematics and seek to develop further students' mathematical representation ability by applying the reciprocal Teaching learning model on Data Presentation material in class VII. This research was conducted at SMP Negeri 37 Medan which is located at Jl. Timor No.36B, Gaharu, Kec. Medan Timur, Kota Medan, North Sumatera. The data collection time in this study was carried out in semester II (even) of Academic Year 2022/2023 in class VII of SMP Negeri 37 Medan. The subjects of this research were all students of class VII-B SMP Negeri 37 Medan, totaling 32 students consisting of 15 boys and 17 girls. And the bject of this study is the implementation of mathematics learning in Data Presentation material through the implementation of the *Reciprocal Teaching* model as an effort to improve the students' mathematical representation abilities of grade VII at SMP Negeri 37 Medan. The Classroom Action Research (CAR) model used in this study is the Kemmis and McTaggart model. According to (Zai et al., 2017), in the Kemmis and McTaggart research model, four things must be done in the action research process: planning, acting, observing/evaluating, and reflecting. The relationship of these four elements is seen as a cycle, as shown in Figure 1 below.

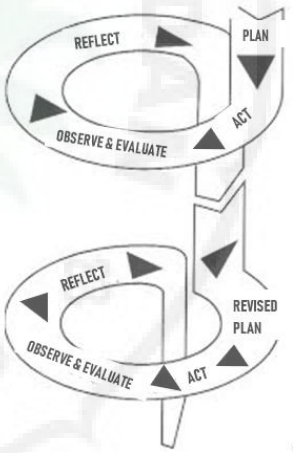

Figure 1. Kemmis and McTaggart CAR Model

The information utilized in this study is essential information, namely data obtained directly from students as research subjects. The research instruments used were observation and written test instruments. The data collection techniques used were the observation and written test methods. Data analysis techniques in this study used data analysis of observation results and data analysis of test results. The observation data collected can be analyzed using a formula adapted from Arikunto (2013) with the following formula:

$$P_i = \frac{Total\ score\ of\ each\ aspect\ observed}{the\ number\ of\ aspects\ observed}$$

Information:

P_i : the results of observations in the *i*-cycle

Furthermore, the average criterion for evaluating observations according to Soegito (in Valentino et al., 2013) is in Table 1 below.

Table 1. Criteria Results Observation Score

Range of scores obtained	Assessment Criteria

$0 - 1{,}1$	Bad
$1{,}2 - 2{,}1$	Enough
$2{,}2 - 3{,}1$	Good
$3{,}2 - 4{,}0$	Very Good

Learning is succesful if the observer's observations are included in the good or very good criteria.

The test data collected in each cycle was analyzed to determine student completeness. In this study, to determine individual and classical completeness, the following learning completeness guidelines were used:

a. Analysis of Individual Completeness
   A student is said to have improved their achievement if they have reached a mastery level of at least 70% or with a score of 70 (the provision of the school).

$$Percentage\ completeness = \frac{Total\ score\ obtained}{Total\ score} \times 100\%$$

(Ananda & Fauziah, 2022)

b. Classical Completeness
   A class is said to have succeeded (accomplished learning fulfillment) if something like 85% of the all out number of understudies in the class have accomplished learning culmination. To determine the percentage of the achievement of student learning completeness, the formula is used:

$$PKK = \frac{Many\ students\ with\ scores \geq 70}{Many\ research\ subject} \times 100\%$$

(Mukhdi, 2015)

Furthermore, the guidelines used to classify the proportion of skills in mathematical representation are as shown in table below.

Table 2. Qualification Guidelines for the Results of the Written Test (Puspaningrum et al., 2021)

Percentage of scores obtained	Category
$90 \leq TKRM \leq 100$	Very high
$80 \leq TKRM < 90$	High
$70 \leq TKRM < 80$	Medium
$60 \leq TKRM < 70$	Low
$0 \leq TKRM < 60$	Very low

The indicators of the success of this research are as follows: first, the learning mastery of students in one class has met the completeness criteria of at least 85% of the number of students in the class who have achieved individual learning mastery. Individual learning completeness that has been set for Data Presentation material is if the student's score is at least 70. The percentage of students' mathematical representation ability indicators increased and reached the high criteria. Second, the results of observing the implementation of learning with the *Reciprocal Teaching* model were in accordance with the specified steps with increased results and reached good or very good criteria.

3. RESEARCH RESULTS AND DISCUSSION

This research was conducted on May 2 - May 30, 2023, in class VII-B SMP Negeri 37 Medan, consisting of 32 students. The research implementation consisted of 3 cycles, each with two meetings. At the first meeting, the researcher held an action in the form of a teaching and learning process. Then, at the second meeting, the researcher had a cycle test. The problem in this study is following the background of the problem, namely the low mathematical representation skills of students. The problem was obtained from the initial test of mathematical representation ability during observation. The results are described in the following table.

Table 3. Improving Students' Mathematical Representation Ability in Each Cycle

Indicator of Mathematical Representation Ability	Cycle			Total
	I	II	III	
Visual	70,70	76,56	78,90	8,2
Symbolic	82,03	83,20	84,37	2,34
Verbal	60,93	77,34	78,90	17,97
Class Average Score	71,09	79,37	82,18	11,09
Classical Completeness	62,50 %	75%	87,5 %	25%

The average value of mathematical representation ability obtained by students classically based on indicators in each cycle test has increased. This can be more clearly seen in the following diagram:

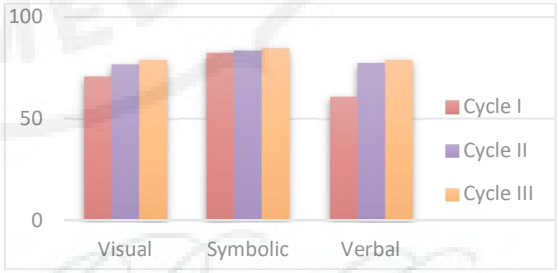

Figure 2. Description of Average Improvement of Mathematical Representation Ability based on Indicators

After conducting a mathematical representation ability test with students, we observed a significant improvement in their performance. The average test score increased from 54.68 to 71.09 in the first cycle, followed by a further increase to 79.37 in the second cycle, and finally reaching 82.18 in the third cycle. Additionally, the percentage of students who demonstrated classical completeness in their mathematical representation skills increased from 21.8% in the initial ability test to 62.5%, 75%, and 87.5% in the first, second, and third cycles, respectively. More details can be seen in Table 4.

Table 4. Mathematical Representation Ability Level of Each Cycle

Interval Value	Criteria	Initial Test	Cycle		
			I	II	III
$90 \leq TKRM \leq 100$	Very high	0	0	8	9
$80 \leq TKRM < 90$	High	0	14	13	13
$70 \leq TKRM < 80$	Medium	7	6	3	6
$60 \leq TKRM < 70$	Low	6	6	7	4
$0 \leq TKRM < 60$	Very low	19	6	1	0
Total		32	32	32	32
Class Average Score		54,68	71,0	79,3	82,1

The average score of students on the mathematical representation ability test classically for each cycle is presented in the following diagram.

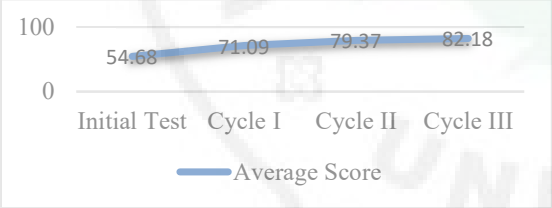

Figure 3. Description of Average Improvement of Mathematical Representation Ability Each Cycle

Based on observations of the learning process carried out from the beginning of the implementation of the action to the end of the learning action. In the first cycle, the learning process using Reciprocal Teaching is in the good category with a final score of 2.26. The observer concluded that what the researcher did was good, but there were still things that needed to be improved. At the first cycle, because students were new to the Reciprocal Teaching learning model, the teacher or researcher was overwhelmed in the use of time. So, it is necessary to pay attention to time efficiency.

At the second cycle, the learning process using Reciprocal Teaching was in the good category with a final score of 2.96. Observation of learning implementation in cycle II has improved from the previous cycle I. The observer concluded that the teacher had been much better at time management and had been able to provide lessons using the Reciprocal Teaching learning model. However, teachers need to pay more attention to the behavior of problematic students when learning takes place. For this reason, the action of controlling the behavior of problematic students during learning needs to be improved.

At the third cycle, the learning process in cycle III using Reciprocal Teaching was in the very good category with a final score of 3,53. Observation of learning implementation in cycle III has improved from the previous cycle II. The observer concluded that the teacher had been able to manage time and had been able to provide lessons using the Reciprocal Teaching learning model. Teachers also pay attention to the behavior of students who have problems when learning takes place by going to these students and guiding them.

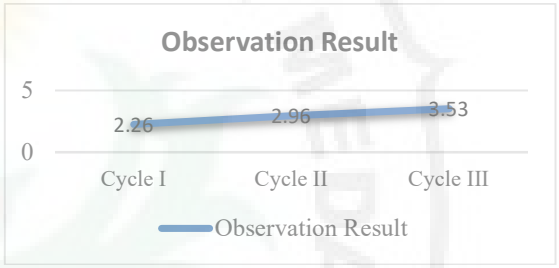

Figure 4. Improvement of Observation Result

The implementation of research in cycle I still has many obstacles experienced by students. At the first meeting for cycle I, students were still not used to the classroom situation where the researcher started learning as a teacher. There are still some students who are not active when group discussions take place. The researcher also lacked mastery of the class at the first meeting because at the beginning of learning, it began with group formation, which was not conducive, so when continuing the lesson, it also became less conducive, and time was inefficient. Based on the results of the first cycle reflection, it was concluded that the learning activities in the first cycle had not been maximally successful. This can likewise be seen from the students' mathematical representation ability and classical completeness that have not met the research success.

The action in cycle II that distinguishes it from cycle I is that groups are made randomly by looking at students' learning abilities, and group learning activities will involve all students to answer individually not only in groups

In the results of cycle II, the average mathematical representation ability of students increased but did not reach the research success target. The average score obtained was 79.37 with a class completion percentage of 75%, so that the results of cycle II were then used as a foothold for planning actions in cycle III. The results of observation and reflection in cycle II were used as the basis for action in cycle III in order to improve students' mathematical representation skills further to be as expected.

The actions taken in cycle III and differentiating from the previous cycle were that the teacher focused

more on guiding students whose test results and observation results in the previous cycle still did not reach the research target and also paid attention to each student who was inactive in the discussion. Based on the results of observations in cycle III, it can be seen that students have been active in discussing and seeking information both individually and in groups to get answers to the problems given in the student worksheet. In addition, students' participation in learning was more active compared to the previous cycle, students had the courage to express their opinions in learning activities and in group discussions.

Based on the data collected during the research, it's clear that students' mathematical representation skills improved significantly from cycle I to cycle III. In cycle I, the average score for the class was 71.09, which rose to 79.37 in cycle II and then to 82.18 in cycle III. The improvement from cycle I to cycle II was 8.28, while the increase from cycle II to cycle III was 2.81. Overall, there was a total improvement of 11.09 from cycle I to cycle III. The number of students who achieved learning completeness in the Mathematical Representation Ability Test I increased by 20 students (62.5%) in cycle II, by 24 students (75%) in cycle III, and by 28 students (87.5%) in cycle III. This means that the percentage of students who achieved learning completeness increased by 12.5% from cycle I to cycle II and cycle II to cycle III. The overall improvement from cycle I to cycle III was 25%.

Based on the aforementioned description, it can be inferred that the Reciprocal Teaching educational approach serves as a viable means to enhance students' mathematical representation skills. The progress in mathematical representation skills is evidenced by the upsurge in the class average score, the heightened proficiency in each indicator of mathematical representation ability, and the amplified individual learning and classical completeness.

From the results of research and observation, it is concluded that the Reciprocal Teaching learning model gives students the freedom to communicate to explain their ideas, listen to their friends' ideas with group discussions, discuss finding concepts contained in the problems given by linking their prior knowledge with new information. This is in line with the basic principles of constructivism, namely, students actively build their own knowledge based on their cognitive maturity. In accordance with the assumption that knowledge and understanding are the result of creative socialization arranged through a negotiation process between students and teachers or vice versa.

The Reciprocal Teaching learning model in this study is in line with Piaget's learning theory, Vygotsky's theory and Brunner's theory. In Piaget's theory, students learn to solve problems based on their understanding of the surrounding environment. In the learning process, students are given problems in the form of real problems. From concrete problems, students will be taken to the abstract so that it makes it easier for students to communicate mathematics. That way, students can solve problems. In Vygotsky's theory, students learn through interaction with their environment or people around them, namely in the learning process the interaction between teachers and students and students with students. This is to create communication so that students can share information with each other by expressing ideas or giving their opinions in their own words. In the learning process, students are formed into groups to discuss solving the given math problems. In Brunner's theory, through real-life problems students can find new concepts then will be associated with existing concepts so that it can help understand the material. This shows that the Reciprocal Teaching learning model can improve students' mathematical representation ability. The results obtained by researchers based on the application of these actions have a positive impact. To strengthen the results of the discussion of this study, the researcher compared it with relevant previous research.

The results of research conducted by (Retta & Nopriyanti, 2020) states that judging from the n-gain test, the learning model RT is 0,3 while the conventional learning is 0,2. According to (Muanifah et al., 2021), the Reciprocal Teaching approach to teaching mathematics in class 3A produced better results than the Group Presentation method in class 3C. The difference in effectiveness was demonstrated by the lowest score, highest score, and average score of students who received the Reciprocal Teaching treatment in class 3A, which were 45, 93, and 74.8 respectively. While the highest, average and lowest value of students in class 3C who were given the Group Presentation treatment were 90, 64 and 36. These findings suggest that the class taught by the RT model outperformed the conventional model.

In a study titled "The Effectiveness of Students' Learning Motivation on Learning Outcomes Using the Reciprocal Teaching Learning Model" conducted by Muthik et al (2022), it was discovered that the Reciprocal Teaching learning model resulted in a good average score of 74.8 for all indicators in the experimental class students' learning motivation. The experimental class students' average score was 82.22, while the control class's average value during learning was 69.13, indicating that using the Reciprocal Teaching learning model can motivate students to learn and ultimately improve learning outcomes. Additionally, in a study titled "Students' Mathematical Representation Ability in Cooperative Learning Type of Reciprocal Peer Tutoring from Learning Style" conducted by Suryani et al (2023), it was concluded that the experimental class with Reciprocal Peer Tutoring cooperative learning had an average score of 76.54, while the control class with Problem-Based Learning (PBL) had an average score of 71.3 based on the mathematical representation ability test. This demonstrates that the Reciprocal Peer Tutoring cooperative learning is more effective than Problem-Based Learning and is effective in enhancing mathematical representation ability.

Thus, based on the discussion of the research results above, the *Reciprocal Teaching* learning model prevailed with regards to further developing advancing by expanding students' mathematical representation ability and student learning outcomes, especially on the subject of data presentation in class VII SMP Negeri 37 Medan. students to learn better so as to achieve optimal achievement.

CONCLUSION

Based on the research and discussion's findings, the authors conclude that by applying the Reciprocal Teaching learning model can increase the mathematical representation skills of VII grade students of SMP Negeri 37 Medan. This can be seen from the percentages of class completeness that increased in each cycle, namely the first cycle 62.50% (20 students), 75% (24 students) in the second cycle and 87.50% in the third cycle. The average student learning outcomes in cycle I of 71.09 increased in cycle II of 79.37 and increased again in cycle III of 82.18. With a total increase of 11,09 and the percentage increase in learning completeness is 25%. The increase in students' mathematical representation skills after the implementation of the Reciprocal Teaching model makes students active and involved in learning activities. The results of observations of the learning process in cycle I to cycle III show that the strategies used in each cycle by teachers can help students to learn better so as to achieve optimal achievement.

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