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

THE IMPLEMENTATION OF COOPERATIVE LEARNING MODEL STAD TYPE TO IMPROVE STUDENTS' PROBLEM-SOLVING ABILITY IN CLASS VII SMP NEGERI 37 MEDAN

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Abstract

This study aimed to evaluate the effectiveness of applying the cooperative learning model STAD type in enhancing students' mathematical problem-solving ability in data presentation materials. The research was conducted at SMP Negeri 37 Medan through a class action research. The research instruments used included problem-solving ability tests and observation sheets. By analyzing problem-solving ability test results and observation results, the study discovered that implementing the cooperative learning model STAD type had a significant positive impact on students' mathematical problem-solving abilities. This was demonstrated by the increase in the average score of students' problem-solving ability tests, as well as the classical completeness from cycle I to cycle III. Specifically, students' average scores rose from 51.09 in cycle I to 73.54 in cycle II and 83.48 in cycle III. The implementation of the cooperative learning model STAD type resulted in an increase in classical completeness among the students. The percentage of classical completeness after cycle I was 26%, 65% after cycle II and 90% after cycle III. The observation results also showed improvement, 72% after cycle I, 82% after cycle II, and 90% after cycle III.

Keywords*: Classroom Action Research, Cooperative Learning Model STAD Type, Problem-solving Ability.*

1. INTRODUCTION

Science and technology are rapidly advancing, affecting every aspect of human life including education. Technology has led to the evolution of mathematics education, which is a crucial component of national education and plays a fundamental role in science and technology development. This is because mathematics fosters critical thinking skills and is essential for technological advancements. Starting from elementary school, all students should receive mathematics education which equips them with logical, deliberate, fundamental, imaginative, and intelligent thinking abilities, and teaches them how to cooperate. These skills are required so students can acquire, make due, and use data to get by in a steadily evolving, unsure, and cutthroat circumstance (Depdiknas, 2006).

Mathematics learning standardizes five basic abilities - problem-solving, reasoning, communication, connection, and representation. These abilities form the foundation of success in both academia and the workforce, enabling one to deeply understand concepts and apply them to real-world situations (NCTM, 2000). Problem-solving ability is the ability to solve problems in previously unknown situations using the knowledge, skills, and understanding acquired.

According to the PISA study in 2018, Indonesia ranks 72 out of 77 nations in mathematical ability, scoring only 379, which is below the average of 489. Similarly, in the TIMSS study conducted by the IEA in 2015, Indonesian students ranked 44th out of 49 countries with a score of 397, compared to the international average of 500. These results suggest that Indonesian students struggle with non-routine or difficult questions, with most only capable of answering level 1 and 2 routine questions (Mariani & Susanti, 2019).

An interview with a mathematics teacher at SMP Negeri 37 Medan stated that online learning for two years has resulted in low mathematics ability among students. Some students have not grasped basic mathematical concepts and have not had the opportunity to solve mathematics problems. In addition, many students were unenthusiastic and uninterested when learning mathematics. The teacher stated that mathematics learning activities are teacher-centered and hinder students from taking an active role. Group discussions also do not run smoothly due to a lack of participation, which negatively affects problem-solving ability in class VII of SMP Negeri 37 Medan. Furthermore, a research conducted by Novriani & Surya (2017) also showed that the problem-solving abilities of class VIII students were still relatively low. Students cannot solve problems by fulfilling each indicator of problem-solving ability; the students' average percentage are 54.48% and belongs to the less category.

Indonesia's low problem-solving ability stems from lack of experience and motivation, and inadequate teaching materials that hinder the development of mathematical problem-solving ability (Dewi et al., 2021). The ability to solve mathematical problems is a fundamental skill that should be developed and emphasized in all areas of math education. The importance of problem-solving abilities to be perceived was likewise stated by Sirait & Siagian (2017) that problem-solving abilities are fundamental in mathematics education because: (1) students become capable at picking related data, then examining it lastly re-actually look at the outcomes; (2) scholarly fulfillment will show up from inside is a characteristic reward for students; (3) the increment of students' intellectual potential; (4) students figure out how to make disclosures by going through the most common way of making disclosures.

Thus, an effort is needed to further develop students' problem-solving abilities. One of the endeavors that can be made to further develop understudies' problem-solving ability is to apply a learning model that is oriented towards students' problem-solving abilities. The results of research conducted by Wardhani & Rajagukguk (2015) and Astuti (2016), it has been observed that the cooperative learning model of STAD type can enhance the mathematical problem-solving ability of students. The results of research conducted by (Pasalbessy et al., 2020), the study found that the STAD cooperative learning model positively impacted students' problem-solving abilities, outperforming the direct learning model.

In the cooperative learning STAD type, students are divided into groups of 4 or 5 pupils of different ability, gender and race. A teacher conducts the lesson and the students are divided into groups to ensure that all individuals of the group have dominated the lesson. At long last, all students complete individual quizzes on the material, although they may not be able to help each other at that time. Students' test scores are compared to their previous averages and grades are awarded according to how much they have improved or how far they have deviated from their previous results (Nurdyansyah & Fahyuni, 2016).

Referring to the opinion of the cooperative learning model STAD type is a learning model that gives students time to discuss in groups, take roles to understand learning materials, and give awards to teams that reach certain criteria, thus the cooperative learning model STAD type can act as a facilitator in improving students' problem-solving abilities.

2. METHOD

This study is a form of classroom action research that is implemented as a problem-solving strategy. CAR is actioned to improve oneself to achieve better things and carried out continuously until the goal is achieved (Arikunto et al., 2018). In this research, the cycle is divided into at least two cycles because if the implementation of the first cycle shows students' mathematical problem-solving ability do not increase, the improvements can be made in cycle II. The process of implementing this classroom action research is

designed from the Kemmis & Mc. Taggart model which consists of 4 stages, namely planning, action, observing & evaluating, and reflecting. Overall the four stages in this CAR form a cycle. This cycle is then followed by other cycles continuously like a spiral (Aqib & Chotibuddin, 2018). The subjects in this research were 31 students in class VII-A of SMP Negeri 37 Medan for the 2022/2023 academic year. The research instruments used in this research were problem-solving ability tests and observation sheets.

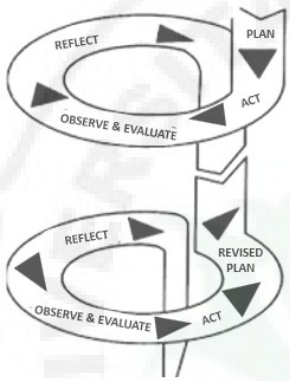

Figure 1. Kemmis & Mc. Taggart CAR Model

Each cycle involves the collection of data on mathematical problem-solving ability tests are analyzed to determine the success rate of student action, with the following steps:

a. Individual Completion (Individual)
To pass the problem-solving test, students need to score at least 70 points to be considered proficient.

$$TKPM = \frac{B}{N} \times 100 \quad (1)$$

TKPM : Student Problem Solving Ability Result
B : Total score of problem solving abilities obtained by students
N : Total maximum score

b. Classical Completeness (Group)
A class succeeds if at least 85% of students achieve learning completeness or score 70.

$$DSK = \frac{M}{N} \times 100\% \quad (2)$$

DSK : Percentage of classes that have achieved learning completeness
M : The total students who have achieved learning completeness
N : Total numbers of students

In this research, students' proficiency in mathematical problem-solving is assessed based on their performance on the mathematical problem-solving exam. Table 1 provides a list of categories along with the rating scale for the segregation of the student's scores on mathematical problem-solving ability.

Table 1. Student Problem-Solving Ability Scoring Category

Interval Score	Category
$80 < x \leq 100$	Very high
$70 < x \leq 79$	High
$60 < x \leq 69$	Medium
$50 < x \leq 59$	Low
$0 < x \leq 50$	Very low

After analyzing the data from observing teacher activities, we utilized the following formula:

$$P = \frac{score\ obtained}{maximal\ score} \times 100\% \quad (3)$$

The categories of observation result are in Table 2 below.

Table 2. Observation Result Criteria

Score Range	Criteria
$90\% < x \leq 100\%$	Very high
$80\% < x \leq 89\%$	High
$70\% < x \leq 79\%$	Medium
$60\% < x \leq 69\%$	Low
$0\% < x \leq 59\%$	Very low

3. RESEARCH RESULT AND DISCUSSION

Research Result

The research conducted on 31 students in class VII-A of SMP Negeri 37 Medan began with a diagnostic test to assess their problem-solving ability. The test was designed to identify the challenges faced by students and determine their initial level of mathematical problem-solving ability. The results showed an average score of 36.29, indicating a very low level of proficiency in this area. Only 1 student (3%) completed the diagnostic test, while the remaining 30 (97%) did not. These findings suggest that there is a significant need for improvement in students' problem-solving ability.

This research was conducted from May 3, 2023 to May 31, 2023, which consisted of 3 cycles. There are four stages carried out in each cycle, namely the planning, action, observation, evaluation and reflection stages. There were two meetings in each cycle.

The implementation stage in cycle I consisted of 2 meetings which were held on 6 May 2023 and 16 May 2023. The first meeting implemented the cooperative STAD learning model for learning activities. At this meeting, learning is carried out on data presentation material with indicators that should be accomplished is that understudies figure out the meaning of data and presenting data by tables. For the purpose of the end cycle test, a second meeting was conducted.

In the initial activity, the teacher opens the lesson by giving greetings, leading the prayer or appointing the class leader to lead the prayer and checking the students' attendance. The teacher also checks student attendance and prepares students to be neat and conducive to learning activities. The next activity was to implement the learning by using the phases of the cooperative learning model STAD type. The results of the testing process can be seen in Table 3.

Table 3. Cycle I Test Result

Num.	Students' Code	Test Result
1.	AFT	72
2.	BMS	81
3.	DAN	54
4.	DTS	36
5.	ESL	63
6.	GFS	72
7.	GRB	54
8.	IDY	63
9.	JGV	63
10.	JSM	54
11.	MRA	27
12.	MGP	27
13.	MBA	45
14.	MIS	72
15.	MVA	63
16.	NAA	27
17.	NAN	81
18.	NAR	72
19.	NGG	81
20.	NAT	45
21.	NHH	18
22.	NHT	45
23.	PJS	36
24.	PJG	36
25.	SCP	18
26.	SRP	36
27.	TMS	18
28.	VAH	54
29.	VAS	81
30.	ZFA	45
31.	CFN	45
Average score : 51.09		
Classical completeness : 26%		

Based on the observer's assessment, the researcher's learning process was rated as "good" with an average score of 72%.

The cycle I test results indicate that the classical student completeness percentage did not meet the specified criteria. Hence, the research continued to cycle II.

Cycle II was carried out as an effort to improve the shortcomings found in cycle I, overcome students' difficulties in solving mathematical problems and to determine the improvement of students' problem-solving ability through the application of the cooperative learning model STAD type. The implementation stage in cycle II consists of 2 meetings which were held on 20 May 2023 and 23 May 2023. The first meeting implemented the cooperative learning model STAD type. At this meeting, learning is carried out on data presentation material with indicators that must be achieved is that students understand data presentation using tables and data presentation using bar charts.

Table 4. Cycle II Test Result

Num.	Students' Code	Test Result
1.	AFT	91
2.	BMS	91
3.	DAN	91
4.	DTS	27
5.	ESL	45
6.	GFS	81
7.	GRB	91
8.	IDY	72
9.	JGV	63
10.	JSM	91
11.	MRA	63
12.	MGP	72
13.	MBA	81
14.	MIS	91
15.	MVA	91
16.	NAA	63
17.	NAN	100
18.	NAR	91
19.	NGG	91
20.	NAT	72
21.	NHH	63
22.	NHT	63
23.	PJS	36
24.	PJG	91
25.	SCP	45
26.	SRP	72
27.	TMS	36
28.	VAH	63
29.	VAS	81
30.	ZFA	91
31.	CFN	81
Average score : 73.54		
Classical completeness : 65%		

Based on the observer's assessment, the researcher's learning process was rated as "good" with an average score of 82%.

Although the average score of students on math-solving tests has increased and the average problem-solving ability test II reached the high category, it has not fulfilled the classical completeness, so this research will be continued to cycle III.

Cycle III was carried out as an effort to improve the shortcomings found in cycle II, overcome students' difficulties in solving mathematical problems and to determine the improvement of students' problem-solving ability through the application of the cooperative learning model STAD type.

Two meetings were held on 27 May 2023 and 30 May 2023 during the implementation stage in cycle III. The cooperative learning model STAD type was implemented during the first meeting to facilitate learning activities. At this meeting, learning was carried out on data presentation material with indicators that must be achieved is that students understand data presentation using line charts and pie charts. The second meeting was done to held the end cycle test. Table 3 displays the test results for cycle III.

Table 5. Cycle III Test Result

Num.	Students' Code	Test Result
1.	AFT	100
2.	BMS	100
3.	DAN	91
4.	DTS	45
5.	ESL	81
6.	GFS	91
7.	GRB	100
8.	IDY	81
9.	JGV	81
10.	JSM	91
11.	MRA	91
12.	MGP	81
13.	MBA	81
14.	MIS	91
15.	MVA	91
16.	NAA	81
17.	NAN	100
18.	NAR	100
19.	NGG	100
20.	NAT	100
21.	NHH	54
22.	NHT	72
23.	PJS	72
24.	PJG	81
25.	SCP	72
26.	SRP	81
27.	TMS	54
28.	VAH	72
29.	VAS	81
30.	ZFA	91
31.	CFN	81
Average score : 83.48		
Classical completeness : 90%		

Based on the observer's observation, after assessing the researcher's learning process, it was determined that it was of high category, with an average score of 90%.

Upon conducting a thorough analysis of the results obtained from the Problem-Solving Ability Test III during Cycle III, it was found that the class average score reached 83.48 with a classical learning completeness rate of 90%. The test results had reached the research success indicator. Because the level of student learning completeness has been achieved, mathematical problem-solving ability has improved, and the research success indicator has been achieved, the researcher did not continue to the next cycle.

Discussion

The outcomes of initial observations before the action showed that the learning process in the classroom had not been carried out optimally. Despite the teacher's efforts to enhance students' mathematical problem-solving ability, it appears that the current approach has not been effective. The learning process seems to lack student engagement, which is crucial in helping them develop their mathematical problem-solving ability. As a result, students are not benefiting as much as they could from the teacher's efforts to improve their ability.

During the action stage, the researcher aimed to encourage all students to actively participate in discussion activities. However, this goal was not accomplished due to obstacles that arose during group presentations. Some students were not fully engaged with the presentations being delivered. After the reflection stage of the cycle I, it was determined that the implementation of the cooperative learning model STAD type did not yield significant improvements in students' mathematical problem-solving ability. Test results indicated poor problem-solving ability among students and classical class completeness was not achieved.

During cycle I, the average score for students' mathematical problem-solving ability was 51.09, indicating a low category. As a result, the insights and reflection from cycle I provide a useful point of reference for designing the activities for cycle II. The approach taken in cycle II is distinct from that of cycle I, and the details are outlined below:

a. Changing the members of the study group heterogeneously in light of the aftereffect of the problem-solving ability test of cycle I.
b. Supervising student discussion activities so that all group members can be involved during discussion and presentation activities.
c. Adding flip PDF learning media to be used when explaining learning materials.

During cycle II, the researcher's ability to supervise and facilitate learning improved significantly, and remained in the good category. The use of flip PDF learning media in class has helped students focus more closely on the teacher's explanations, resulting in increased student engagement, more questions asked, and more productive group discussions. Group presentation activities also went smoothly, leading to a marked improvement in students' problem-solving abilities. The average problem-solving ability of students has increased to 73.54, as evident from the test results and the student learning completeness rate increased to 65%. However, this research has not yet reached its success level, which is the classical completeness of students reaching 85%. Hence, the research was carried forward to the third phase of action. The results of observation and reflection in cycle II can be used as a reference for improving actions in cycle III.

In cycle III, the researcher implemented the STAD type of cooperative learning model well. This can be seen from students' participation in learning was more active compared to the previous cycle, students had the courage to express their opinions in group discussions and during group presentations. The implementation of the cooperative learning model STAD type has been running following the steps previously determined and play on words students are very enthusiastic to solve mathematical problems and

get good grades in learning. Recent research has indicated a noteworthy enhancement in the problem-solving ability of students. Classically, the mathematical problem-solving ability of the students had shown improvement and based on the indicators of research success, the students had attained the level of complete learning. The test results of students' mathematical problem-solving ability have been seen to increase this can be seen in figure 2.

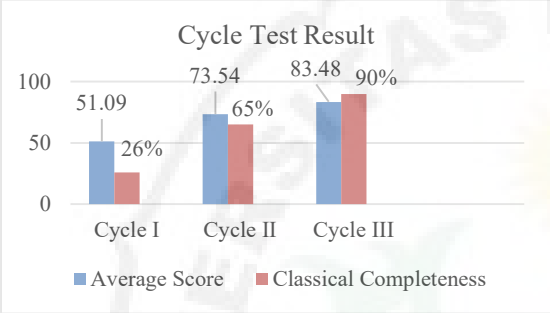

Figure 2. Cycle Test Result

Based on the diagram above, it can be seen that cycle I has not yet reached the predetermined indicators of research success, namely the average test of at least 70 and classical class completeness of 85%. In cycle II, the test average had reached the research success criteria, namely 73.54 but class completeness had not yet reached the predetermined target. In cycle III, the results of the problem-solving ability test have reached the predetermined indicators of success, namely the class average reached 83.48 and class completeness reached 90%.

After implementing the cooperative learning model STAD type during the learning process, students showed significant improvements in their mathematical problem-solving abilities, particularly in data presentation material. From the problem-solving ability test results, 8 out of 31 students (26%) reached the level of learning completeness in cycle I with an average score of 51.09. In cycle II, the number of students who reached learning completeness increased to 20 (65%) out of 31 students, with an average score of 73.54. In cycle III, this number further increased to 28 students (90%) out of 31 with an average score of 83.48. Based on the data collected, it is evident that classical learning completeness increased from cycle I to cycle III. Specifically, classical learning completeness was achieved by 26% of students in cycle I, while in cycle II, the percentage rose to 65%, and in cycle III, it further increased to 90%.

The mathematical problem-solving ability of the students has significantly improved from cycle I to cycle III. This can be attributed to the effective implementation of the cooperative learning model STAD type, which has been consistently applied throughout each cycle. The teacher's activities and performance in utilizing the cooperative learning model STAD type has also significantly improved in each cycle. Based on the observation results of the learning process using the cooperative learning model STAD type, it has increased in each cycle. This can be seen from the increase in the percentage of the overall teacher activity score, namely 72% in cycle I, 82% in cycle II, and 90% in cycle III. Furthermore, the teacher has made an effort to encourage previously uninvolved students to participate actively in the discussion activities, which has resulted in positive outcomes. The students' cooperation and efforts to learn and discover during each meeting have also improved considerably over time. The diagram in figure 2 shows the results of teacher activity observation results.

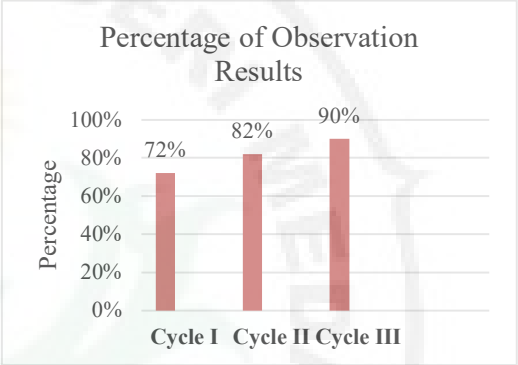

Figure 3. Percentage of Observation Results

The implementation of the cooperative learning model STAD type has yielded a significant enhancement in the learning journey. This is apparent through the rise in the teacher activity score percentage, which stood at 72% during cycle I, 82% during cycle II, and 90% during cycle III.

During cycle I, the cooperative learning model STAD type implementation highlighted several teacher shortcomings, such as the inability to guide students towards concluding the material learned, manage time effectively, and create a conducive learning environment. To overcome these shortcomings, the researcher made improvements in cycle II. The mathematics teacher provided suggestions to address the issues identified in cycle I, and the teacher's activity in cycle II improved significantly. The percentage of teacher activity increased to 82%, and all indicators of teacher activity assessment were in the good category. However, the researcher needs to work on improving student discussion activities to ensure that discussions run smoothly. In cycle III, the percentage of teacher activity was in the excellent category at 90%. According to the mathematics teacher's observations, the learning process using the cooperative learning model STAD type was successful.

According to the research findings, the utilization of the cooperative learning model STAD type can significantly improve the mathematical problem-solving ability of students in class VII-A at SMP Negeri 37 Medan, specifically when learning data presentation concepts. Moreover, the research revealed that the teacher proficiently implemented the cooperative learning model STAD type throughout the learning process.

Previous research conducted by Astuti (2016) support the findings of this research, which indicate that the cooperative learning model STAD type can effectively improve students' problem-solving ability in mathematics. During cycle I, students scored an average of 73.82 on the problem-solving ability test, with only 40.91% of students achieving learning completeness. However, during cycle II, the average score increased to 80.73, and 77.27% of students reached the KKM. Notably, the implementation of the cooperative learning model STAD type during cycle II achieved a success rate of 86.67%.

Furthermore, this research is supported by the previous study conducted by Wardhani & Rajagukguk (2015), which suggested that using the cooperative learning model STAD type can significantly enhance the students' numerical problem-solving ability. The study showed a remarkable improvement in the students' problem-solving abilities from cycle I to cycle II. In cycle II, most of the students had achieved good criteria problem-solving ability. The results of the study revealed that in cycle I, 57.14% of the students were able to achieve learning completeness with the cooperative learning model STAD type. However, this result increased to 85.7% in cycle II, indicating a substantial increase in the number of students who achieved learning completeness.

According to a study conducted by Dewi et al., (2017), the utilization of the STAD learning model led to greater proficiency in mathematics problem-solving ability among students compared to conventional methods. The research revealed an elevated level of mathematical problem-solving abilities among students taught through the STAD model in comparison to those taught through conventional approaches. Ultimately, the study determined that the STAD learning model proved to be a more efficient and effective means of enhancing students' mathematics problem-solving ability than conventional models.

The cooperative learning model STAD type, based on Piaget's learning theory, prioritizes active student engagement and collaboration with both peers and teachers. This approach fosters meaningful learning and empowers students to participate in group problem-solving activities. By utilizing the cooperative learning model STAD type, students have ample opportunities to process information, develop innovative problem-solving techniques, implement solutions, and assess the results. In the cooperative learning model STAD type, students will be easier to find comprehensive concepts that are difficult if they discuss it with other students about the problems encountered. The STAD learning model emphasizes the social environment of learning and making learning groups a place to gain knowledge and challenge the knowledge possessed by individuals. This is the key to the basic concepts of constructivism theory put forward by Piaget and Vygotsky (Baharuddin et al., 2015).

Piaget and Vygotsky theories strongly supports the cooperative learning model STAD type, because in STAD students are required to be active in the learning process, students are grouped according to their abilities, in group activities students will find answers to the problems they face, students interact with teachers and also other students. The STAD learning model requires students to be responsible for the tasks given by the teacher. The teacher acts as a mediator and facilitator in the STAD learning model. In conclusion, implementing the cooperative learning model STAD type has been shown to enhance the mathematical problem-solving capabilities of students in class VII-A SMP Negeri 37 Medan, particularly in the area of data presentation material.

The cooperative learning model STAD type is a learning model where students work collaboratively in groups to solve mathematic problems. The group members come from diverse backgrounds, thus enhancing students' socialization skills as well. For the model to be effective, teachers should incorporate relevant learning materials to make the learning process more engaging and innovative. This learning model should be applied as a variation to the existing learning models, especially in subjects related to daily life. It's important to note that implementing the STAD cooperative learning model demands a considerable amount of time. Therefore, teachers who intend to apply this model should manage their time efficiently to ensure proper implementation of the model steps.

4. CONCLUSION

After conducting mathematical problem-solving ability tests in cycle I, II, and III, we have determined the following results. It was observed that the mathematical problem-solving ability of the students in class VII-A SMP Negeri 37 Medan have improved significantly. The average score obtained in the problem-solving ability test in cycle I was 51.09 which increased to 73.54 in cycle II, and further increased to 83.48 in cycle III. This improvement in the average score of the problem-solving ability test is attributed to the effective implementation of the cooperative learning model STAD type during the learning process. The implementation of cooperative learning model STAD type led to significant improvements in the classical completeness of students in class VII-A at SMP Negeri 37 Medan. During the first cycle, only 8 of the 31 students (26%) achieved classical completeness. After implementing cycle II, the percentage of students reaching classical completeness increased to 20 (65%) out of 31 students. By cycle III, 28 (90%) out of 31 students have achieved classical completeness, indicating a significant improvement in their academic performance. This research was successful in achieving the goal of at least 85% of students scoring 70 or higher.

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