International Journal of Research and Review
Volume 11; Issue: 5; May 2024
Website: www.ijrrjournal.com
Research Paper *E-ISSN: 2349-9788; P-ISSN: 2454-2237*

Improving Mathematical Problem-Solving Skills of Grade X Students on Arithmetic Sequence Material Through the Application of the Discovery Learning Model

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DOI: https://doi.org/10.52403/ijrr.20240562

ABSTRACT

This study was motivated by the lack of student motivation caused by the assumption that math is difficult and teachers who still practice conventional learning models in learning mathematics. As a result, students have low mathematical problem solving skills. The purpose of this study is to show that the improvement of mathematical problem solving ability of students taught used Discovery Learning model is better than students taught used conventional learning model. This research used quantitative approach with quasi experimental method and The Nonequivalent Pretest Posttest Control Group Design. The population of this study was class X SMAN 4 Kediri in the 2023/2024 academic year. Sampling was done by random sampling. The instruments used in this study were lesson plans / teaching modules, pretest questions and posttest questions. Data analysis techniques used the Mann Whitney U Test. Based on the results of the study, the increase in the average pretest and posttest scores was 42.6562 with the level of students' mathematical problem solving skills increased by 40.56% in the experimental class. While in the control class, the increased in the average value of the pretest and posttest was 15.9143 with the level of students' mathematical problem solving ability increased by 16.53%. Thus, it is concluded that the improvement of mathematical problem solving ability of students taught used Discovery Learning model is better than the improvement of mathematical problem solving ability of students taught used conventional learning model.

Keywords: mathematical problem solving ability, discovery learning

INTRODUCTION

The rapid development of Science and Technology in 21st century learning brings changes in education, including changes in curriculum, learning media, modules, facilities, and learning models applied to students to face global challenges. In the 21st century learning world, the learning process is more student-centered than teacher-centered. (1) argue that the thinking and learning skills needed in the 21st century are formulated by the Framework Partnership of 21st Century Skills commonly referred to as "The 4C Skills are: (1) Communication, (2) Collaboration, (3) Critical Thinking and Problem Solving, and (4) Creative and Innovative. The main goal of 21st century education is for students to have the ability to think critically and solve problems,

communicate, collaborate, be creative and innovative, and technology. One of the high-level skills required in 21st century learning is problem solving. This is in line with Permendikbud No 22 of 2016 which states that one of the objectives of mathematics is to have problem solving skills (2). However, the importance of math problem solving ability is inversely proportional to the reality. In mathematics education, there are still students who face difficulties in mastering mathematical concepts. This is because mathematics itself is abstract, causing students to be less or unable to solve math cases given by their teachers. The success of learning mathematics is characterized by the ability to solve problems experienced by a person. (3) states that the curriculum already outlines the importance of students' problem-solving skills.

Based on the results of the Program for International Student Assessment (PISA) survey in 2022, Indonesia ranked 68 out of 81 countries in the field of mathematics skills with an average score of 366. The results of this average score show that this number is down 13 points compared to 2018. The low performance of Indonesian students in PISA is due to their lack of ability to solve advanced and non-routine math problems. PISA questions are organized into 6 levels, with level 1 as the lowest level and level 6 as the highest level. At levels 5 and 6, students are able to model real-life situations mathematically and select, compare and evaluate appropriate problem-solving strategies. However, only 9% of Indonesian students reach levels 5 and 6 (4). The low math scores of Indonesian children aged 15-16 years in PISA 2022 indicate that 21st century skills including critical thinking, problem solving, and higher order thinking skills (HOTS) are still lacking. It can be concluded that the ability of Indonesian students to solve math problems is still low.

According to (5), most students lack problem solving skills. This is evidenced by the large number of students who rely on simple formulas in solving math problems. (6) argue that there are several causes of students' low mathematical problem solving skills, namely: (1) less creative and innovative learning media in supporting student participation in learning mathematics, (2) the use of inappropriate learning methods, (3) decreased motivation to learn mathematics because there is an assumption that math is scary and difficult, and (4) the role of the teacher in the learning process which still tends to be dominant.

Muhardhikawati, Mardiyana, and Setiawan (2017) in (7) suggest that mathematical problem solving skills are important for students. The reasons are: (1) Students are expected to be able to solve problems independently, because problem solving ability is a mathematics learning outcome that students must have, (2) Problem solving ability is a component of the process of mastering mathematics, and (3) Problem solving skills are used and applied in real life to solve problems.

To overcome this case, an effective learning model that makes students understand concepts and master math problem solving skills must be implemented. During this time, teachers only use conventional learning models that do not train students in solving math problems. The learning model that can be applied in 21st century education is the discovery learning model (8).

Atmawati in (9) argues that discovery learning is a procedure used by teachers in learning activities that involves students to be able to find their own answers to the problems faced and the teacher only acts as a facilitator. According to Illahi (2012) in (10), the discovery learning model has several objectives, namely: (1) Increase creativity, (2) Gain direct learning experience, (3) Improve the ability to think rationally and critically, (4) Increase student activeness during the learning process, (5) Improve student problem solving skills, and (6) Get updates in the learning process. (11) in their research suggested that the application of the discovery learning model was able to improve students' mathematical problem solving skills. Students are more active,

enthusiastic, and excited in learning mathematics.

This research aims to show that the increase in problem solving skills of students taught with the Discovery Learning model is better than students taught with conventional learning models.

LITERATURE REVIEW

Mathematical Ability Problem Solving

Hasratuddin (2018) in (7) defines mathematical problem solving ability as the ability in mathematics to solve difficulties by practicing mathematical concepts and rules learned to achieve the expected goals. Mathematical problem solving ability is an important ability that students must master when learning mathematics (12). Based on (13), problem solving centers on something that is logical, critical, analytical, thorough and careful, does not give up easily, and is responsible for solving existing mathematical problems and is the goal of learning mathematics (14). Indicators of mathematical problem solving ability proposed by Polya (1973) in (15), namely: (1) understand the problem, (2) think of a plan, (3) implement the plan/plan to solve the problem, and (4) look back/re-examine the results of problem solving.

Learning Model

The learning model is a framework in the learning process that describes the learning activities described by the teacher from beginning to end. The learning model can be described as a framework for implementation in approaches, procedures, strategies, and methods in learning activities (16). (17) suggests that learning models are options for teachers in developing an efficient and effective learning process to achieve certain learning objectives. A good learning model can be used as a guideline for designing classroom learning processes and guidance and for selecting teaching materials that are suitable for the content of the material being taught (Trianto, 2009) in (18). Teachers are expected to be selective in choosing learning models that are suitable for the subject matter and the needs of their students. The accuracy of choosing a learning model can affect students' ability to master the material taught by the teacher.

Discovery Learning

Discovery Learning is a learning model that requires students to be able to actively participate in the learning process, prioritizing independence in finding and discovering the concept of learning material, thinking critically and increasing creativity in solving mathematical problems. The teacher's position is only as a facilitator who facilitates students during the learning process (19). (20) stated that by using the Discovery Learning model, learning becomes more meaningful because students can explore their learning environment rather than passively looking at the teacher's explanation. The Discovery Learning model can realize better results in students' mathematical problem solving skills (21).

Kurniasih (2014) in (22) argues that discovery learning has 3 main characteristics, namely: (1) solving problems to create a concept of knowledge, (2) student-centered, and (3) activities that integrate new knowledge and previously acquired knowledge. According to Eko Sudarmanto in (23), the characteristics of discovery learning are: (1) the teacher's position is only as a guide/facilitator, (2) students can play an active role as a scientist, and (3) this model develops students in exploring data, classifying, collecting, and analyzing information to draw conclusions. The steps for implementing the Discovery Learning model according to (24) are: (1) Stimulation, (2) Problem statement, (3) Data collection, (4) Data processing, (5) Verification, and (6) Generalization.

Conventional Learning

Djamarah (1996) in (25) said that the conventional learning model is commonly known as the lecture method, which has been used since time immemorial as a means of oral communication between teachers and students in the learning process. (16) argues

that the teaching and learning process of conventional learning models is usually carried out in a unidirectional manner, where the teacher shares knowledge, data, norms, values, and others with the student. This process assumes that students are likened to an empty bottle or a piece of white paper. As a teacher, you must be able to fill an empty bottle with knowledge or write something on a blank piece of paper. This system is commonly known as the banking concept. Conventional learning can be defined as an approach to behavior and attitudes that are in line with the values and traditions passed down from generation to passed down from generation to generation (26).

According to Burrowes (2003) in (27) conventional learning has characteristics, namely: (1) the teacher becomes the center of the learning process, (2) passive learning is created, and (3) interaction in learning is lacking, (4) collaborative groups are not created, and (5) the assessment carried out is sporadic. (28) states that the steps for implementing conventional learning models are: (1) The teacher conveys orientation, apperception, motivation, and learning objectives, (2) The teacher explains the learning material, (3) The teacher provides opportunities for students to ask questions, (4) The teacher distributes practice problem assignments to strengthen knowledge concepts, (5) The student teacher concludes the core of the learning that has been done, and (6) The teacher closes the lesson.

MATERIALS & METHODS

The research approach used is a quantitative approach. While the research method in this study is the experimental method. The experimental method is a research method that aims to test the effect of a treatment on other treatments in controlled conditions (29). This research design uses a quasi-experimental research design. The form of quasi-experimental design used is The Nonequivalent Pretest Posttest Control Group Design. In a quasi-experiment, researchers test independent and dependent variables in experimental and control class groups. The sample selected in this study was chosen randomly (random sampling). This study used pretest and posttest. The Discovery Learning model was used in the experimental class. While the control class used the conventional learning model. The experimental research design according to (29) is shown in Table 1 below.

Table 1. Research Design

Subject	*Pretest*	Treatment	*Posttest*
Experimental Class	O_1	X	O_2
Control Class	O_3	-	O_4

Description:

O_1 : Pretest result for experimental class

O_3 : Pretest result for control class

O_2 : Posttest result for experimental class

O_4 : Posttest result for control class

X : Treatment used Discovery Learning model for experimental class

This research was conducted at SMAN 4 Kediri. The researcher chose the school because based on observation, the learning model applied in mathematics subjects at SMAN 4 Kediri was still conventional. The population of this study was the X class of SMAN 4 Kediri in the 2023/2024 academic year. From random sampling, class X-3 was selected as the experimental class and class X-6 as the control class. The independent variable in this study is the Discovery Learning model. While the dependent variable is students' mathematical problem solving ability.

The instruments of this research consisted of lesson plans/teaching modules that used the Discovery Learning model and the conventional model. The measurement instrument is a test sheet consisting of pretest questions to determine mathematical problem solving ability before treatment and posttest questions to determine mathematical problem solving ability after treatment. The teaching material used in this research is arithmetic sequence. The research data were obtained from the pretest and posttest results. The test consisted of 3 description questions for the experimental class and control class with the same type of questions.

To determine the percentage of students' mathematical problem solving ability on each indicator, the following formula is used (30).

$$p = \frac{X_i}{Maximum\ Score \times n} \times 100\%$$

Description:

p : percentage of each student's math problem solving ability based on indicators

X_i : the number of scores on the i-th indicator with $i = 1,2, \dots, n$

Maximum Score: the maximum score of each indicator

n : many students in the class

Next, calculate the overall percentage of students' mathematical problem solving ability scores with the following formula.

$$P = \frac{\sum_{k=1}^{n} P_k}{n}$$

Description:

P : percentage of students' overall mathematical problem solving ability

P_k : percentage on the i-th indicator, with $k = 1,2, \dots, n$

Students' mathematical problem solving ability is categorized according to (31) below.

Table 2. Criteria for Students' Mathematical Problem Solving Ability Based on Overall Indicators Score

Score	Criteria
$89\% < X \leq 100\%$	Very good
$78\% < X \leq 89\%$	Good
$64\% < X \leq 78\%$	Medium
$55\% < X \leq 64\%$	Low
$0\% < X \leq 55\%$	Very low

Students' mathematical problem solving ability was also observed from the pretest and posttest results of the experimental and control classes. The average scores before and after treatment were categorized based on the level of mathematical problem solving ability proposed by (32).

Table 3. Categories of Students' Mathematical Problem Solving Ability Based on Pretest and Posttest Scores

Score	Category
81 - 100	Very good
61 - 80	Good
41 - 60	Simply
21 - 40	Less
0 - 20	Very less

STATISTICAL ANALYSIS

Statistical data using quantitative data analysis. Descriptive statistical analysis and inferential statistics were used in this study. Descriptive statistical analysis is usually expressed in the form of tables, graphs and diagrams, mean, median, mode, decile calculation, percentile, standard deviation, and percentage calculation (29). According to (29), inferential statistical analysis consists of parametric statistics and nonparametric statistics. Parametric statistics require the data obtained to be normally distributed and homogeneous. If one or both are not met, then nonparametric statistical analysis is used. This research data was processed and analyzed using Microsoft Excel 2010 program and IBM SPSS Statistics Version 22.

RESULTS

The mathematical problems of students were seen from the results of the pretest and posttest in class X-3 as the experimental class and class X-6 as the control class.

Pretest Posttest Results in Experimental Classes

Data on pretest and posttest results in the experimental class used the Discovery Learning model are shown in Table 4 below.

Table 4. Pretest Posttest Results in the Experimental Class

Number	Statistics	*Pretest*	*Posttest*
1.	N	32	32
2.	Total Score	1,553	2,918
3.	Average	48.5313	91.1875
4.	Variance	385.289	148.093
5.	Standard Deviation	19.62879	12.16934
6.	Minimum	15	36
7.	Maximum	87	100

Based on Table 4 above, the average value of the experimental class treated with the application of the Discovery Learning model reached a pretest average value of 48.5313 in the simply category, with the highest value of 87 and the lowest value of 15. The posttest average value was 91.1875 in the very good category with the highest value of 100 and the lowest value of 36. This shows that there was an increase in the average value of 42.6562 from the pretest.

Next, a diagram of the results mathematical problem solving ability of class X-3 students before and after treatment used the Discovery Learning model is presented.

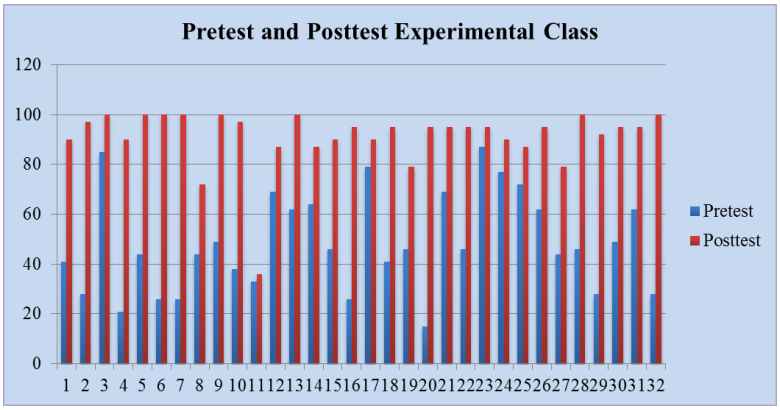

Figure 1. Diagram of Experimental Class Pretest and Posttest Results

Pretest Posttest Results in Control Class

Data on pretest and posttest results in the control class used the conventional learning model are shown in Table 5 below.

Table 5. Pretest Posttest Results in the Control Class

Number	Statistics	*Pretest*	*Posttest*
1.	N	35	35
2.	Total Score	2,239	2,796
3.	Average	63.9714	79.8857
4.	Variance	449.323	133.987
5.	Standard Deviation	21.19723	11.57526
6.	Minimum	26	49
7.	Maximum	95	95

Based on Table 5 above, the average value of control class treated with the application of the conventional learning model reached a pretest average value of 63.9714 in the good category, with the highest value of 95 and the lowest value of 26. The posttest average value was 79.8857 in the good category with the highest value of 95 and the lowest value of 49. This shows that there was an increase in the average value of 15.9143 from the pretest.

Next, a diagram of the results mathematical problem solving ability of class X-6 students before and after treatment used the conventional learning model is presented.

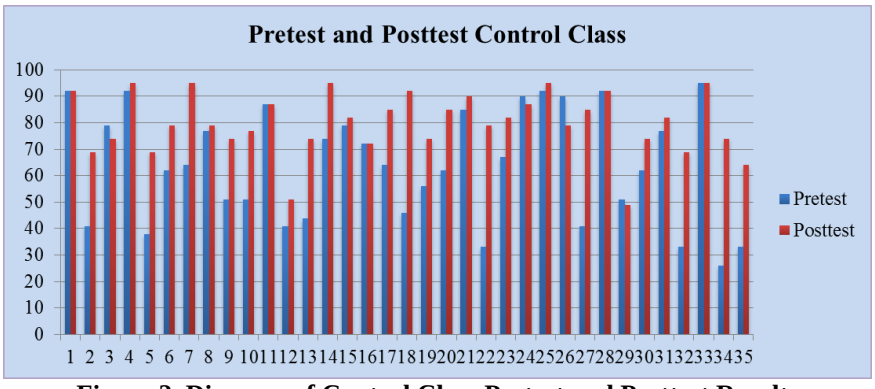

Figure 2. Diagram of Control Class Pretest and Posttest Results

The percentage of students' mathematical problem solving ability in the experimental class is described below.

Table 6. Percentage of Students' Mathematical Problem Solving Ability By Indicator in Experimental Class on Pretest

Indicator	Persentage
1. Understand the problem	75.52%
2. Thinking of a plan	51.56%
3. Implementing the plan or planning the problem solving	45.57%
4. Looking back or rechecking the results of problem solving	30.21%
Total	**50.72%**

Based on the data in Table 6 above, before the Discovery Learning model was applied, the overall percentage of students' mathematical problem-solving ability was 50.72% in very low criteria.

Table 7. Percentage Of Students' Mathematical Problem Solving Ability By Indicator in Experimental Class on Posttest

Indicator	Persentage
1. Understand the problem	98.44%
2. Thinking of a plan	95.83%
3. Implementing the plan or planning the problem solving	92.71%
4. Looking back or rechecking the results of problem solving	78.13%
Total	**91.28%**

Based on the data in Table 7 above, after applying the Discovery Learning model, the overall percentage of students' mathematical problem solving ability on the posttest was 91.28% in very good criteria.

Based on Tables 6 and 7 above, in the experimental class there was an increase in mathematical problem solving ability of 40.56%.

The percentage of students' mathematical problem solving ability in the control class is shown below.

Table 8. Percentage Of Students' Mathematical Problem Solving Ability By Indicator in Control Class on Pretest

Indicator	Persentage
1. Understand the problem	74.76%
2. Thinking of a plan	83.57%
3. Implementing the plan or planning the problem solving	60.95%
4. Looking back or rechecking the results of problem solving	34.92%
Total	**63.55%**

Based on the data in Table 8 above, before the conventional learning model was applied, the percentage of students' mathematical problem solving ability in the pretest was 63.55% in the low criteria.

Table 9. Percentage Of Students' Mathematical Problem Solving Ability By Indicator in Control Class on Posttest

Indicator	Persentage
1. Understand the problem	93.33%
2. Thinking of a plan	94.76%
3. Implementing the plan or planning the problem solving	77.62%
4. Looking back or rechecking the results of problem solving	54.60%
Total	**80.08%**

Based on the data in Table 9 above, after applying the conventional learning model, the overall percentage of students' mathematical problem solving ability on the posttest was 80.08% in good criteria.

Based on Tables 8 and 9 above, the control class experienced an increase in mathematical problem solving ability of 16.53%.

To determine the type of test used, either parametric or nonparametric statistics, first calculate the normality test of the data obtained. The purpose of the data normality test is to test whether the research data obtained is normally distributed or not. The data normality test used the Shapiro Wilk test on the lBM SPSS Statistics Version 22 program. The Shapiro Wilk test was chosen

because the number of samples in this study was less than 50 (33).

Data normality test decisions are based on: (1) Data is not normally distributed if the significance value < 0.05 and (2) Data is normally distributed if the significance value > 0.05 . The results of the data normality test in this study are as follows.

Table 10. Data Normality Test Results

Tests of Normality							
	Class	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
Pretest	Experimental Class	.147	32	.078	.954	32	.181
	Control Class	.102	35	.200*	.934	35	.038
Posttest	Experimental Class	.242	32	.000	.642	32	.000
	Control Class	.106	35	.200*	.927	35	.023
*. This is a lower bound of the true significance.							
a. Lilliefors Significance Correction							

Based on Table 10 of the experimental class data normality test results and the control class above, it can be seen that the experimental class pretest data gets a significance value of $0.181 > 0.05$, which means that the data is normally distributed. The experimental class posttest data received a significance value of $0{,}000 < 0.05$ which means that the data was not normally distributed. Then, the control class pretest data gets a significance value of $0.038 < 0.05$ which means that the data is not normally distributed. The control class posttest data received a significance value of $0.023 < 0.05$ which means that the data was not normally distributed. Thus, it is concluded that the research data obtained is not normally distributed.

The data from the pretest and posttest results of the experimental class and control class did not meet the requirements of parametric analysis, namely the data obtained were normally distributed and homogeneous, so that further nonparametric analysis was used. The nonparametric analysis used in this study to test the hypothesis is the Mann Whitney U Test with the IBM SPSS Statistic Version 22 program.

The hypothesis used in this study is as follows.

H_0 : The improvement of mathematical problem solving ability of students taught with Discovery Learning learning model is not better than students taught with conventional learning model.

H_a: The improvement of mathematical problem solving ability of students taught with Discovery Learning learning model is better than students taught with conventional learning model.

The criteria in hypothesis testing are: (1) H_0 is rejected and H_a is accepted if the value $sig.(2-tailed) < 0.05$ and (2) H_0 is accepted and H_a is rejected if the $sig.(2-tailed) > 0.05$. The results of hypothesis testing are described in the following table.

Table 11. Mann Whitney U Test Results

Test Statistics[a]		
	Pretest	Posttest
Mann-Whitney U	335.000	203.000
Wilcoxon W	863.000	833.000
Z	-2.828	-4.512
Asymp. Sig. (2-tailed)	.005	.000
a. Grouping Variable: Model Pembelajaran		

Table 11 of the Mann Whitney U Test results above shows that the *Asymp. Sig.(2-tailed)* obtained by the experimental class pretest data and the control class is $0.005 < 0.05$. While *Asymp. Sig.(2-tailed)* value obtained by the experimental class posttest data and the control class is $0.000 < 0.05$. By paying attention to the hypothesis testing criteria described above, the conclusion drawn is that H_0 is rejected and H_a is accepted. In this case, it means that the improvement of mathematical problem solving ability of students taught with Discovery Learning model is better than students taught with conventional learning model.

DISCUSSION

This research was conducted on students of class X-3 and class X-6 of SMAN 4 Kediri odd semester of 2023/2024 academic year. This research is quantitative research because the research data obtained are in the form of numbers and the analysis used is statistical analysis. The purpose of this study is to show that the improvement of mathematical problem solving ability of students taught with Discovery Learning model is better than students taught with conventional learning model.

This study included 2 classes, an experimental class and a control class, and each class was treated differently. In this study, class X-3 was the experimental class with the implementation of the Discovery Learning model. Class X-6 was the control class with the implementation of conventional learning model.

First, researchers distributed pretest questions to the experimental class and control class to determine the initial ability of mathematical problem solving in each class. Next, the experimental class was treated with the Discovery Learning model and the control class was treated with the conventional learning model. After the treatment, both classes were given posttest questions to determine the final mathematical problem solving ability of each class.

The students' mathematical problem solving ability on the pretest in the experimental class was 50.72% in very low criteria and the average value of the pretest score was 48.5313 in the simply category. Furthermore, after applying the Discovery Learning model, students' mathematical problem solving ability on the posttest in the experimental class was 91.28% in very good criteria and the average posttest score was 91.1875 in the very good category. Thus, it can be seen that students' mathematical problem solving ability increased by 40.56% and the pretest posttest value also increased by 42.6562 after being given treatment.

The minimum pretest value of the experimental class was 15 and the minimum posttest value was 36. This means that there was an increase in the minimum value by 21. Conversely, the maximum value of the experimental class pretest was 87 and the maximum value of the posttest was 100. The maximum value of the pretest posttest increased by 13.

Next, based on the research data, before the conventional learning model was applied, the mathematical problem solving ability of control class students was 63.55% in the low criteria with an average pretest score of 63.9714 in the good category. Then, the mathematical problem solving ability of control class students after applying the conventional learning model was 80.08% with good criteria and the average posttest score was 79.8857 in the good category. Thus, it can be seen that students' mathematical problem solving ability increased by 16.53% and the pretest posttest score also increased by 15.9143.

The minimum value of the control class pretest was 26 and the minimum value of the posttest was 49. This means that there was an increase in the minimum value by 23. Then, the maximum value of the pretest was 95 and the maximum value of the posttest was 95. That is, there was no increase in the maximum value of the pretest posttest in the control class.

The minimum and maximum pretest posttest values of both the experimental and control classes show that the second pretest posttest value has increased. In the calculation, the increase in the minimum and maximum pretest posttest values of the experimental class practicing the Discovery Learning model is better than the increase in the minimum and maximum pretest posttest values of the control class practicing the conventional learning model.

The results of this study are in accordance with previous research entitled “The Effect of Discovery Learning Method on Mathematical Problem Solving Ability of Class X Students of SMAN 5 Batam in 2014/2015 School Year” by (34) that students' problem solving ability is superior by used the discovery learning model than

the conventional learning model. This is also supported by (35) research on "Application of Discovery Learning Model to Mathematical Problem Solving Ability of Junior High School Students" which shows that the mathematical problem solving ability of students taught with Discovery Learning model is better than students taught used conventional learning model. Not only that, research conducted by (11) with the title "Discovery Learning Model on Mathematical Problem Solving Ability of Class IX E Students of Bhakti Mulya Batujajar Junior High School" concluded that students' mathematical problem solving skills can be improved by practicing the Discovery Learning model. Students become more active and participate eagerly in the learning process.

The results of hypothesis testing using the Mann Whitney U Test show that the *Asymp. Sig.(2-tailed)* < 0.05 which means rejecting H_0 and accepting H_a. From the research results that have been presented above, the increase in the average pretest and posttest scores of students' mathematical problem solving skills in the experimental class that practiced the Discovery Learning model increased better than those who practiced the conventional learning model.

CONCLUSION

Based on the research data obtained from experimental and control class students, then analyzed using Microsoft Excel 2010 and the IBM SPSS Statistic Version 22 program. From these results, it shows that the percentage of students' mathematical problem solving ability has increased in each indicator and overall. In addition, the average value of the pretest and posttest given also increased. However, a better improvement occurred in the experimental class. The conclusion of this study is that the improvement of mathematical problem solving ability of students taught used Discovery Learning model is better than the improvement of mathematical problem solving ability of students taught used conventional learning model.

Declaration by Authors

Acknowledgement: None

Source of Funding: None

Conflict of Interest: The authors declare no conflict of interest.

REFERENCES

1. Nabilah LN, Nana. Pengembangan Keterampilan Abad 21 Dalam Pembelajaran Fisika Di Sekolah Menengah Atas Menggunakan Model Creative Problem Solving. Sci Gate [Internet]. 2020;1–10. Available from: https://osf.io/6vwhd/
2. Sofyan Y, Sumarni S, Riyadi M. Pengembangan Perangkat Pembelajaran Pada Materi Bangun Ruang Sisi Datar Berbasis Model Project Based Learning Untuk Meningkatkan Kemampuan Pemecahan Masalah Matematis Siswa. Sigma J Pendidik Mat. 2021;13(2):129–42.
3. Andriani A. Peningkatan Kemampuan Pemecahan Masalah Matematik Mahasiswa FMIPA Pendidikan Matematika Melalui Model Pembelajaran Improve. J Tarb. 2016;23(1):83–100.
4. OECD. PISA 2022 Insights And Interpretations (Volume 1) [Internet]. OECD; 2023. 1-68 p. Available from: https://www.oecd.org/pisa/
5. Rofiqoh Z, Rochmad, Kurniasih A. Analisis Kemampuan Pemecahan Masalah Siswa Kelas X Dalam Pembelajaran Discovery Learning Berdasarkan Gaya Belajar Siswa. Unnes J Math Educ. 2016;5(1):24–32.
6. Nurhasanah DE, Kania N, Sunendar A. Penggunaan Model Pembelajaran Discovery Learning Untuk Meningkatkan Kemampuan Pemecahan Masalah Pada Siswa SMP. Didact Math. 2018;1(1):21–33.
7. Simatupang R, Napitupulu E, Asmin A. Analisis Kemampuan Pemecahan Masalah Matematis Dan Self-Efficacy Siswa Pada Pembelajaran Problem Based Learning. Parad J Pendidik Mat. 2020;13(1):29–39.
8. Barus DR. Model–Model Pembelajaran Yang Disarankan Untuk Tingkat SMK Dalam Menghadapi Abad 21. Univ Negeri Medan [Internet]. 2019;1–13. Available from: http://digilib.unimed.ac.id/id/eprint/38932
9. Okpiyanto T, Wahyudi, Yunianta TNH. Pengaruh Metode Discovery Terhadap Kemampuan Berpikir Kreatif Siswa Pada Materi Aljabar Kelas VIII Semester Ganjil

Tahun Ajaran 2014/2015 Di SMPN 2 Susukan. 2014;1–10.
10. Saputra R, Betania, Saputri LD. Efektivitas Model Discovery Learning Ditinjau Dari Kemampuan Pemecahan Masalah Matematis Pada Materi Bangun Datar. J Pendidik Mat (AL KHAWARIZMI). 2023;3(1):1–10.
11. Denati NP, Fitriani N, Pertiwi CM. Model Pembelajaran Discovery Learning Terhadap Kemampuan Pemecahan Masalah Matematis Siswa Kelas IX E SMP Bhakti Mulya Batujajar. J Pembelajaran Mat Inov. 2022;5(5):1485–94.
12. Hendriana H, Rohaeti E, Sumarmo U. Hard Skills Dan Soft Skills Matematik Siswa. Bandung: PT. Refika Aditama; 2017.
13. Peraturan Menteri Pendidikan Dan Kebudayaan Republik Indonesia Nomor 58 Tahun 2014 Tentang Kurikulum 2013 Sekolah Menengah Pertama/ Madrasah Tsanawiyah. In: Departemen Pendidikan Nasional. 2014. p. 1–82.
14. Muflihatusubriyah U, Utomo RB, Saputra NN. Analisis Kemampuan Pemecahan Masalah Matematis Siswa Berdasarkan Disposisi Matematis. AlphaMath J Math Educ. 2021;7(1):49–56.
15. Wahyudi, Anugraheni I. Strategi Pemecahan Masalah Matematika. Edisi 1. Salatiga: Satya Wacana University Press; 2017. 1-108 p.
16. Helmiati. Model Pembelajaran. Yogyakarta: Aswaja Pressindo; 2012.
17. Rusman. Model-model Pembelajaran Mengembangkan Profesionalisme Guru. Jakarta: PT. RajaGrafindo Persada; 2014.
18. Hsb AA. Pengaruh Model Discovery Learning Terhadap Kemampuan Pemecahan Masalah Matematika Peserta Didik Kelas IV MIS Istiqomah Islamic Fullday School Kec. Sunggal Kab. Deli Serdang. Skripsi. Universitas Islam Negeri Sumatera Utara; 2021.
19. Sunarto MF, Amalia N. Penggunaan Model Discovery Learning Guna Menciptakan Kemandirian Dan Kreativitas Peserta Didik. BAHTERA J Pendidik Bhs dan Sastra. 2022;21(1):94–100.
20. Fadhilah P, Surya E. Penggunaan Discovery Learning Terhadap Kemampuan Pemecahan Masalah Matematis. Artik Pendidik Mat Univ Negeri Medan [Internet]. 2019;(December). Available from: https://www.researchgate.net/publication/337737912
21. Effendi LA. Pembelajaran Matematika Dengan Metode Penemuan Terbimbing Untuk Meningkatkan Kemampuan Representasi Dan Pemecahan Masalah Matematis Siswa SMP. J Penelit Pendidik [Internet]. 2012;13(2):1–10. Available from: http://jurnal.upi.edu/file/Leo_Adhar.pdf
22. Krisna D, Adiarta A, Santiyadnya N. Penerapan Model Discovery Learning Untuk Meningkatkan Hasil Belajar Dasar Dan Pengukuran Listrik SMK. J Pendidik Tek Elektro Undiksha. 2018;7(3):102–12.
23. Buana PSL. Penggunaan Model Discovery Learning Untuk Meningkatkan Hasil Belajar Dan Percaya Diri Siswa Pada Subtema Wujud Benda Dan Cirinya (Penelitian Tindakan Kelas Di Kelas V SDN Gentra Masekdas Bandung Tahun Pelajaran 2017/2018). Skripsi. Universitas Pasundan; 2017.
24. Rizal RS, Harjono N, Airlanda GS. Perbaikan Proses Dan Hasil Belajar Muatan IPA Tema 4 Menggunakan Model Pembelajaran Discovery Learning (Dl) Siswa Kelas 5 SD Negeri Dukuh 01 Kecamatan Sidomukti Kota Salatiga Tahun 2017/2018. Pendek J Pendidik Berkarakter. 2018;1(1):207–13.
25. Iswari AP, Sunarsih ES, Thamrin AG. Perbandingan Hasil Belajar Antara Model Pembelajaran Konvensional Dengan Model Pembelajaran Kooperatif Tipe Team Accelerated Instruction (TAI) Pada Mata Pelajaran Mekanika Teknik Kelas X TGB Di SMK Negeri 2 Surakarta. Indones J Civ Eng Educ. 2017;1(2):1–9.
26. Bari F, Syarif CR, Hidayatullah. Pengaruh Model Pembelajaran Kooperatif Tipe Jigsaw Dan Kecerdasan Emosional Terhadap Hasil Belajar. JTPPm (Jurnal Teknol Pendidik dan Pembelajaran) Edutech Intructional Res. 2015;2(2):176–91.
27. Purnomo A, Kanusta M, Fitriyah, Guntur M, Siregar R, Ritonga S, et al. Pengantar Model Pembelajaran [Internet]. Lombok: Yayasan Hamjah Diha; 2022. 1-181 p. Available from: http://repository.unpas.ac.id/37102/3/BAB II KAJIAN TEORI.pdf
28. Susanti Y. Penerapan Model Pembelajaran Kooperatif Tipe Talking Chips Pada Pembelajaran IPA Kelas VII SMPN 1 Pariangan. Skripsi. Institut Agama Islam Negeri (IAIN) Batusangkar; 2019.

29. Sugiyono. Metode Penelitian Kuantitatif, Kualitatif, dan R&D. Bandung: Alfabeta; 2013. 1-346 p.
30. Nanda A. Kemampuan Pemecahan Masalah Matematis Siswa Menggunakan Model Missouri Mathematics Project [Internet]. Skripsi. Universitas Islam Negeri Ar-Raniry; 2018.
31. Pritasari A. Upaya Meningkatkan Kemampuan Berpikir Kritis Siswa Kelas XI IPA 2 Sekolah Menengah Atas Negeri 8 Yogyakarta Pada Pembelajaran Matematika Melalui Pembelajaran Kooperatif Tipe Group Investigation (GI). Skripsi. Universitas Negeri Yogyakarta; 2011.
32. Ariani S, Hartono Y, Hiltrimartin C. Kemampuan Pemecahan Masalah Matematika Siswa Pada Pembelajaran Matematika Menggunakan Strategi Abduktif-Deduktif Di SMA Negeri 1 Indralaya Utara. J Elem. 2017;3(1):25–34.
33. Lestari KE, Yudhanegara MR. Penelitian Pendidikan Matematika. Karawang: Refika Aditama; 2015.
34. Gusmania Y, Marlita. Pengaruh Metode Discovery Learning Terhadap Kemampuan Pemecahan Masalah Matematis Siswa Kelas X SMAN 5 Batam Tahun Pelajaran 2014/2015. PYTHAGORAS J Progr Stud Pendidik Mat. 2016;5(2):151–7.
35. Handayani F. Penerapan Model Pembelajaran Discovery Learning Terhadap Kemampuan Pemecahan Masalah Matematis Siswa SMP. Skripsi. Universitas Islam Negeri Ar-Raniry; 2020.

How to cite this article: Eka Endah Febiyanti, Suryo Widodo, Yuni Katminingsih. Improving mathematical problem-solving skills of grade X students on arithmetic sequence material through the application of the discovery learning model. *International Journal of Research and Review*. 2024; 11(5): 548-559. DOI: *https://doi.org/10.52403/ijrr.20240562*

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