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Investigating the use of Mondrian Art Puzzles to develop students' problem-solving and mindset

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Abstract

Indonesia is currently undergoing changes towards the era of society 5.0 after passing through the 4.0 revolution. In the face of such changes in a short time, it is important for human resources to have 21st century skills or 4Cs such as critical thinking and problem solving, creativity and innovation, communication, and collaboration. Therefore, along with the development of education that is increasingly complex, problem-solving skills and students' mindset are crucial aspects that need to be developed in the learning process of Mathematics. Therefore, this study investigates the effectiveness of Mondrian Art Puzzle as an innovative learning stimulus with the aim of influencing problem-solving ability and mindset development. In this quantitative research study, data were collected through tests and questionnaires in both experimental classes. The first class used Mondrian Cube (apps) and Mondrian Paintings (handout), while the second class only used Mondrian Cube. The findings show that the combination of Mondrian Cube and Mondrian Paintings is more effective in improving mathematical problem-solving skills than Mondrian Cube alone. Although not statistically significant, Mondrian Art Puzzles has the potential to encourage the development of mindset by reducing fixed mindset students and increasing growth mindset students, thus having a positive impact on learning mathematics.

Keywords: Mondrian Art Puzzle, problem-solving ability, student mindset

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INTRODUCTION

Indonesia is currently undergoing changes towards the era of society 5.0 after passing through the 4.0 revolution. In the face of such changes in a short time, it is important for human resources to have 21st century skills or 4Cs, such as critical thinking and problem solving, creativity and innovation, communication, and collaboration. Learning that emphasizes the development of students' critical thinking, creativity, and problem-solving abilities in various subjects including mathematics, can support 21st century skills competencies (Morrar & Arman, 2017).

Based on research conducted by Nurmuslimah (2019), math is still a subject that is frightening and disliked by most students in schools. Evident from some of the survey results that have been conducted, most students say that math is the most difficult subject, makes the head dizzy, the teacher who teaches monotonously is not fun and so on. The problem that students often face when working on math problems is errors in carrying out problem solving (Hidayah et al., 2020). In line with research conducted by Enlisia et al. (2020), students often experience difficulties in understanding mathematical problems, which have an impact on the problem-solving process.

Problem solving ability in learning mathematics is an important thing that must be developed and owned by every student (Ariani et al., 2017; Harahap & Surya, 2017; Layali & Masri, 2020). Although problem solving is an important aspect in learning mathematics, the reality in the field shows that students' mathematics problem solving skills, especially at the high school level, have not shown satisfactory results. Students' difficulties in understanding mathematics have an impact on their low ability to solve mathematical problems. The perception above agrees with the findings of the Program for International Student Assessment (PISA) based on the 2022 PISA results which were just announced on December 5, 2023 involving 690,000 students worldwide. Indonesia involved 14,340 students and ranked 68th with a PISA 2022 mathematics literacy score of 366 while PISA 2018 (Program for International Student Assessment) involved 600,000 students worldwide. Indonesia involved 12,098 students and the PISA 2018 score was 379. From the score results, PISA 2022 and PISA 2018 there was a decrease in scores, which reflects the challenges in learning mathematics in Indonesia. Thus, there needs to be special attention from the Ministry of Education, Culture and Research to improve the quality of Indonesian education.

Based on preliminary observations on August 22, 2024 at school, data on the results of the diagnostic test of mathematical cognitive abilities carried out by all X grade students were obtained on new students for the 2024/2025 school year obtained 76.22% of students whose scores were still below the score of 70. This illustrates that there are still many students who experience weaknesses in solving math problems. Zakiyah et al. (2018) stated that the math problem solving ability of high school students is still relatively low, with a percentage result of 23.7%. With the percentage of each indicator for students' ability to understand the problem of 83.33%, choose a problem-solving strategy plan of 51.39%, solve the problem 37.5%, verify and inform the results 29.17%. With the condition of students' ability to solve mathematical problems that are classified as low, students become less able to solve non-routine problems and are weak in developing their ideas and skills (Astutiani et al., 2019; Muniri & Yulistiyah, 2022; Suryani et al., 2020).

Referring to the background phenomenon of the problem above that the importance of mathematical problem-solving skills in learning mathematics, so that an interesting, effective, and efficient mathematics learning strategy is needed, to help students overcome difficulties in understanding concepts and solving problems. One strategy that can be applied is by providing a learning stimulus. Nurmuslimah (2019) stated that students have potential in terms of abstraction ability, pattern ability, and algorithm ability. But in the basic thing, namely problem solving, students are still lacking and still need a special stimulus.

According to Nahar (2016), it is stimulus from within a person which can encourage an activity. In the context of learning, stimulus refers to giving teachers to students to create interaction during the learning process. According to the general dictionary of Indonesian, stimulate means to provide stimulation to express various creative ideas. Therefore, providing stimulus is a process where teachers provide stimuli to students so that students are able to develop critical thinking skills, good problem solving, and build new knowledge to improve mastery of learning materials. The more often a learning stimulus is given to students, the more likely it is that the stimulus will succeed or get a student response. Student response itself is the behavior that arises as a result of the stimulus given by the teacher or as a reaction to the learning that has

been given. Therefore, student response is one of the important factors that influence the success of the stimulus so that teachers must have a special strategy in providing learning stimulus.

The stimulus that teachers can provide to students should be able to construct new knowledge in an effort to improve better mastery of the material to develop students' problem-solving skills, one of which is assisted by game media. In line with research conducted (Putra et al., 2019), which says that games with puzzles and obstacles can make students feel curious and try to find ways to solve obstacles, it is in this part that will train problem solving skills in students. This educational game will support the learning process with the concept of playing while learning. According to Siswanto in (cited in Widyastuti & Puspita, 2020), for some children, the term "learning" can cause fear so it is hoped that with this interesting educational game, children will not realize that what they are doing is including learning activities, so that children become happy and have a passion for learning.

One of the educational game media is to use "Mondrian Art Puzzles" Mondrian Art Puzzles is a puzzle game inspired by the art style of Piet Mondrian, a painter who is famous in the Netherlands for his geometric abstract works. In this game, players will be able to arrange colored pieces in a suitable geometric pattern, which is in line with the Mondrian Puzzles style, to solve Mondrian Puzzles there are rules that must be obeyed, namely in this puzzle game has a unique pattern or structure, so there are no two puzzle arrangements of the same size so it must be done repeatedly to find the simplest solution. Because players have to solve different puzzles with rules that are met everytime they play it. In playing Mondrian Puzzles, it is required to always think critically, creatively and adaptively in solving each problem given.

Researchers also pay attention not only to pedagogical and methodological problems but also to the psychological problems of students, so far, the problem of students is the perception that math subjects are difficult. The phenomenon that we can now feel regarding students' views that math is a scary subject. Math teachers are often perceived as "killer" teachers, many students are reluctant to attend math lessons (MathCommunities) and are even willing to avoid them. This reflects a negative view of math that is influenced by the assumption that math is scary, abstract and full of confusing formulas, which makes the experience of learning math at school less enjoyable. As a result, students' interest in learning decreases and their grades tend to be low due to an unsupportive mindset.

Carol (2015), in her research, identified two types of mindset in her experiment using puzzles as a determinant, namely fixed mindset and growth mindset. Where for students who have a growth mindset even though students experience difficulties or failures when playing difficult puzzles, students with a growth mindset will keep trying and not give up easily. They will use their failures as opportunities to continue learning and developing to improve their skills. individuals with a growth mindset believe that intelligence and talent can develop through effort and environmental influences. Then for students with a fixed mindset when playing puzzles with challenges tend to respond with frustration or confusion so that they give up easily and seem to avoid, individuals with a fixed mindset believe that intelligence and talent are something fixed, innate from birth, and cannot be changed.

Dari' et al., (2023) in his research stated that students who have a growth mindset tend to have a higher enthusiasm to continue learning than students

who have a fixed mindset, so students with a growth mindset will have better learning outcomes and abilities in mathematical problem solving.

Students who have a growth mindset will focus on the process compared to the results, as well as solving math problems, especially contextual problems, students need to have a growth mindset to work hard, not give up easily so that when facing challenges students will be more persistent to achieve goals so that the desired students' mathematical problem-solving skills will be achieved.

The focus of this study was to determine the effect of stimulus using the Mondrian Art Puzzles educational game on mathematical problem-solving ability and the effect of providing stimulus using the Mondrian Art Puzzles educational game on mindset in class X students senior high school.

RESEARCH METHOD

This research was conducted in one of the senior high schools with a population of all X grade students with a total of 396 students divided into 11 classes, with quantitative research methods classified into quasi experimental research using two experimental classes as samples. In the study there was a pre-test before being given treatment after which a post-test was given after treatment. The treatment design is given in Table 1.

Table 1. Pretest-posttest research design

Group	Pretest	Treatment	Posttest
Experiment Class 1	O_1	X_1	O_2
Experiment Class 2	O_1	X_2	O_2

Note:

O_1: Initial Test (Pretest)

O_1: Final Test (Posttest)

X_1: Providing Mondrian Art Puzzles stimulus through Mondrian Cubes (Digital Application) and Mondrian Paintings (Handout) individually.

X_2: Providing Mondrian Art Puzzles stimulus only through Mondrian Cubes (Digital Application) individually.

(Sugiyono, 2017:116)

Determination of research samples using cluster random sampling which involves random or random sampling from units or sub-populations called clusters (Budiyono, 2017:43). In the study, random sampling was taken from students in grades X-1 to X-11 before the research was carried out so that class X4 was obtained as experimental sample 1 and class X1 as experimental sample 2.

The first data collection technique using the documentation method is used to obtain data on student diagnostic test scores before learning is given and data on Learning Outcomes Assessment scores are used to determine whether the experimental class 1 and experimental class 2 are in a balanced state using the prerequisite test and the average balance test before the intervention is given. Second, using the test method with data collection techniques that provide questions to research subjects, where the answers given are assessed based on right and wrong (Budiyono, 2017). Students' problem-solving skills in this study will be measured using the test method. The test instrument consists of 5 items with each item having the same maximum score of 10 for each question. Then the number of scores obtained is then converted into a number scale (0-100).

Table 2. Measurement scale of mathematical problem-solving ability

Criteria	Value
Very High	$81 \leq N \leq 100$
High	$61 \leq N \leq 80$
Medium	$41 \leq N \leq 60$
Low	$21 \leq N \leq 40$
Very Low	$0 \leq N \leq 20$

N is the value of students' mathematical problem-solving ability.
Modified from Hidayat and Irawan (2017).

The third questionnaire is a technique used in collecting data by giving a set of questions or written statements to respondents (Sugiyono, 2017:142). The questionnaire in this study is in the form of a Likert scale. The Likert scale model in this study is a Likert scale with 4 answer options, namely SS (Strongly Agree), S (Agree), TS (Disagree), STS (Strongly Disagree). This questionnaire is shown to X1 and X4 students to find out the mindset of students to find out the criteria that students have based on Carol Dweck which is divided into 4 levels, but in this study, we summarized it into 2 categories, namely the first category, namely Growth Mindset includes a strong growth mindset and a growth mindset with some fixed ideas, for the second category fixed mindset includes a fixed mindset with some growth ideas, and a strong fixed mindset. The mindset categories can be seen in Table 3.

Table 3. Mindset measurement scale

Type	Point	Category
Strong Growth Mindset	45 – 60 points	1
Growth Mindset with some Fixed ideas	34 – 44 points	
Fixed Mindset with some Growth ideas	21 – 33 points	2
Strong Fixed Mindset	0 – 20 points	

In the instrument validation technique for questionnaires using the Pearson Product Moment Correlation formula. Obtained values for all questionnaires 1 to 20 with $r_{xy} > r_{tabel}$ which means the questionnaire is said to be valid. As for the reliability test using the Cronbach Alpha formula, r=0.768 was obtained. Because the value of r>0,7, it means that the mindset questionnaire instrument is declared reliable so that it can be used as a measuring tool for students' mindset. For instrument validation techniques for problem solving ability tests using the Pearson Product Moment Correlation formula. Obtained values for all questions with $r_{xy} > r_{tabel}$ which means the question is said to be valid, the differentiating power of the question based on (Arikunto, 2015) obtained a very good differentiating power, the test of the difficulty of the items is moderate and for the reliability test using the Cronbach Alpha formula obtained r=0,768. Because the value of r>0,7, it means that the mindset questionnaire instrument is declared reliable so that it can be used as a measuring tool for students' mindset.

The data analysis technique in this study begins with the analysis requirements test and testing the average balance, after which it is continued with hypothesis testing. This study involves statistical techniques using the independent sample test to test the first hypothesis, and to test the second

hypothesis using a non-parametric statistical test, namely the Chi-Square test because it is to test categorical data.

RESULTS AND DISCUSSION

This study was conducted with the aim of identifying the effect of providing stimulus by using Mondrian Art Puzzles educational games on mathematical problem-solving skills and identifying the effect of providing stimulus by using Mondrian Art Puzzles educational games on mindset in class X students of Senior High School. The provision of Mondrian Art Puzzles stimulus is given in stages starting with simple to complex puzzles, namely first given using the Mondrian cube (application) as an initial orientation then continued using Mondrian Paintings (Handout) starting with simple to complex dimensions in experimental class 1 and Mondrian cube (application) with the "Free Style" menu after that proceed with the "Puzzles" menu in experimental class 2. The stimulus was given three times a week, with details in Table 4.

Table 4. Time of Mondrian Art Puzzles stimulus administration

Group	Date	Stimulus Type	Difficulty Level
Experiment Class 1	Sept 30, 2024; Oct 2,4,7,9, and 11, 2024	Mondrian cube (*application*) on the "Free Style" and "Puzzles"	From the simplest (Free Style) to the most complex (Puzzles).
	11,13,15,18 and 20, October 2024	Mondrian Paintings (Handout*)*	From 4×4 to 15×15 dimensions.
Experiment Class 2	Sept 30, 2024 October 2,4,7,9, 11 and 20, 2024	Mondrian cube (application) on the "Free Style"	From the simplest (Free Style) to the most complex (Puzzles).
	October 11,13,15,18 and 20, 2024	Mondrian cube (app) on the "Free Style" and "Puzzles" menus	

Student mindset and mathematical problem-solving ability results

Mindset data

The results showed the pre-test value for experimental class 1 with 8 respondents who fell into the fixed mindset category with a relative frequency of 22.22% and for a growth mindset of 77.78% with 28 students as respondents. Meanwhile, the post-test data obtained a relative frequency of 16.67% with a fixed mindset category with a total of 6 students, for a growth mindset of 83.33% with a total of 28 students. While the pre-test value for experimental class 2 with 8 respondents who fell into the fixed mindset category with a relative frequency of 22.86% and for a growth mindset of 77.14% with a total of 27 students. Meanwhile, the post-test data obtained a relative frequency of 17.14% with a fixed mindset category with a total of 6 students, for a growth mindset of 82.86% with a total of 29 students.

Students' mathematical problem-solving ability

The results showed the value of mathematical problem-solving ability that the pre-test value for experimental class 1 and experimental class 2 was superior to

the experimental class 2 seen from the average pre-test value of 36.28 for experimental class 1 and 39.65 for experimental class 2. After being given treatment in experimental class 1 and experimental class 2 with different treatments, then both classes were given a post-test there were differences in mathematical problem-solving ability on the material of sequence and series in Arithmetic and Geometry. Experimental class 1 experienced an increase with a value of 88.4 (post-test) with an average increase of 143.62%. While the experimental class 2 only experienced an increase with a value of 70.05 (post-test) with an average increase of 76.65%. So that it can be concluded while there is a significant effect of using learning stimulus, namely Mondrian Art Puzzles through Mondrian cube (Application) and Mondrian Paintings (Handout) in Mathematics subjects.

Data analysis of learning outcomes

Normality test

The normality test in this study was carried out twice with the Liliefors test. From the results of the first normality test as a prerequisite test before the experimental balance test using the Learning Outcomes Assessment value, it is known that for each sample it does not exceed, thus the decision is accepted. Because it is accepted, it can be concluded that each sample comes from a normally distributed population. A summary of the normality test results can be seen in Table 5.

Table 5. Initial condition normality test results

Class	n	L_{obs}	$L_{\alpha;n}$	Decision	Conclusion
Experiment 1	36	0.087333	0.147667	H_0 Accepted	Normal
Experiment 2	35	0.08183	0.149761	H_0 Accepted	Normal

The results of the normality test calculation are used as a prerequisite test for analysis, the data used are pre-test and post-test scores separately from the results of the mathematical problem-solving ability test in each experimental class using a statistical test with a significance level of 0.05 has a value of L_{maks} which does not exceed $L_{0.05;n}$ so that L_{maks} ∉DK. So, it can be concluded that overall it is not rejected. Therefore, it can be concluded that H_0 learning data with the provision of Mondrian Art Puzzles learning stimulus is normally distributed. A summary of the normality test results can be seen in Table 6.

Table 6. Normality test results

Class	L_{maks}	$L_{0,05;n}$	Decision
Experiment 1	0.1069	0.1497	H_0 Accepted
Experiment 2	0.0653	0.1497	H_0 Accepted

Homogeneity test

After the normality test is carried out, the homogeneity test is continued using the Bartlett method with the Chi Kuadrat approach/statistic with a significance level of 0.05. Based on the results of the initial condition homogeneity test for experimental class 1 and experimental class 2, it was obtained that

χ^2_{obs} =0.093498 while $\chi^2_{0.05;2} = 3.841459$ so that the H0 was accepted. Because H0 is accepted, it can be concluded that experimental class 1 and experimental class 2 come from a homogeneous population. Based on the results of the homogeneity of the value of mathematical problem-solving ability in each class, the data used in the homogeneity test is the difference in pre-test and post-test scores in each experimental class using statistical tests with a significance level of 0.05, the value of χ^2_{obs} does not exceed $\chi^2_{0.05;(k-1)}$ so that $\chi^2_{obs} \notin$DK. So, it can be concluded that the difference between the pre-test and post-test scores of the experimental class has a homogeneous variance. A summary of the normality test results can be seen in Table 7.

Table 7. Homogeneity test results

Homogeneity Test	χ^2_{obs}	$\chi^2_{0,05;(k-1)}$	Test Decision
Experiment 1 and Experiment 2	3.15727	3.84145	H_0 Accepted

Experimental class balance test

Based on the results of the normality test and homogeneity test, it was concluded that both classes came from normally distributed and homogeneous populations. Thus, the prerequisite test before the balance test has been fulfilled. Furthermore, the balance test was carried out using the t-test with a significance level of 0.05. Based on statistical tests obtained $t_{obs} = 0.52419$ not a member of $DK = \{t|t < -t_{0.25;69} \text{ or } t > t_{0.25;69}\}\} = \{t|t < -1.99495 \text{ or } t > 1.99495\}$. Therefore, $t_{obs} \notin DK$ so that H0 is not rejected. This means that both groups have the same initial ability.

Hypothesis test

Independent sample t-test

This independent sample t-test test is used to determine whether there is a significant difference in students' mathematical problem solving abilities based on the Mondrian art puzzles stimulus obtained $t_{obs} = 3.828$ not on $DK = \{t|-t_{obs} < -t_{0.25;68} \text{ or } t_{obs} > t_{0.25;68}\} = \{t_{obs} < -1{,}99547 \text{ or } t_{obs} > 1{,}99547\}$. So that the obtained $t_{obs} > t_{0.25;68}$, the hypothesis criteria can be determined, namely H01 is rejected and Ha1 is accepted. Thus, it is concluded that there is a significant difference in students' mathematical problem-solving ability based on the Mondrian art puzzles stimulus.

Chi-square test

Prerequisite tests (normality and homogeneity tests) are not carried out because this chi-square test is included in non-parametric statistics which do not require prerequisite tests (normality and homogeneity tests). Hypothesis testing in this study uses statistical tests with a significance level of 0.05. A summary of the calculation of the second hypothesis test can be seen in Table 8.

Based on Table 8, it is obtained that for experimental class 1 before being given treatment there were 22.22% of students categorized as fixed mindset and 77.78% growth mindset, while after being given treatment using the Mondrian art puzzles stimulus, there was an increase in students' mindset or mindset for the growth mindset category to 83.33%, while students in the fixed mindset category decreased to 16.67%.

Table 8. Summary of chi-square 2 × 2 test results

Experiment Class		Mindset Category						Chi-Square Count (χ^2)
		1 (Fixed Mindset)		2 (Growth Mindset)		Total Number		
		f	%	f	%	f	%	
Eksperiment 1	Pre-test	8	22.22	28	77.78	36	100	0.35468
	Post-test	6	16.67	30	83.33	36	100	
Eksperiment 2	Pre-test	8	22.86	27	77.14	35	100	0.35714
	Post-test	6	17.14	29	82.86	35	100	

For experimental class 2 before being given treatment, there were 22.86% of students in the fixed mindset category and 77.14% growth mindset, while after being given treatment using the Mondrian art puzzles stimulus, there was an increase in students' mindset or mindset for the growth mindset category to 82.86%, while students in the fixed mindset category decreased to 17.14%. The data above gives the conclusion that there is an effect of Mondrian art puzzles on changes in student mindset.

Based on the results of the analysis with the Chi-Square 2×2 test, the effect of Mondrian art puzzles stimulus on mindset in classes X1 and X4, for experimental class 1, the value is obtained and the Chi-Square table (0.05;1) is 3.841. Then the significance results show that on the basis of 5% significance, the value of Chi-Square count χ^2= 0,35468 is smaller than the Chi-Square table (0.05;1) = 3.841. So that the frequency difference obtained is not significant, which indicates that there is no significant difference in mindset based on the Mondrian art puzzles stimulus. Meanwhile, for experimental class 2, the calculated Chi-Square value is 0.35714 and the Chi-Square table (0.05; 1) is 3.841. Then the significance results show that on the basis of 5% significance the calculated Chi-Square value χ^2 = 0.35714 is smaller than the Chi-Square table (0.05; 1) = 3.841. So, the frequency difference obtained is not significant, which indicates that there is no significant difference in mindset based on the Mondrian art puzzles stimulus.

Discussion

In this study, the Mondrian art puzzles stimulus had a positive effect on mathematical problem-solving ability both in experimental class 1 and in experimental class 2. This is in line with research conducted by Melyaningsih et al. (2021) and Permata (2020) where puzzle-assisted learning not only attracts student interest, but also significantly improves the ability to solve mathematical problems. In line with the research of Adelia et al. (2024) and Aminah & Masniladevi (2019) which in their research concluded that puzzle-based learning has a positive influence on students' mathematical problem-solving skills and the use of puzzles in the form of logic puzzles will train mathematical logical intelligence. Their research also said that it showed that students who learned using puzzles showed an increase in mathematical problem-solving ability scores higher than students who learned without using puzzles. Ageng Pambudi et al. (2020), Herawaty & Widada (2018), and Widada et al. (2019) in their research also said that students who learn through innovative learning such as using puzzles in learning bring up more ideas, because they get a stimulus that is useful in encouraging creative thinking,

critical thinking, which is such that it can improve problem solving skills, concept understanding skills, representation skills, and be able to overcome misunderstandings of mathematical concepts. This is in line with the research of Layali & Masri (2020) and Tambunan et al. (2024) who in their research concluded that learning based on puzzle games can empower students to think more critically in analyzing difficulties. By creating a fun learning atmosphere, puzzle-based learning is able to encourage students to be actively involved during the learning process. This engagement not only makes learning more interesting, but also stimulates students' creativity and critical thinking when they are faced with challenges to solve problems.

Based on some of these studies, it confirms that providing learning stimulus using puzzles is not only an interesting learning tool, but also an effective means of improving students' mathematical problem-solving skills.

Based on the results of the analysis with the Chi-Square test, the effect of the Mondrian art puzzles stimulus on mindset in classes X1 and X4, there is no significant difference in mindset based on the Mondrian art puzzles stimulus. This is in line with the research of Dweck & Yeager (2019) in his research explains that individuals with a strong growth mindset tend to show small changes when given an intervention related to mindset because they are already at a better level of understanding of students' ability to learn and develop. This is a factor in the provision of stimulus Mondrian art puzzles that do not significantly affect the mindset of students. This is in line with the research of (O'Keefe et al. (2018) in his research stated that where individuals with a strong growth mindset and tend to be stable, interventions do not affect their beliefs or mindsets much and also in this study confirmed that interventions have a greater impact on individuals with a fixed mindset category. In line with research by Yeager et al. (2019) in his research which states that the most effective intervention is given to groups of students who have a fixed mindset rather than students who have a growth mindset. Students with a strong growth mindset show small changes because the basis of their mindset already supports the continuous learning process.

Based on the data of this study, although statistically insignificant, but in descriptive analysis there is an increase in the category of mindset that shows a positive potential for providing this Mondrian art puzzles stimulus, especially in encouraging students to reflect on their mindset. Then from several studies in line with this research which states that providing interventions for students with a strong growth mindset shows small changes because the basis of their mindset already supports the continuous learning process. So that the importance of developing interventions (stimulus Mondrian art puzzles) that are more intensive, directed, and focused with students who are classified in a fixed mindset to achieve more significant results.

CONCLUSION

Based on the literature review, problem formulation, hypothesis and data analysis results that refer to the formulation of the problem that has been stated in the previous chapter, the following conclusions are obtained.

Learning by using Mondrian art puzzles stimulus has a positive effect on improving mathematical problem-solving skills both in experimental class 1 which uses Mondrian Art Puzzles through Mondrian cube (Application) and Mondrian Paintings (Handout) and experimental class 2 which is only through Mondrian cube (Application) only. However, learning by using Mondrian Art Puzzles through Mondrian cube (Application) as well as Mondrian Paintings

(Handout) provides better mathematical problem-solving skills compared to using learning that only uses Mondrian cube (Application) alone.

Based on the results of statistical analysis, the provision of Mondrian art puzzles stimulus does not have a significant effect on the overall mindset of students. This is motivated by pre-test data, the majority of which shows that students are already in the growth mindset category. Therefore, the provision of stimulus Mondrian art puzzles does not look significant in its changes. However, descriptive data analysis shows a decrease in the number of students with a fixed mindset and an increase in the number of growth mindset students, which identifies that providing the Mondrian art puzzles stimulus has the potential to encourage the development of a better mindset. Although statistically the impact is not significant, the use of the Mondrian art puzzles stimulus still has a positive influence on the learning process, especially in strengthening students' growth mindset.

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