

THE INFLUENCE OF DIFFERENTIATED LEARNING-BASED WINDOW SHOPPING MODEL ON STUDENTS' MATHEMATICAL CREATIVE THINKING ABILITIES

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Abstrak

Rendahnya kemampuan berpikir kreatif menjadi permasalahan yang penting dalam pendidikan saat ini. Kemampuan berpikir kreatif merupakan keterampilan inti yang diperlukan untuk menghadapi tantangan kompleks dalam kehidupan sehari-hari, terutama dalam menghadapi perkembangan teknologi dan ekonomi yang cepat. Penelitian ini bertujuan untuk mengatasi permasalahan rendahnya kemampuan berpikir kreatif matematis siswa dengan melihat pengaruh penggunaan model pembelajaran *window shopping* berbasis pembelajaran berdiferensiasi. Populasi dalam penelitian ini mencakup seluruh siswa kelas X MAN 1 Magelang sedangkan sampel penelitiannya yaitu kelas X-3 sebagai kelompok eksperimen dan kelas X-15 sebagai kelompok kontrol. Metode penelitian yang digunakan adalah *nonequivalent pretest-posttest control group design*. Instrumen yang digunakan adalah tes kemampuan berpikir kreatif matematis. Analisis data dilakukan menggunakan uji *independent sample t-test* dan uji Wilcoxon. Hasil penelitian menunjukkan bahwa terdapat pengaruh positif yang signifikan pada penggunaan model *window shopping* berbasis pembelajaran berdiferensiasi terhadap kemampuan berpikir kreatif matematis siswa.

Kata Kunci: *Window shopping*, pembelajaran berdiferensiasi, matematika, siswa, berpikir kreatif.

Abstract

The low level of creative thinking ability is a significant issue in the current educational context. Creative thinking skills are core competencies needed to address complex challenges in daily life, particularly amidst rapid technological and economic developments. This research aims to address the problem of students' low mathematical creative thinking ability by examining the influence of using the window shopping learning model based on differentiated instruction. The population for this study includes all tenth-grade students at MAN 1 Magelang, with class X-3 selected as the experimental group and class X-15 as the control group for the sample. The research method employed is a nonequivalent pretest-posttest control group design. The instrument used to measure mathematical creative thinking ability is a mathematical creativity test. Data analysis was conducted using independent sample t-tests and Wilcoxon tests. The instrument used was a test of mathematical creative thinking ability. Data analysis was conducted using independent sample t-tests and Wilcoxon tests. The research results indicate that there is a significant positive effect on the use of the window shopping model based on differentiated learning on students' mathematical creative thinking abilities.

Keywords: *Window shopping, differentiated learning, mathematics, students, creative thinking*

INTRODUCTION

The low level of creative thinking ability has become a significant issue in education today. Creative thinking is considered an essential aspect to be strengthened and developed in order to enhance understanding and application of mathematical concepts at higher levels of education.

Based on the initial test of mathematical creative thinking ability conducted in class X at MAN 1 Magelang, the average score obtained was 40.162. Then, from the percentage of each indicator, fluency had a percentage of 42.241%, originality 41.379%, flexibility 38.793%, and elaboration 48.276%, resulting in an average

achievement of all indicators at 42.672%. According to the data, it indicates that the creative thinking ability in mathematics learning among the tenth-grade students at MAN 1 Magelang is relatively low. The results of the initial test show students' difficulty in solving complex problems. Their answers are difficult to understand, lack detail, and often result in errors.

According to Tambunan (2016), mathematics learning strategies play a crucial role with a high level of significance. However, classroom learning activities still appear to be monotonous with the use of traditional methods such as sit, listen, write, and memorize. This makes students less enthusiastic and less understanding of mathematical concepts. The observation results of mathematics learning at MAN 1 Magelang indicate monotonous teaching that does not accommodate students' needs. Teachers tend to use less effective lecture methods, rarely employing group or discussion methods, and not implementing differentiated learning strategies. Tenth-grade students feel that lecture methods are ineffective, unpleasant, and boring.

A solution to address the low mathematical creative thinking ability is by using the window shopping learning model based on differentiated learning. This learning model is chosen because it has several strong reasons for enhancing students' creative thinking abilities. Erliyanti (2019) highlights that the window shopping learning approach emphasizes collaboration and task division within groups. Suprpto (2017) emphasizes the attractiveness of window shopping activities as they involve group collaboration and peer tutoring, making students happier and contributing to improving their learning achievements. Istianingsih & Mir'anina (2018) explain that in window shopping activities, students are asked to observe the work of other teams displayed, creating interaction and communication within the group. Nengsih (2022) highlights that the window shopping learning model encourages group learning and active collaboration, and provides opportunities for students to act as peer tutors. Thus, this learning model encourages active student roles in the learning process.

Students are not just recipients of information but also knowledge explorers and problem solvers, which can stimulate creative thinking abilities (Siregar, et al., 2020). By implementing the window shopping learning model based on differentiated learning, it is expected that students can significantly develop their mathematical creative thinking abilities (Muhlisah, et al, 2023).

The window shopping learning model gives students the freedom to explore mathematical concepts according to their interests. This supports differentiated learning where teachers can adjust approaches according to students' understanding and learning styles. With this freedom, students can develop their creativity to solve complex mathematical problems (Acesta, 2020). Fitriyah & Bisri (2023) explain that differentiated learning regards each student as a unique and dynamic individual through three main strategies: differentiated content, process, and product.

In this research, the researcher utilized differentiated product learning based on students' learning styles. According to Purbaningrum (2017), learning style is a consistent method applied by individuals at cognitive stages to perceive, organize, and process received information. One of the causes is the teaching method predominantly consisting of lectures, which are deemed ineffective in enhancing students' creative thinking abilities. Therefore, it is necessary to implement more varied teaching models. One proposed model is "window shopping," which focuses on group work where students have the opportunity to view the work of other groups and broaden their insights. Additionally, differentiated learning has not been implemented in this educational institution, despite the curriculum mandate for its application. This study applies differentiated learning based on student learning styles. Through understanding students' learning style preferences, teachers can provide support in the learning process according to each student's learning characteristics, leading to a significant improvement in students' learning achievement (Silitonga &

Magdalena, 2020). According to Zagoto et al. (2019), the types of learning style preferences are detailed as follows: (1) Visual learning style refers to an individual's ability to understand and learn through visual perception; (2) Auditory learning style indicates a better ability to process information through hearing; and (3) Kinesthetic learning style involves using movement and physical activities for learning.

METHOD

This research employed a quantitative method with a nonequivalent pretest-posttest control group design. It involved two groups, namely the experimental group and the control group, which were evaluated through pretest and posttest. The population of this study comprised all tenth-grade students of MAN 1 Magelang in the academic year 2023/2024. In this study, the sample was selected using cluster random sampling technique, consisting of two randomly chosen groups. The sample in this research included class X-3 with 31 students as the experimental group, and class X-15 with 28 students as the control group. In the experimental group, the teaching approach involves explaining the topic and forming groups based on pre-measured student learning style preferences. Each group tackles distinct problems related to probability of events, crafting solutions tailored to their learning styles and showcasing their work akin to setting up shop in a mall. Group members split tasks: some manage the "store" while others visit and interact with other groups, engaging in peer tutoring. After a designated period, groups reconvene to share findings. The

teacher evaluates their work, offers feedback, and uses tools such as questionnaires to assess learning styles, PowerPoint presentations (PPT), group discussions, tailored products, Student Worksheets (LKS), and pre/post-tests measuring mathematical creative thinking abilities. Conversely, the control class follows traditional phases: Establishing Set, Demonstrating knowledge, Guided Practice, Feedback, and Extended Practice, using similar instructional tools to enhance learning effectiveness.

The instruments used in this study were interview guidelines, learning implementation observation sheets, student learning style questionnaires, and mathematical creative thinking ability tests. The student learning style questionnaire was used to identify students' learning styles as the basis for group formation. The questionnaire used was structured positively with five answer choices: strongly disagree, disagree, neutral, agree, and strongly agree. Moreover, the instrument for testing mathematical creative thinking ability had undergone content validity testing by three expert validators in the relevant field. Additionally, construct validity testing, difficulty level, discrimination power, and reliability testing were also conducted on the instrument. Based on the results of these tests, the instrument was considered to meet the required standards and could be used as a measure to evaluate students' mathematical creative thinking abilities.

The indicators of creative thinking ability applied in this research are presented in Table 1, while the categories of mathematical creative thinking ability are presented in Table 2.

Table 1. Indicators of Creative Thinking Ability

Indicator	Description
Fluency	Students' ability to provide multiple relevant answers or solutions
Flexibility	Students' ability to generate answers or ideas from various perspectives
Originality	Students' ability to provide unique and unconventional answers
Elaboration	Students' ability to provide answers along with detailed explanations

Adopt (Cahyani, (2021)

Table 2. Criteria of Mathematical Creative Thinking Ability

Value Range	Category
$0 \leq x \leq 40$	Very Low
$40 < x \leq 50$	Low
$50 < x \leq 65$	Moderate
$65 < x \leq 80$	High
$80 < x \leq 100$	Verry High

Febrianingsih (2022)

RESULT AND DISCUSSION

The initial data is the pretest data, obtained before the research was conducted in both the experimental and control classes.

The results of the initial data calculations (pretest) in both classes are presented in the following table.

Table 3. Description of Initial Data

Class	SMI	X_{max}	X_{min}	\bar{X}	Me	Mo	S
Experiment	100	46,875	6,250	22,480	18,750	18,750	12,563
Control	100	53,125	3,125	19,085	20,313	6,250	11,579

The final data is the posttest data, which is obtained after the research is conducted in both the experimental and control classes.

The calculation results of the final data (posttest) in both classes are presented in the following table.

Table 4. Description of Final Data

Class	SMI	X_{max}	X_{min}	\bar{X}	Me	Mo	S
Experiment	100	96,875	40,625	80,948	81,250	87,500	12,587
Control	100	71,875	21,875	50,335	53,125	56,250	14,740

Next, hypothesis testing 1 was conducted to determine whether students who underwent learning through the window shopping model based on differentiated learning had better creative thinking abilities compared to students who underwent direct

learning on probability materials in class X. The data used in this test were posttest results where normal distribution and homogeneity were confirmed. Therefore, an independent sample t-test was used. The results are as follows:

Table 5. Results of Independent Sample T-Test

Class	Mean	$t_{calculate}$	t_{table}	Decision
Experiment	80,949	8,603	2,002	H_0 Rejected
Control	50,337			

Referring to the results of the independent sample t-test, the null hypothesis H_0 was rejected, indicating a difference in mathematical creative thinking abilities between students who participated in differentiated learning-based window shopping model and students who underwent direct learning. The findings reveal that the mean posttest scores of students in the experimental group are significantly higher than those in the control

group. Therefore, it can be concluded that the mathematical creative thinking abilities of students who underwent learning through the differentiated learning-based window shopping model are better than those of students who underwent direct learning.

In the implementation of the differentiated learning-based window shopping model, various instruments are used to enhance the effectiveness of the learning process. These instruments include

the use of questionnaires to identify students' learning styles, Power Point (PPT) presentations, facilitation of group discussions, creation of products tailored to students' learning preferences, use of Student Worksheets (LKS), and administration of mathematical creative thinking ability tests before and after learning.

This study consists of four learning sessions on probability. Each session begins with an introductory activity using

stimulating questions. The material is presented through Power Point presentations by the teacher, followed by grouping of students based on their learning styles. Each group is given Student Worksheets (LKS) with different problems to solve, and then they create products according to their learning styles. These products are then showcased during the window shopping activity. The activities involved are as follows.



Figure 2. Discussion and Product Creation Activity

Secondly, the discussion in the window shopping activity involves task allocation among group members. Some students act as guards, and some students visit other groups. Guards provide explanations to visitors, who have the right to ask questions, give opinions, and take notes on the visited group's work. This activity encourages students to collaborate within groups to

discuss material, present ideas, provide explanations, and ask each other questions. According to Cahyani (2021), this peer tutoring activity can increase students' interest in learning because the material is presented in a more understandable language. The activities are as follows.



Figure 2. Window Shopping Activity

Next, group members return and share information. They explain their findings to their group peers. This discussion enhances students' ability to explain, in line with Erliyanti's (2019) perspective on the

scientific approach based on window shopping that enriches thinking skills, group cooperation, effective communication, and creativity.



Figure 3. Post-visit Discussion Activity

The teacher evaluates the performance of each group, provides feedback and comments, and monitors group discussions.

The teacher also praises correct answers and provides guidance for incorrect ones. The activity can be described as follows.



Figure 4. Teacher Guidance on Group Work Results

Next, hypothesis test 2 was used to determine the extent of the increase in students' mathematical creative thinking abilities taught through the differentiated learning-based window shopping model.

Since the initial data was not normally distributed, a non-parametric statistical approach using the Wilcoxon test was employed. The results are as follows.

Table 6. Result of Wilcoxon Test for Experimental Class

Kelas	N	Mean Rank	Sum of Rank	Asymp. Sig. (2 tailed)	Sig.	Decision
Negative Rank	0	0,00	0,00	0,000	0,05	H ₀ Rejected
Positive Rank	31	16,00	496,00			
Ties	0					
Total	31					

The Wilcoxon test results in the experimental class, where the implementation of the differentiated learning-based window shopping model provided strong support for the claim that the learning model had a positive impact on improving students' mathematical creative thinking abilities. It can be seen that there was no decrease in scores from the pretest to the posttest in that class. A total of 31 positive data points indicated an increase in students' mathematical creative thinking abilities after learning, with an average increase of 16.00 and a total positive ranking

of 496.00. Statistical analysis shows that the Asymp.Sig. (2-tailed) value is 0.000, which is less than the significance value (0.05), thus rejecting the null hypothesis H₀. Therefore, it can be said that the differentiated learning-based window shopping model significantly influences the improvement of students' mathematical creative thinking abilities in the tenth-grade class at MAN 1 Magelang.

Student participation in group discussions in the window shopping model enhances creative thinking abilities. These discussions encourage students to generate

ideas and arguments, consistent with Juliarini's (2020) view of the benefits of discussions in improving thinking skills. In the three discussion sessions per meeting, students must manage their time efficiently, stimulating quick and accurate thinking skills. This process not only enhances thinking fluency but also stimulates novelty by facilitating the exchange of ideas from various perspectives. By considering diverse viewpoints, students can generate innovative and unexpected ideas, thereby fostering their creativity.

This model emphasizes differentiated learning based on students' learning styles, which helps improve creative thinking

abilities such as fluency and originality. Students can learn according to their needs; for example, visual learners are interested in visual materials such as posters depicting mathematical problems, while auditory learners prefer listening to oral explanations. Kinesthetic learners learn through hands-on experiments. This aligns with (Silitonga & Magdalena's, 2020) view of learning styles as ways individuals understand and use information. Below are examples of products produced by students through the differentiated learning-based window shopping model.

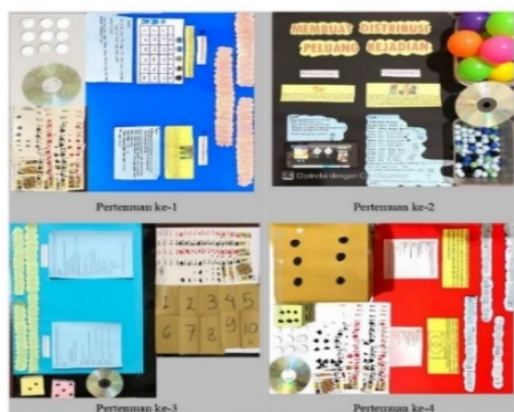


Figure 5. Products of Students from the Experimental Class

Based on the observations, each group in the four meetings successfully created diverse products according to their represented learning styles. The experimental class consisted of four groups, each representing visual, auditory, and two kinesthetic learning styles. They produced interesting posters, informative voice recordings, and physical objects such as dice and cards. The use of differentiated learning methods, such as discussions, visual representations, and physical activities, successfully enhanced students' mathematical creative thinking abilities. These results support Aprima & Sari's (2022) assumption about the effectiveness of differentiated approaches in improving student understanding and enriching the learning process by utilizing media according to their learning styles.

The output from the window shopping model based on differentiated learning includes several important aspects. First, there is an increase in creative thinking skills and student participation according to their learning styles. This model also enhances social interaction and understanding of the material through collaboration and peer tutoring. The use of different Student Worksheets (LKS) for each group and the exchange of information between groups through window shopping activities stimulate mathematical creative thinking abilities and expand students' knowledge from different perspectives. Products such as posters, voice recordings, and physical objects demonstrate the effectiveness of the differentiated approach in enhancing student understanding and interest in learning mathematics. Through post-visit activities, the exchange of information allows for the

strengthening of students' understanding and skills in solving mathematical problems.

Challenges in implementing the window shopping model based on differentiated learning include the high motor activity of kinesthetic groups, which can disturb other groups and require extra attention from the teacher. This model creates diverse and relevant learning experiences and enhances

students' mathematical creative thinking abilities.

Next, hypothesis test 3 was conducted to determine the extent of the increase in mathematical creative thinking abilities of students taught through direct instruction. Since the initial data were not normally distributed, a non-parametric statistical approach using the Wilcoxon test was employed. The results are as follows:

Table 7. The Result of Wilcoxon Test for Control Class

Class	N	Mean Rank	Sum of Rank	Asymp. Sig. (2 tailed)	Sig.	Decisiom
Negative Rank	0	0,00	0,00	0,000	0,05	H ₀ ditolak
Positive Rank	28	14,50	406,00			
Ties	0					
Total	28					

The application of the Wilcoxon test in the control class using the direct learning model also indicated a significant increase in students' mathematical creative thinking abilities. There was no decline in scores from the pretest to the posttest in the control class. A total of 28 positive data points showed an increase in students' mathematical creative thinking abilities, with an average increase of 14.50 and a total positive ranking of 406.00. Statistical analysis showed that the Asymp.Sig. (2-tailed) value was 0,000, which is less than the significance level (0.05), thus rejecting H₀. Therefore, it can be said that the direct learning model has a significant impact on improving the mathematical creative thinking abilities of tenth-grade students at MAN 1 Magelang.

The application of the direct learning model in the control class can improve students' mathematical creative thinking abilities; however, the improvement is not as optimal as the implementation of the window shopping model based on differentiated learning. This finding is consistent with research by Asniah (2020), which showed that although the direct learning model significantly improved student learning achievement, some students

still did not reach the expected learning mastery. Nevertheless, teachers have made efforts to enhance students' creative thinking abilities within the direct learning model. They focused on developing fluency, originality, flexibility, and elaboration as key aspects to promote. Teachers encouraged flexible thinking by introducing various solution methods, such as when explaining the concept of modifying addition rules. Additionally, teachers stimulated students' originality by presenting unusual examples or questions. The provision of Student Worksheets (LKS) also gave students the opportunity to elaborate on their thoughts regarding the concepts taught, thereby enhancing fluency in expressing ideas and related solutions.

In the learning process, teachers provided clear instructions for completing the LKS and offered opportunities to ask questions if there were difficulties. Teachers also encouraged collaborative discussions, but many students did not take full advantage of this. Some students actively participated in discussions, while others remained silent and did not participate, as indicated by the students marked with red in the image.

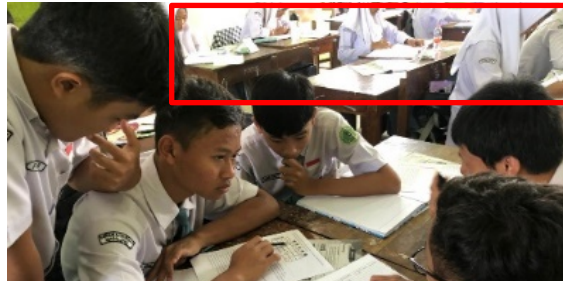


Figure 6. Student Worksheet Discussion

In the control class, the teacher provided instructions and direct assistance to students who were struggling. The teacher was ready to offer additional explanations or direct guidance, ensuring that each student received the attention needed for better

understanding. According to Rosmi (2017), additional guidance encourages active student engagement in learning and facilitates their ability to apply new concepts. As shown in the following image.



Figure 7. Teacher Guiding Students in Problem Solving

In the evaluation stage of students' work, the teacher provides feedback to explain concepts and appreciate the creativity and originality demonstrated by the students (Mirnawati, 2019). The teacher assesses students' understanding through oral and written questions and gives responses. However, the lack of student awareness to ask questions and the lack of courage to express themselves can hinder the learning process. These findings align with Rusli, Tahmir, Dassa (2018), who highlight the challenges students face in completing tasks after understanding the material.

In the final stage of learning, the teacher gives students the opportunity to continue learning through additional guidance, such as homework. According to Mirnawati (2019), this assignment is given to deepen their understanding independently outside of class time, fostering students' independence and responsibility in their educational process.

The output of the direct learning model includes several important aspects, such as creating a dynamic learning environment. The use of Student Worksheets (LKS) stimulates thinking and provides additional guidance with thorough evaluation and constructive feedback, encouraging students to actively explain their understanding. Homework allows students to deepen their understanding independently outside of class. However, there are obstacles such as a lack of collaboration among students, minimal active participation, insufficient attention to different learning styles, and limited use of additional guidance.

CONCLUSION

This study highlights that students using a differentiated learning-based window shopping model experience significantly greater improvement in mathematical creative thinking abilities, with an average score increase of 16.00, compared to classes using direct instruction, which showed an

average increase of 14.50. These results underscore the effectiveness of the window shopping model in enhancing students' creative thinking skills within mathematics education. Educators are encouraged to consider both models to foster creative thinking in their teaching practices. Moreover, these findings offer practical recommendations for educators and future educators to support the development of students' mathematical creative thinking abilities through appropriate instructional models. Further advancements in engaging models and strategies are essential to fully harness the potential for improving students' mathematical creative thinking skills, establishing the differentiated learning-based window shopping model as a cornerstone for effective learning processes.

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