

EFFECTIVENESS OF THE DISCOVERY LEARNING MODEL ASSISTED BY PINTAR MEDIA (PAPAN INTERAKTIF BANGUN DATAR) ON THE MATHEMATICAL LITERACY SKILLS OF ELEMENTARY SCHOOL STUDENTS

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Abstract: This study aims to determine the effectiveness of the discovery learning model assisted by PINTAR media (Papan Interaktif Bangun Datar) on the mathematical literacy skills of elementary school students in comparing the characteristics of plane shapes. The research used a quantitative approach with a pre-experimental method and a one-group pretest-posttest design. The population consisted of all fifth-grade students of SD 3 Gondosari. The sample included 11 students, consisting of 6 female and five male students, selected using a saturated sampling technique. The research instruments included pretest and posttest questions to measure students' mathematical literacy. Data analysis techniques used tests of normality, Paired Sample Test, and the N-Gain Test to determine the effectiveness of the discovery learning model assisted by PINTAR media (Papan Interaktif Bangun Datar) on mathematical literacy skills in comparing the characteristics of plane shapes. The results showed improved students' mathematical literacy skills after implementing the discovery learning model assisted by PINTAR media. This is evidenced by an increase in the average score from 45.36 to 67.36 after using PINTAR media. T Test showed a significance value of 0.000 ($p < 0.05$), indicating a significant difference between the pretest and posttest results. Meanwhile, the average N-Gain score of 0.4687 falls into the medium category. Therefore, the discovery learning model assisted by PINTAR media (Papan Interaktif Bangun Datar) is considered moderately effective in improving the mathematical literacy skills of elementary school students.

Keywords: Discovery learning, Elementary School, Mathematical Literacy, PINTAR Media

1. INTRODUCTION

Education is a place where students gather to gain helpful knowledge [1], [2]. Through education, students can develop abilities and skills that will become the forerunner or container for the golden generation of the Indonesian nation [3], [4]. However, education in Indonesia is still commonly found using conventional teaching methods [5], [6]. The traditional method is a learning approach in which the teaching and learning process is carried out by delivering material orally by the teacher, aiming to provide students with as much knowledge as possible [7]–[9]. Using conventional

teaching methods impacts learning that tends to be tedious and challenging to understand because material delivery is still abstract [10], [11]. The abstract nature of mathematics material is one of the factors that cause students to have difficulty understanding the learning content optimally [12]. This condition shows that mathematics learning is one of the fields of study affected by the limitations of conventional approaches, so it requires innovation in the learning model.

Math learning is closely related to story problems [13]–[15]. Story problems are generally related to real-life situations. Many story problems appear in problem-solving, which requires students to understand the purpose and issues that must be solved to find the right solution [16]–[18]. In this case, mathematical literacy is one of the essential abilities that need to be developed. Mathematical literacy is a person's ability to understand, apply, and convey mathematical ideas in situations relevant to real life [19]. Solving mathematical literacy problems includes three processes: formulating, using, and interpreting [20]. The three processes are based on the cognitive level of numeracy in the Asesmen Kompetensi Minimum (AKM), which is divided into three parts: knowing, applying, and reasoning.

Mathematical literacy is still challenging for many students because not all can optimally link mathematical concepts with real-life contexts. Therefore, an innovation in the learning model is needed by applying the discovery learning model. Discovery learning is a learning model that encourages students to learn actively. In addition to being student-oriented, the discovery learning model has characteristics designed based on real problems, which enable students to build contextual and in-depth understanding of mathematical concepts through a series of constructive questions [21]. Appropriate learning media is also needed to support the application of discovery learning, so researchers use PINTAR media (Papan Interaktif Bangun Datar) as props to support the application of the discovery learning model.

Based on the observation, it is known that the mathematical literacy of fifth-grade students of SD 3 Gondosari is still relatively low. In addition, there is no innovative learning media used to support the learning process, so learning is still conventional. Students' low mathematical literacy skills are reflected when they have difficulty

understanding story problems related to comparing the characteristics of plane shapes. Some students have been unable to relate mathematical concepts to real situations, such as distinguishing the number of sides and angles in various plane shapes. These findings are reinforced by interviews with fifth-grade homeroom teachers, who said that some students still have difficulty solving math literacy problems independently. This condition also aligns with the decrease in students' mathematics literacy achievement scores by 2.05 points in the geometry domain compared to the previous year. This shows the need for a more concrete and contextual learning approach so that students can more easily understand the content of the problem and find the answer.

Previous studies have shown that conventional learning without adequate media utilization tends to make students easily feel bored and less focused on understanding the material [22]. Therefore, teachers play an essential role in creating a fun and meaningful learning process, including designing and using learning media to support maximum student understanding, especially in mathematics material at the elementary school level [23]. Meanwhile, [24] has proven that smart board media can positively impact learning mathematics but has not explicitly led to the development of mathematical literacy skills in comparing the characteristics of plane shapes. This is a relevant research gap that needs to be studied further. Based on the results of a literature study by [25], there is an urgent need to develop a more contextual and adaptive learning model with the help of innovative media, such as discovery learning, that allows students to discover concepts through exploration and hands-on activities. Therefore, it is essential to conduct further research that examines the effectiveness of the discovery learning model assisted by PINTAR media on the mathematical literacy skills of elementary school students to answer the research gap that has not been widely touched.

With the help of PINTAR media (Papan Interaktif Bangun Datar), the discovery learning model is used to actively encourage students to discover the concept of plane shapes through direct experience. PINTAR media is a concrete media in the form of a board equipped with a sticky area and instruction cards containing the characteristics of plane shapes. Students are asked to guess the type of shape based on the clues, then

shape it using plasticine and sticks and stick it on the board as a form of presentation. This study aimed to determine the effectiveness of the discovery learning model assisted by PINTAR media (Papan Interaktif Bangun Datar) on the mathematical literacy skills of elementary school students in comparing the characteristics of plane shapes.

2. RESEARCH METHODS

This research uses a quantitative approach, a pre-experimental method, and a one-group pretest-posttest design. The research design can be seen below.

O ₁	X	O ₂
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O₁: pretest score before using PINTAR media (Papan Interaktif Bangun Datar).

X: action (learning in class using PINTAR media (Papan Interaktif Bangun Datar)).

O₂: posttest score after using PINTAR media (Papan Interaktif Bangun Datar).

In this study, the pretest was conducted before the researchers gave the treatment to measure the initial conditions. Furthermore, the treatment was given and only then ended with a posttest to measure what changes occurred. The research was conducted at SD 3 Gondosari, with the research subjects being fifth-grade students. The population of this study were all fifth-grade students of SD 3 Gondosari. Using the saturated sampling technique, the sample size consisted of 11 students, with details of 6 female and five male students. The research instruments included pretest and posttest questions to measure mathematical literacy skills.

The data analysis technique was carried out with the Paired Sample T-Test test to determine the difference in students' mathematical literacy skills before and after using learning media. Before the t-test, tests of normality was conducted as a prerequisite for data analysis. Then, the N-Gain Test was conducted. The N-Gain test measures the difference in pretest and posttest scores by considering the maximum score that can be obtained. It provides an overview of the extent to which improvement occurs after treatment. Interpretation of N-Gain is divided into three categories: low (less effective) $N\text{-Gain} \leq 0.3$, medium (moderately effective) $0.3 - 0.7$, and high (effective) > 0.7 .

3. RESULTS AND DISCUSSION

A. RESULTS

The implementation of this research was carried out in three meetings. The first meeting aimed to identify the problems faced by fifth-grade students based on the results of the analysis of education report cards and interviews with fifth-grade teachers. The second meeting was held to give pretests to students, while the third meeting was used to conduct posttests. During the learning activities using the discovery learning model with the help of PINTAR media (Papan Interaktif Bangun Datar), there were still some students who experienced confusion, especially when asked to match the characteristics of plane shapes with the type of shapes based on the instructions on the paper that had been given. However, the majority of students have started to be able to distinguish the characteristics of each plane shapes well. Not a few of them could correctly answer the instructions for the characteristics of plane shapes written on the paper, then formed plane shapes using plasticine and sticks according to their guesses. After finishing, the plane shapes that the students had made were then attached to the board as part of the presentation activity of their findings. This study hypothesizes that the discovery learning model assisted by PINTAR media (Papan Interaktif Bangun Datar) effectively improves the mathematical literacy of elementary school students. To determine the effectiveness of the discovery learning model assisted by PINTAR media (Papan Interaktif Bangun Datar) in effectively increasing the mathematical literacy of elementary school fifth-grade students of SD 3 Gondosari, data analysis was carried out using the tests of normality as a prerequisite, then the Paired Sample T-Test test, then the N-Gain test. The following are the descriptive results of the pretest and posttest scores of fifth-grade students of SD 3 Gondosari.

Table 1. Main Focus of Lecturer Research

Descriptive Statistics	Pretest Scores	Posttest Scores
Sample Size	11	11
Minimum	25	33
Maximum	83	100
Mean	45.36	67.36
Std. Deviation	17.648	20.958

Based on the table above, the results obtained from the pretest are minimum=25, maximum=83, and standard deviation 17.648. deviation=17.648. The posttest scores is minimum=33, maximum=100, and standard deviation 20.958. deviation=20.958. Based on Table 1, there is a difference between the pretest and posttest of 22.00, and there is an increase in the pretest (before treatment) and posttest (after treatment). Before analyzing the data using the Paired Sample T-test test, researchers first conducted a normality test to determine whether the data on students' mathematical literacy scores were normally distributed. This normality test is important to fulfill one of the basic assumptions in parametric statistical tests. The results of the normality test are presented in the table below.

Table 2. Tests of Normality					
Kolmogorov-Smirnov^a			Shapiro-Wilk		
Statistic	df	Sig.	Statistic	df	Sig.
.213	11	.176	.884	11	.116
.160	11	.200 [*]	.956	11	.727

Based on the table above, it can be interpreted that the significance value (Sig.) in the Shapiro-Wilk test for pretest data is 0.116, and for posttest data, it is 0.727. Because both significance values are greater than the significance level of 0.05, it can be concluded that the data from the students' pretest and posttest results are normally distributed. Therefore, the data meets the normality assumption and can be analyzed using parametric statistical tests, namely the Paired Sample T-Test test.

Once the data is known to be normally distributed, it meets the requirements for testing using the Paired Sample T-Test. The researcher conducted the Paired Sample T-Test test to determine whether there was a statistically significant difference between the student's mathematical literacy scores before and after applying the discovery learning model assisted by PINTAR media (Papan Interaktif Bangun Datar).

Table 3. Paired Sample T-Test

	Paired Differences						t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error	95% Confidence Interval of the Difference					
				Lower	Upper				
<i>Pretest- Posttest</i>	- 22.00 0	11.933	3.598	-30.017	-13.983	- 6.115	10	.000	

Based on the Paired Sample T-Test test results in the table above, the significance value (Sig. 2-tailed) of 0.000 is obtained; the value is smaller than 0.05. Thus, it can be interpreted that there is a significant difference between students' mathematical literacy scores before and after the application of the discovery learning model assisted by PINTAR media (Papan Intraktif Bangun Datar). This means that using the discovery learning model assisted by PINTAR media (Papan Intraktif Bangun Datar) is proven to be statistically effective in improving the mathematical literacy skills of fifth-grade elementary school students, especially in comparing the characteristics of

In the next step, researchers will conduct the N-Gain test. The results are shown in the table below.

Table 4. The N-Gain Test

	N	Minimum	Maximum	Mean	Std. Deviation
NGain	11	.00	1.00	.4687	.29447
Valid N (listwise)	11				

Based on Table 4 of the N-Gain test results, the mean value is 0.4687 with a std.deviation of 0.29447. Based on the interpretation of the N-Gain criteria, the value is included in the moderate category (quite effective), which is between the range of values 0.3-0.7. This shows that the increase in students' mathematical literacy scores after applying the discovery learning model assisted by PINTAR (Papan Interaktif Bangun Datar) media is medium. Thus, it can be concluded that the discovery learning model assisted by PINTAR media (Papan Interaktif Bangun Datar) moderately effective

in helping students improve their understanding of the material by comparing the characteristics of plane shapes.

B. DISCUSSION

Using the discovery learning model assisted by PINTAR media (Papan Interaktif Bangun Datar) in learning mathematics contributes significantly to improving the mathematical literacy skills of fifth-grade students. The results of this study indicate that the discovery learning model assisted by PINTAR media (Papan Interaktif Bangun Datar) is efficacious in improving students' mathematical literacy skills. Before this media was applied, learning activities were still dominated by the lecture/conventional method. Teachers delivered material without visual aids, so students easily forgot the material taught, had difficulty concentrating, and had trouble understanding story problems related to plane shapes.

The lack of mathematical literacy skills in fifth-grade students of SD 3 Gondosari can be seen from their difficulty in solving story problems correctly. Most students immediately write the final answer without going through critical stages, such as understanding the meaning of the problem, applying relevant mathematical concepts, and interpreting the results thoroughly. Meanwhile, mathematical literacy includes the ability to formulate, use, and interpret mathematics in various contexts [26]. In other words, students have not been able to demonstrate the mathematical thought process, which is an essential indicator of mathematical literacy.

Developing students' skills starts from the initial stage when researchers give pretest questions. In this stage, students were asked to solve math problems in the form of story problems related to the characteristics of plane shapes without using tools or media. The results of the initial test show that most students cannot understand the questions well; they only guess or give direct answers without going through a systematic thinking process. The average score achieved was only 45.36.

Furthermore, the learning process uses a discovery learning model assisted by PINTAR media (Papan Interaktif Banangun Datar). This model focuses on student-first learning, where students actively seek, discover, and develop their knowledge through direct exploration. In its implementation, the researcher does not provide answers

directly but instead guides students to observe, classify, compare, and conclude the concept of plane shapes based on their experiences using concrete media. This media is a board that students use to create and see the shape of plane shapes using real materials such as plasticine, sticks, and cardboard. During this activity, students actively form different plane shapes, recognize the number of sides and angles, and compare them with other shapes. This activity is done jointly and exploratively, where the researcher acts as a facilitator while the students explore the material. This process is the key to success for students. The discovery learning model allows students to go through various stages of active and rewarding learning, namely: (1) Stimulation (providing stimuli), (2) Problem Statement (recognizing problems), (3) Data Collection (collecting data through exploration), (4) Data Processing (classifying and analyzing), (5) Verification (concluding), and (6) Generalization (summarizing general concepts) [27]. This stage uses PINTAR media (Papan Interaktif Bangun Datar) which is interactive and real.

Students develop a visual and tangible understanding by using their own hands to shape and observe plane shapes. This activity helps them to connect direct learning experiences with abstract mathematical concepts. For example, students can identify the difference between a rectangle and a square by directly observing their shapes, not just through pictures or verbal explanations. This kind of learning strengthens memory, improves concentration, and provides a meaningful learning experience for students.

After the discovery learning model with the help of PINTAR media (Papan Interaktif Bangun Datar) media was applied in the learning process, there was a significant change in students' participation in the class. Initially, less active students began to show interest and engage more in learning activities. They seemed enthusiastic when asked to form plane shapes directly using simple materials such as plasticine and sticks on the interactive board. The selection of this media is based on the results of an interview with the fifth-grade teacher of SD 3 Gondosari, who said that students still have difficulty in identifying and comparing the characteristics of plane shapes, such as the number of sides, types of angles, and overall shapes. Through PINTAR media, students can observe and arrange plane shapes in a real way so that they can more easily

understand the differences and similarities between plane shapes in a fun and concrete way. This shows that through explorative and collaborative learning stages, by the discovery learning model, students are actively involved in developing reasoning skills and understanding concepts in depth.

After the learning was completed, the researcher gave posttest questions for students with questions similar to the pretest. The posttest results showed significant progress, with the average score reaching 67.36, which means an increase of 22.00. This increase occurred because students already had a real picture of plane shapes, recognized the characteristics of plane shapes of each shape, and could relate them to the context of story problems. They not only answered the questions but could also explain the steps of their thinking. This indicates that students' mathematical literacy skills have improved, especially in formulating problems, applying concepts, and interpreting results. Thus, students' achievement in the posttest is not accidental but rather the result of a structured, significant learning process involving real experiences through concrete media and the discovery learning model. The results obtained align with the findings of [28] in their study, which emphasizes that interactive media, including magazines and visual boards, can improve mathematical literacy skills. Using media that allows students to see, touch, and classify objects directly facilitates the abstract thinking process and helps them relate math to everyday life.

Data analysis using the Paired Sample T-Test test showed a significance value 0.000, smaller than 0.05. Thus, it can be interpreted that there is a significant difference between students' mathematical literacy scores before and after the application of the discovery learning model assisted by PINTAR media (Papan Interaktif Bangun Datar). This means that the discovery learning model assisted by PINTAR media is statistically proven to be effective in improving students' mathematical literacy skills, especially in understanding the comparison of the characteristics of plane shapes. This is in line with the findings of [29], which revealed that concrete media associated with real situations are very effective in helping students understand geometry concepts that tend to be abstract. Direct visual presentation through concrete media encourages students' enthusiasm for learning and strengthens their ability to relate mathematical material to

everyday situations. A similar study by [30] showed that using concrete media significantly helped students understand the material of building space. Both studies indicate that concrete media such as PINTAR media (Papan Interaktif Bangun Datar) contributes considerably to improving mathematical literacy skills because it provides a learning experience that involves students formulating, applying, and interpreting concepts contextually and meaningfully.

4. CONCLUSION

Based on the results of the research conducted, it can be concluded that the discovery learning model assisted by PINTAR media (Papan Interaktif Bangun Datar) is moderately effective in improving the mathematical literacy of fifth-grade elementary school students, particularly on the topic of comparing the characteristics of plane shapes. This is evidenced by the increase in students' average scores from a pretest score of 45.36 to a posttest score of 67.36. The Paired Sample T-Test showed a significant difference between the pretest and posttest results with a significance value of 0.000 ($p < 0.05$). This indicates that the discovery learning model assisted by PINTAR media (Papan Interaktif Bangun Datar) significantly improves students' mathematical literacy. Furthermore, the average N-Gain score of 0.4687 falls into the moderate category, showing that the discovery learning model assisted by media PINTAR (Papan Interaktif Bangun Datar) is moderately effective for learning.

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