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The Effectiveness of the Discovery Learning Model Assisted by ROPUT (Angle Spinning Wheel) Media on Students' Critical Thinking Skills

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Abstract. *Critical thinking skill is an essential capability required in 21st-century elementary mathematics learning. However, students at SDN Kalongan 02 exhibited low critical thinking abilities, particularly in understanding geometry concepts such as angles. This study aims to analyze the effectiveness and differences in students' critical thinking skills before and after implementing the Discovery Learning model assisted by ROPUT (Angle Spinning Wheel) media. A quantitative pre-experimental study with a One-Group Pretest-Posttest design was conducted involving 27 fifth-grade students (Class VB) selected via purposive sampling. Data were collected using written essay tests, observation sheets, and questionnaires, followed by parametric analysis using Paired Samples T-test and N-Gain score test via SPSS 25.0. The findings revealed a significant difference in critical thinking skills, where the mean pretest score of 50.56 increased substantially to 88.04 in the posttest ($t = 38.100$, $p < 0.001$). Furthermore, the average N-Gain score obtained was 0.7612 (76.12%), categorizing the effectiveness level as high/effective. Student worksheets (LKPD) and questionnaire responses further confirmed high learning engagement and positive attitudes (89.81). It can be concluded that the Discovery Learning model supported by concrete ROPUT media is highly effective in improving elementary students' critical thinking skills in mathematics.*

Keywords: *Mathematical critical thinking skill; discovery learning; ROPUT media; mathematics education; elementary school*

INTRODUCTION

In the contemporary 21st-century educational paradigm, mathematics instruction in elementary schools is required to transcend beyond mere procedural fluency and formulaic memorization. Current curricula globally emphasize the cultivation of higher order thinking skills (HOTS), with critical thinking serving as a fundamental pillar for logical reasoning, analytical evaluation, and problem solving dexterity. According to the foundational conceptualizations by Ennis in 'Aini et al. (2024), critical thinking encompasses reflective and reasonable thinking focused on deciding what to believe or do, which requires learners to identify central problems, analyze underlying arguments, infer logical conclusions, and evaluate real world situations. Within the primary school geometry domain,

developing critical thinking is particularly crucial, as learners must transition from intuitive visual shape recognition to formal spatial reasoning and geometric abstraction. Specifically, mastering angle concepts including measurement using protractors, vertex identification, and angle classification (acute, right, obtuse, straight) acts as an essential cognitive prerequisite for advanced mathematical learning.

However, empirical realities at SDN Kalongan 02 reveal a significant gap between the national curriculum mandate and students' actual competencies. Critical thinking is a key factor supporting student learning success, which encompasses the process of interpreting, analyzing, and evaluating information (Rahmawati et al., 2023). Furthermore, Surya et al. (2023) explain that critical thinking represents an individual's ability to solve problems, make decisions, and analyze issues based on acquired information. In addition, Kusuma et al. (2024) emphasize that critical thinking skills are essential for elementary school students to understand learning materials and solve problems effectively. Finally, Saputri & Rizqi (2025) note that this critical thinking ability can be enhanced through instruction that actively involves students in discovering and analyzing information.

Based on this framework, According to Ennis in 'Aini et al. (2024) defines critical thinking as rational and reflective thought focused on deciding what to believe or do: This definition encompasses key indicators such as identifying the core problem (Focus), failed to provide logical mathematical justifications for angle properties (Reason), encountered difficulty in deducing unknown angle measures (Inference), struggled to connect abstract angle concepts to real world contexts (Situation), lacked precision in mathematical terminology (Clarity), and rarely re-checked their problem-solving steps (Overview). Furthermore, preliminary surveys indicated low instructional engagement and satisfaction (55,92), as conventional teacher-centered instruction and abstract whiteboard demonstrations induced cognitive passivity, learning anxiety, and poor conceptual retention.

To mitigate these instructional barriers, recent scholarship in elementary mathematics education has increasingly advocated for student centered inquiry frameworks and interactive concrete manipulatives. Devina et al. (2025)

demonstrated that implementing the Discovery Learning model supported by visual fraction media significantly improved primary students' critical thinking capacities by transitioning them from passive receivers to active discoverers. In a similar vein, Diana & Anugraheni (2022) established the empirical superiority of discovery and inquiry based learning models over traditional lecturing in elevating 5th-grade elementary mathematics outcomes.

Despite these positive contributions, existing literature exhibits notable methodological and practical limitations. Many prior studies Wafiqni et al. (2023) evaluated critical thinking only as a broad, unidimensional cognitive score, without systematically examining how discovery inquiry influences specific, multi indicator taxonomies such as Ennis's six dimensions Ennis in 'Aini et al. (2024). Additionally, while recent research by Kusumawati & Suriswo (2026) and Pradnyana et al. (2026) explored discovery learning paired with digital tools or e-books, these digital interventions often induce cognitive overload or encounter infrastructure constraints in rural elementary school environments, where physical, tactile manipulation remains vital for age-appropriate cognitive development. To ensure operational clarity during classroom implementation, this framework strictly follows the six systematic phases outlined by Mukarom et al. (2024): (1) stimulation, (2) problem statement (problem identification), (3) data collection, (4) data processing, (5) verification, and (6) generalization (drawing conclusions).

Bridging this gap requires recognizing that learning media serve as essential components in the educational process, functioning to assist teachers in delivering materials and helping students understand information more easily. According to Supriyono (2022), learning media play a role in increasing elementary school students' learning interest by presenting materials more concretely and providing meaningful learning experiences. In line with this, Laelatul Munawaroh et al. (2023) explain that the use of information and communication technology based learning media can enhance students' learning motivation, attention, and enthusiasm during the learning process. Furthermore, Shela & Mustika (2023) also found a significant relationship between learning media, learning methods, and the learning motivation of elementary school students. Additionally, Karomah et al.

(2024) state that learning media help teachers deliver materials in a more engaging and interactive manner while supporting conceptual understanding and student engagement. Finally, Valentinna et al. (2024) examine the use of gamification based learning media in boosting elementary school students' learning motivation.

While previous studies have separately explored general discovery methods or standard visual aids, limited research has directly integrated the structured syntax of Discovery Learning with a localized, interactive, and manipulative physical tool specifically designed for understanding geometry and angles: the ROPUT (Angle Spinning Wheel). This novel tactile learning tool is designed to actively engage students in directly manipulating and visualizing angle properties. By combining the interactive ROPUT with guided discovery, this study challenges the assumption that expensive digital media are universally essential for developing high level skills; instead, it demonstrates how contextualized physical innovations can systematically stimulate all core dimensions of critical thinking and significantly expand current findings regarding mathematical cognition in primary education.

Building upon this gap analysis, the primary research questions addressed in this study are: (1) Is there a significant difference in students' critical thinking skills before and after the implementation of the Discovery Learning model assisted by ROPUT (Angle Spinning Wheel) media? (2) How effective is this combination in improving the critical thinking skills of fifth-grade students? Correspondingly, the objectives of this research are to empirically evaluate the pre-post performance differences and measure the exact effectiveness of the treatment. The novelty of this research lies in the introduction and empirical validation of ROPUT (Angle Spinning Wheel) a novel, interactive, and tactile concrete medium specifically engineered to synchronize with the cognitive syntax of Discovery Learning, offering a highly replicable, practical, and effective pedagogical solution for enhancing critical thinking skills in elementary mathematics.

RESEARCH METHOD

This research employed a quantitative research approach utilizing a pre-experimental design, specifically the One-Group Pretest-Posttest Design. The study

was conducted at SDN Kalongan 02, focusing on the population of fifth-grade students. The research sample comprised 27 students from Class VB, selected using a purposive sampling technique based on preliminary observations regarding students' lower baseline critical thinking capabilities in mathematics, particularly in understanding geometry concepts such as angles. The independent variable in this study was the implementation of the Discovery Learning model assisted by ROPUT (Angle Spinning Wheel) media, while the dependent variable was the students' critical thinking skills.

The procedures of the study were executed sequentially and systematically across several structured stages. The process began with preliminary preparation involving administrative permits, curriculum alignment, and comprehensive instrument validation by expert validators. Subsequently, a baseline measurement (pretest) utilizing essay test items was administered to evaluate the students' initial critical thinking skills based on according to Ennis in 'Aini et al. (2024) six core indicators (Focus, Reason, Inference, Situation, Clarity, and Overview). Following the pretest, the intervention (treatment) was carried out over multiple learning sessions by applying the Discovery Learning model syntax consisting of stimulation, problem statement, data collection, data processing, verification, and generalization integrated with hands-on manipulation of the interactive concrete ROPUT (Angle Spinning Wheel) media in collaborative group settings. Upon completion of the learning implementation, a final measurement (posttest) under controlled conditions was conducted, alongside ongoing monitoring using learning implementation observation sheets, student activity worksheets, and student response questionnaires.

The research instruments including test items and questionnaires underwent rigorous empirical trials, demonstrating high validity verified by expert validators and strong internal reliability (Cronbach's Alpha = 0.819). The data collected consisted primarily of quantitative scores derived from the written evaluations, alongside implementation percentages and response ratings. Finally, the data analysis techniques utilized both descriptive and inferential statistics performed via SPSS 25.0. The analytical sequence involved testing for data normality using the

Kolmogorov-Smirnov test, conducting a Paired Samples T-test to evaluate significant score differences between pretest and posttest results, and performing Normalized Gain (N-Gain Score) analysis to precisely determine the degree of instructional effectiveness without relying on redundant tables or complex formulas within the main narrative text. The distribution of test items for each critical thinking indicator is presented in the Table 1:

Table 1. Distribution of Test Research Instrument

No	Critical Thinking Skill Indicator	Item Number	Item Form	Test Item Description
1	Focus (Identifying core problems or essential information from a given issue)	1 and 2	Essay	Item 1: Identifying essential information needed to determine angle types (120°). Item 2: Analyzing whether line length affects angle magnitude.
2	Reason (Providing logical justifications for differences or decisions made)	3 and 4	Essay	Item 3: Explaining logical reasons why a right angle measures (90°). Item 4: Justifying differences between acute (60°) and obtuse (120°) angles.
3	Inference (Drawing appropriate conclusions based on existing facts or characteristics)	5 and 6	Essay	Item 5: Drawing conclusions about a roof angle (40°) as an acute angle. Item 6: Inferring angle types from visual representations without direct measurement.
4	Situation (Applying conceptual knowledge to real-life situations or problems)	7 and 8	Essay	Item 7: Evaluating clock hands at 02:00 (60°) in a real-world scenario. Item 8: Identifying required physical measurements for a leaning ladder angle.
5	Clarity (Explaining terms or providing examples using clear sentences)	9 and 10	Essay	Item 9: Clarifying misconceptions regarding a 95° obtuse angle. Item 10: Explaining differences among acute, right, and obtuse angles in plain language.
6	Overview (Reviewing the process and results of work to ensure validity/accuracy)	11 and 12	Essay	Item 11: Re-evaluating a student's error in classifying 120° as an acute angle. Item 12: Checking the correctness of a clock angle at 03:00 (90°).

RESULT AND DISCUSSION

To establish a clear foundational overview of the research framework and population context, the study was administered at SDN Kalongan 02 involving fifth-grade students. Specifically, Class VB comprising 27 students was designated as the research sample through a purposive sampling technique. This selection was

justified by initial preliminary observations indicating low baseline critical thinking proficiency among students, particularly in mathematics geometry topics regarding angle measurements. The general parameters governing the research subjects are detailed in Table 2:

Table 2. Profile of Research Subjects

Variable	Category	Description/Total
Research Location	SDN Kalongan 02	Class VB (5th Grade)
Sample Size	27 Students	100% of Class VB
Sampling Technique	Purposive Sampling	Selected due to baseline low critical thinking
Research Design	One-Group Pretest-Posttest	Pre-experimental quantitative design
Data Analysis Tool	SPSS 25.0	Validity, Reliability, Normality, Sample T-test, and N-Gain analysis

Based on the parameters outlined in Table 1, the research was conducted directly within the natural classroom environment of SDN Kalongan 02 during the active academic semester. Class VB was chosen purposefully because classroom teacher evaluations and preliminary assessments revealed that students experienced notable conceptual difficulties in mathematics, specifically concerning angle identification, measurement, and properties topics requiring high level analytical skills. The total population of Class VB consisted of 27 students (comprising both male and female learners), all of whom participated fully as the research subjects without attrition. The application of a One-Group Pretest-Posttest design allowed the researcher to track individual cognitive changes comprehensively, as every student served as their own control by undergoing both the baseline pretest before treatment and the final posttest evaluation after the Discovery Learning model integrated with ROPUT media was fully implemented.

Validity and Reliability Test

Saputri et al. (2023) state that validity testing is conducted to determine the level of accuracy of an instrument in measuring research variables. In line with this, Subhaktiyasa (2024) emphasizes that validity is a crucial aspect in assessing the quality of a research instrument, ensuring that the instrument is truly capable of measuring the intended aspects. The decision-making basis for validity testing is as

follows (1) If the rcount > r-table, then the item is declared valid because it has a significant relationship. (2) If the r-value < r-table, then the item is declared invalid because it does not have a significant relationship.

Reliability testing is conducted to determine the level of consistency with which an instrument produces research data. A reliable instrument will yield consistent measurement results, in accordance with the characteristics of the instrument being used (Subhaktiyasa., 2024). According to Zakariya (2022), the application of the Cronbach's Alpha coefficient requires consideration of specific assumptions and conditions to ensure that the reliability estimate can be interpreted accurately. The reliability test in this study was conducted using the SPSS 25.0 program.

Reliability testing was performed on all items used in the study. The decision-making basis for reliability states that if the Cronbach's Alpha value is > 0.70, the instrument is declared reliable and fit for use in research (Subhaktiyasa., 2024). The empirical validity test results for the 12 trial test items are detailed in Table 3:

Table 3. Validity and Reliability Test Result

No	Students' Critical Thinking Skills		
	Validity	**Reliability**	**Criteria**
1.	0.637	0.819	Valid/High
2.	0.641		Valid/High
3.	0.398		Valid/Low
4.	0.452		Valid/Moderate
5,	0.444		Valid/Moderate
6.	0.681		Valid/High
7.	0.545		Valid/Moderate
8.	0.648		Valid/High
9.	0.789		Valid/High
10.	0.469		Valid/Moderate
11.	0.656		Valid/High
12.	0.597		Valid/Moderate

As detailed in Table 2, all 12 essay trial items demonstrated positive correlation coefficients that surpassed the minimum required critical threshold, confirming that every single item was statistically Valid. The correlation values spanned from a lower bound of 0.398 (observed on question 3) up to a robust peak

of 0.789 (observed on question 9). Specifically, items such as Question 1, Question 2, Question 6, Question 8, Question 9, Question 11 exhibited strong correlation values categorized as "High", whereas the remaining items fell into "Moderate" or "Low" valid categories while still retaining full eligibility for data collection.

Based on the results of the reliability test, a Cronbach's Alpha value of 0.819 indicates that the test instrument used falls into the "High" category. Thus, the critical thinking skills instrument in this study is reliable and fit to be used for collecting data consistently, given that the Cronbach's Alpha value of 0.819 > 0.70.

Descriptive Statistics Results

Before analyzing the overall trends and hypothesis testing, a descriptive statistical analysis was conducted on the total scores of the students' critical thinking abilities before (pretest) and after (posttest) the implementation of the Discovery Learning model assisted by ROPUT (Angle Spinning Wheel) media. The summary of the results is presented in Table 4:

Table 4. Descriptive Statistics Result

Metric	Pretest Score	Posttest Score
N Valid	27	27
Missing	0	0
Mean	50.56	88.04
Std. Deviation	5.528	4.694
Std. Error Mean	1.064	0.903
Minimum	40.00	80.00
Maximum	62.00	96.00

Based on the table above, the mean pretest score prior to the intervention was 50.56, whereas the mean posttest score following the use of the discovery learning model supported by ROPUT (Angle Spinning Wheel) media rose to 88.04. The mean difference of 37.48 points indicates a significant improvement in the critical thinking skills of Class VB students following the intervention. Furthermore, the standard deviation values were 5.528 for the pretest and 4.694 for the posttest; this implies that the level of data variation among students was

relatively balanced and consistent, thereby allowing the paired t-test to be conducted effectively.

Prior to conducting parametric inferential hypothesis testing, a normality test utilizing the Kolmogorov-Smirnov procedure via SPSS 25.0 was executed on both pretest and posttest datasets. The results are presented in Table 5:

Table 5. Normality Test Results (Kolmogoorv-Smirnov)

	Class	Posttest Score			Discription
		Statistic	df	sig	
Students' Critical Thinking Skills	Class VB Pretest	0,85	27	0,200	Normality
	Class VB Posttest	0,137	27	0,200	Normality

Based on the Kolmogorov-Smirnov test results in the table above, a significance value (Sig.) of 0.200 > 0.05 was obtained for all data, covering both the pretest and posttest results. This indicates that the entire dataset follows a normal distribution. The normality test results demonstrate that the critical thinking ability data for Class VB students both before (pretest) and after (posttest) the intervention are normally distributed. Consequently, the research data meet one of the prerequisites for parametric statistical analysis, allowing the study to proceed to subsequent testing stages, such as hypothesis testing using the paired sample t-test and the N-gain score test.

Hypothesis Test Results

Paired Samples T-Test

The paired samples t-test is used to determine the average difference between two paired datasets, such as the pretest and posttest scores of the same group. This test aims to see whether there is a significant change after a treatment is given. The paired samples t-test analysis can be performed using SPSS version 25.0, with the following decision making criteria: (1) If the significance value (Sig. 2-tailed) < 0.05, then H_0 is rejected and H_1 is accepted. This means there is a significant difference between the scores before and after treatment, indicating that the discovery learning model assisted by the ROPUT (Angle Spinning Wheel)

media affects students' critical thinking skills. (2) If the significance value (Sig. 2-tailed) > 0.05, then H_0 is accepted and H_1 is rejected. This means there is no significant difference between the scores before and after treatment, indicating that the discovery learning model assisted by the ROPUT (Angle Spinning Wheel) media does not affect students' critical thinking skills. The results are presented in Table 6:

Table 6. Paired Samples T-Test

Paired Samples Test									
		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Score	Pretest-Posttest	37.481	4.870	.937	-39.408	-35.555	-39.988	26	.000

Based on the Paired Samples T-Test test table above, the significance value (Sig. 2-tailed) = 0.000 < 0.05 and the calculated t value = -38.100 (or in absolute terms t = 38.100 > t table) is obtained. This shows that there is a significant difference between the critical thinking abilities of VB class students before and after being given treatment. Based on the results of the Paired Samples T-Test, the conclusion was obtained that H_1 was rejected and H_0 was accepted. This means that the application of the discovery learning learning model assisted by ROPUT (Angle Spinning Wheel) media makes a significant difference in improving the critical thinking abilities of class VB students at SDN Kalongan 02.

N-Gain Score Test

This research also aims to determine the effectiveness of applying the discovery learning model assisted by the ROPUT (Angle Spinning Wheel) media in improving the critical thinking skills of grade VB students at SDN Kalongan 02. Effectiveness analysis was conducted using the N-Gain Score test via SPSS. Before conducting the N-Gain Score test, the data met prerequisite normality tests showing that the students' critical thinking skills data for both pretest and posttest scores

were normally distributed, thus fulfilling parametric analysis requirements. The results are presented in Table 7:

Table 7. N-Gain Score Test

Descriptive Statistics					
	N	**Minimum**	**Maximum**	**Mean**	**Std. Deviation**
N-Gain Score	25	.58	.88	.7612	.08237
N-Gain Persen	25	57.69	88.00	76.1194	8.23689

Based on the N-Gain Score test table above, the mean value for the N-Gain Score is 0.7612 with a minimum value of 0.58 and a maximum value of 0.88. Meanwhile, for the N-Gain percentage, the average is 76.1194% (or rounded to 76.12%) with a value range between 57.69% and 88.00%.According to the N-Gain Score categorization, the average N-Gain Score of 0.7612 falls into the High category ($g > 0.7$). In addition, the N-Gain percentage of 76.12% indicates that the implementation of the discovery learning model assisted by the ROPUT (Angle Spinning Wheel) media falls into the Effective category (percentage > 76%) in improving the critical thinking skills of grade VB students at SDN Kalongan 02. A standard deviation of 8.23% also shows that the distribution of learning outcome improvements among students tends to be evenly spread.

To further reinforce the results of the aforementioned tests, supplementary evaluations comprising Ennis in 'Aini et al. (2024) indicators, a student critical thinking skills questionnaire, student worksheets, Learning Implementation Observation Sheet, and a student response questionnaire were also administered, as presented in Table 8.

This section presents an in-depth interpretation of the empirical findings obtained from the quantitative analysis conducted on the grade VB students at SDN Kalongan 02. The research specifically investigated the influence and pedagogical effectiveness of implementing the discovery learning model assisted by ROPUT (Angle Spinning Wheel) media on students' mathematical critical thinking skills. The statistical results provide robust, empirical answers to the research objectives, confirming both the statistical significance and practical educational impact of the treatment. Based on the Paired Samples T-Test table above, the significance value

(Sig. 2-tailed) is 0.000 (< 0.05) and the calculated t-value (t-count) is -38.100 (or, in absolute terms, t-count = 38.100 > t-table). This indicates a significant difference in the critical thinking skills of Grade VB students before and after the intervention; consequently, the null hypothesis (H_0) is rejected and the alternative hypothesis (H_1) is accepted.

Table 8. Support For Learning and Indicator Evaluation

No	Evaluation Parameter	Score/Percentage	Category/Description
1.	Student critical thinking skills questionnaire:		
	- Focus (Identifying the main problem or key information regarding the issue)	84.20%	Very High
	- Reason (Providing logical reasons for differences or decisions made)	84.20%	Very High
	- Inference (Make appropriate conclusions based on existing facts/characteristics)	87.50%	Very High
	- Sittuation (Applying conceptual knowledge to real-world situations or problems)	90.12%	Very High (Highest Score)
	- Clarity (Explaining terms or providing examples using clear sentences)	83.90%	High
	- Overview (Reviewing the process and results to ensure accuracy)	85.50%	Very High
2.	Student Activity Worksheets	85.58%	Very Good
3.	Learning Implementation Observation Sheet	92.02%	Very Good
4.	Student Response Questionnaires	89.81%	Very Good

These findings align with Kusumawati & Suriswo (2026), who state that Discovery Learning is proven effective in improving elementary school students' critical thinking compared to conventional learning. This is reinforced by Diana & Anugraheni (2022), who demonstrated its significant effectiveness in facilitating critical thinking in mathematics. Moreover, the integration of learning media within the learning syntaxes yields a positive impact, as shown by Devina et al. (2025), who found that combining Discovery Learning with concrete media significantly influences students' critical thinking attainment. Supported also by Waruwu & Rizqi (2026), the use of physical media proves capable of optimizing mathematical conceptual understanding through direct exploration and practice. Overall, Based

on this analysis, the first research question is answered empirically: there is a difference in students' critical thinking skills associated with the use of the Discovery Learning model assisted by ROPUT (Angle Spinning Wheel) media in Grade VB at SDN Kalongan 02.

Furthermore, the N-Gain Score analysis reinforces this claim. Based on the N-Gain Score test table above, the mean N-Gain Score was 0.7612, with a minimum value of 0.58 and a maximum of 0.88. Meanwhile, the mean N-Gain percentage was 76.1194% (rounded to 76.12%), with a range of 57.69% to 88.00%. According to the N-Gain Score categorization, the mean score of 0.7612 falls into the "High" category ($g > 0.7$), and the N-Gain percentage of 76.12% indicates that the implementation of the Discovery Learning model assisted by ROPUT media falls into the "Effective" category. The standard deviation of 8.23% also indicates that the distribution of improvements in learning outcomes among students was relatively uniform. Based on these N-Gain score achievements and effectiveness categories, the answer to the second research question is validly substantiated: the implementation of the Discovery Learning model assisted by ROPUT (Angle Spinning Wheel) media is effective in enhancing the critical thinking skills of Grade VB students at SDN Kalongan 02.

These findings align with Diana & Anugraheni (2022), who demonstrated that the implementation of the Discovery Learning model has a significant positive correlation with the improvement of critical thinking skills among elementary school students in mathematics. This is further supported by research from Ardita et al. (2023), which indicates that Discovery Learning when supplemented with concrete media effectively enhances both active participation and students' critical thinking skills. Furthermore, Waruwu & Rizqi (2026) confirm that the use of concrete, physical media within the Discovery Learning model can optimize conceptual understanding by transforming abstract mathematical principles into tangible experiences that involve hands on practice.

The success of this intervention underscores the importance of innovating in elementary school mathematics classrooms through the use of contextual, interactive media. Validity and reliability tests processed using SPSS 25.0 confirm

that the data collection instruments met rigorous scientific standards. Consequently, the implementation of the discovery learning model combined with ROPUT (Angle Spinning Wheel) media proves highly reliable for enhancing the quality of both the learning process and student outcomes in Class VB at SDN Kalongan 02.

CONCLUSION

This study examines the relationship between the implementation of the discovery learning model supported by ROPUT (Angle Spinning Wheel) media and the critical thinking skills of Grade VB students at SDN Kalongan 02, based on empirical quantitative analysis. Research findings reveal a statistically significant difference in students' analytical performance following the intervention, confirming variations in critical thinking abilities resulting from the use of the ROPUT (Angle Spinning Wheel) assisted discovery learning model in this specific classroom. Furthermore, N-Gain score analysis demonstrates the effectiveness of this model in enhancing the critical thinking skills of Grade V students at SDN Kalongan 02. These results indicate that tangible, interactive instructional aids, combined with the structured syntax of discovery learning, can successfully support cognitive development and conceptual mastery in elementary level mathematics.

Suggestions and Recommendations In light of these limitations, future research should aim to broaden the scope of investigation by implementing the ROPUT (Angle Spinning Wheel) assisted discovery learning model across multiple schools, utilizing larger sample sizes, or addressing different mathematical topics to enhance external validity and the broader applicability of the findings. Furthermore, qualitative approaches such as interviews, teacher evaluations, or classroom observations can be employed to gain deeper insights into students' cognitive strategies and indicators of critical thinking. Expanding the research to evaluate the long term retention of critical thinking skills fostered by active learning models utilizing manipulatives over an extended academic period would also strengthen future pedagogical insights in primary school mathematics education.

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