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The Influence of Discovery Learning on Mathematics Learning Motivation in Elementary Schools

Sesmita Oktaria[1], Siti Quratul Ain[1]

[1] Islamic University of Riau, Pekanbaru, Indonesia
sesmitaoktaria@student.uiri.ac.id, quratulain@edu.uir.ac.id
corresponding author: *sesmitaoktaria@student.uiri.ac.id*

ABSTRACT

This study aims to analyze the effect of the Discovery Learning approach on students' motivation in learning mathematics. The research employed a quantitative pre-experimental method with a one-group pretest–posttest design. The subjects were 30 third-grade students selected through purposive sampling. The instrument used was a motivation questionnaire, consisting of 15 items tested for validity and reliability, all of which met the required standards (Cronbach's Alpha = 0.853). Data analysis included normality, linearity, and paired sample t-tests. The findings show that students' average motivation score increased by 20.433 points, with a significance value of 0.000 ($p < 0.05$). These results indicate that Discovery Learning has a significant and positive effect on students' mathematics learning motivation.

Keywords*: *discovery learning, learning motivation, mathematics, elementary students

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INTRODUCTION

Education can be understood as a series of systematic efforts designed to shape and develop individual capabilities, encompassing cognitive, affective, and psychomotor domains, whose application is not limited to formal institutions and extends throughout life. Referring to Ahdar (2021:53), education is a form of social engineering implemented by society and the state authorities to instill values while equipping the younger generation with competencies that enable them to adapt and actively participate in the dynamics of ever-changing life. This process transcends classroom boundaries, encompassing nonformal and informal educational interactions, thereby positioning education as a transformative mechanism through continuous learning experiences.

The success of education is strongly supported by the individual's internal drive. Alfitry (2020:17) explains motivation as a psychological dynamic in the form of energy changes within a person, triggered by emotions and directed toward achieving specific goals. This psychological drive is reflected in tangible actions, including motor activities, indicating an intention to realize particular objectives. Similarly, Evayani (2020:392) emphasizes that learning motivation is an intrinsic impulse that encourages students to consistently engage in the learning process to meet academic expectations. Thus, learning motivation can be understood as an internal energy derived from students' self-belief in their capacity, influencing their perseverance and consistency in facing learning challenges, particularly in mathematics.

Mathematics, as a fundamental branch of the exact sciences, holds a significant position in the elementary school curriculum. However, its abstract and complex nature often becomes a barrier for elementary students whose cognitive abilities are still developing. Various studies have revealed that students frequently perceive mathematics as a difficult and unappealing subject, partly due to traditional teaching methods dominated by teacher monologues that position students as passive recipients. In this context, learning motivation becomes a determining factor in students' readiness to face academic challenges, ranging

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from problem-solving, conceptual understanding, to the development of mental resilience in the learning process (Annawa, 2024:133).

In response to these identified problems, pedagogical strategies that place students as the main actors in the learning process have gained increasing attention. One of the prominent approaches is the Discovery Learning method, where teachers act as facilitators, while learners are encouraged to actively construct knowledge through empirical experiences. This approach not only activates the cognitive and affective dimensions but also stimulates critical thinking, as students are provided the opportunity to explore, reason, and discover mathematical principles on their own. Conceptually, Discovery Learning contributes to building deep understanding, enhancing flexibility in problem-solving strategies, and strengthening long-term retention of information (Amrillah et al., 2024:618).

Findings from interviews with third-grade teachers at SDN 001 Muara Lembu, Singingi District, Kuantan Singingi Regency, revealed that mathematics instruction has not yet reached an optimal level and remains below the Minimum Mastery Criterion (KKM) of 75. One of the dominant factors hindering achievement is students' low learning motivation. This is reflected in limited enthusiasm, low confidence in solving problems, and a passive tendency to rely on academically stronger peers. Student discipline has also become a concern, as evidenced by habits such as leaving the classroom during lessons or copying tasks without authentic understanding. To address these challenges, teachers have attempted to apply progressive teaching methods, including Discovery Learning, aimed at fostering active participation and conceptual understanding through structured exploration.

Low academic achievement is also linked to students' negative affect toward mathematics. Many consider it uninteresting and burdensome, which diminishes their interest and motivation to engage. In the learning process, interest, attention, and motivation form a trinity that drives cognitive activity. When these three elements weaken, learning effectiveness declines, triggering internal psychological resistance that causes students to avoid participation. Forced involvement under such conditions instead creates a learning atmosphere of boredom and reluctance.

Therefore, the need for teaching methods that can genuinely activate student engagement becomes crucial. Kusuma & Yudiono (2024:418) emphasize that the appropriate choice of pedagogical strategies significantly affects the quality of understanding and learning outcomes. Interactive and engaging methods are believed to maximize student participation. In this regard, Discovery Learning deserves attention because it creates student-centered learning spaces and provides meaningful learning experiences when applied effectively. Amrillah et al. (2024:619) further add that applicable teaching methods and media can shape a dynamic and transformative learning atmosphere. Discovery Learning facilitates students' involvement in concept discovery independently through direct interaction, thereby strengthening memory retention and authentic learning experiences. Its stages include initial stimulation, problem identification, data collection, verification, and the formulation of generalizations.

In addition, previous studies have shown that the selection of appropriate learning methods can significantly influence students' outcomes and motivation. Putra (2022:905) emphasized that the application of discussion methods can improve learning outcomes by encouraging students to actively exchange ideas, express opinions, and practice critical thinking in problem-solving. Similarly, Sragih, Sitepu, & Silaban (2022:1295) explained that the Experiential Learning model has a positive effect on elementary students' learning outcomes because it provides opportunities for direct experience and reflection. In the context of technology-based learning, Fadhilah, Ardianti, & Kuryanto (2021:1659) found that the use of Zoom in e-learning proved effective in increasing elementary school students' learning interest.

Previous studies on Discovery Learning have mostly highlighted its impact on cognitive outcomes such as problem-solving skills, conceptual mastery, or academic achievement in mathematics. However, relatively fewer studies have examined its influence specifically on learning motivation at the elementary school level, especially in lower grades where students' affective engagement plays a central role in shaping learning behaviors. Furthermore, most existing research has been conducted in broader contexts, without

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focusing on the concrete challenges faced in classrooms where motivation is low, discipline issues persist, and reliance on peers weakens independent learning. This study therefore seeks to fill that gap by investigating how Discovery Learning can directly affect the mathematics learning motivation of third-grade students. However, there are studies that focus more on discussion methods, experiential learning, and the use of technology, while research specifically addressing the influence of Discovery Learning on mathematics learning motivation in elementary schools, particularly in lower grades, remains limited. This study seeks to fill that gap by examining the impact of Discovery Learning on the learning motivation of third-grade students.

The urgency of this research lies in the need to evaluate the effect of the Discovery Learning method on students' motivation in learning mathematics. The objective of the study is to determine whether the application of Discovery Learning exerts a significant impact on the learning motivation of third-grade students at SDN 001 Singingi.

LITERATURE REVIEW

a. Discovery Learning Method

The application of the Discovery Learning method in the educational domain does not merely function as a conventional instructional tool but serves as a strategic medium that emphasizes the intensification of students' cognitive engagement and the cultivation of deeper critical thinking capacity. Hidayat et al. (2022:212) affirm that Discovery Learning is a pedagogical approach designed to stimulate proactive learning activities, in which learners independently explore and investigate the subject matter so that the resulting understanding becomes more sustainable and firmly embedded in long-term memory. This process originates from learners' authentic experiences, which are then processed reflectively through dynamic interaction with a problem-oriented learning environment.

In line with this, Alfitry et al. (2020:76) state that discovery-based learning aims to facilitate students in uncovering the characteristics, meanings, and fundamental principles of a concept through the mental constructions they build themselves. Within this framework, learners are no longer passive objects who merely receive information but rather active subjects who independently organize, analyze, categorize, and conclude information from empirical interactions with their surrounding environment.

Istidah et al. (2022:35) further emphasize that Discovery Learning stimulates the emergence of reflective questions from students while guiding them to formulate generalizations based on concrete and practical experiences. Referring to Bruner's perspective, discovery learning requires students' involvement in constructing the cognitive structure of the subject matter in a holistic way, rather than merely receiving the teacher's final presentation. In this context, the teacher transforms into a facilitator who designs open and challenging scenarios, where students are granted autonomy to explore, discover, and construct meaning independently, with problem-solving approaches serving as the core technique.

Summarizing these perspectives, Discovery Learning can be concluded as a constructivist paradigm that emphasizes learners' active engagement in exploration and meaning-making. This process not only activates the cognitive domain but also nurtures affective and metacognitive dimensions. Teachers act as architects of learning who facilitate understanding through observation, experimentation, reflective dialogue, and independent inference. The ultimate goal of this method is to reconstruct students' understanding in depth, strengthen the retention of information, and foster learners' autonomy, reflectiveness, and responsibility for their own learning process. Hence, learning through Discovery Learning is transformative rather than merely informative, while simultaneously supporting the holistic development of 21st-century competencies.

b. Learning Motivation

Learning motivation can be understood as a psychological energy that functions as a trigger, director, and driver of an individual's learning activities, originating from internal impulses (intrinsic factors) as well as being influenced by the external environment (extrinsic factors). According to Saefullah (2023:13058),

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learning motivation is a fundamental drive that not only initiates learning activities but also sustains the continuity of the process while guiding learning behavior toward achieving predetermined goals. The manifestation of learning motivation can be identified through behavioral indicators such as persistence in completing tasks, resilience in overcoming obstacles, explicit interest in the learning material, the tendency to work independently, fatigue with repetitive tasks, consistency in maintaining arguments, steadfastness in upholding beliefs, and the ability to recognize and solve problems.

On the other hand, Setiawan (2022:167) defines learning achievement as an outcome that reflects the psychological transformation of students as a result of their engagement in the educational process, encompassing the cognitive, affective, and psychomotor domains. The measurement of this achievement highlights key indicators such as intellectual creativity (cognitive), emotional expression toward the learning process (affective), and intention as well as skills in applying actions (psychomotor).

From these explanations, it can be synthesized that learning motivation serves as an essential foundation in supporting students' academic success. When both internal and external drives weaken, students' engagement in the learning process tends to decline, leading to lower academic achievement. Therefore, teachers are required not only to act as facilitators of subject matter but also as motivators who create a conducive learning environment, stimulate curiosity, and facilitate the exploration of students' potential so that learning achievements can be optimally realized across all dimensions of individual development.

c. Characteristics

Every individual is born with a set of inherent traits and attributes, which are further enriched through interaction with the surrounding environment. According to Mutia (2021:118), innate characteristics refer to inherent qualities present from birth, encompassing both biological and socio-psychological domains. Traits associated with biological aspects tend to display relative stability, whereas socio-psychological dimensions are more flexible and subject to change in accordance with external environmental influences.

In line with this, Ahdar (2021:135) emphasizes the urgency for teachers to understand the characteristics of elementary school students as a fundamental basis for adapting teaching strategies. Teachers who are able to examine the unique characteristics of each student are better prepared to design instructional approaches that align with individual needs. Moreover, a deep recognition of students' learning needs becomes a vital component in ensuring the effectiveness of the educational process.

From this perspective, individual characteristics, particularly in elementary school students, can be classified into two main domains: innate characteristics and those shaped by environmental interaction. Innate characteristics function as relatively fixed modalities, particularly related to biological aspects, while socio-psychological characteristics are dynamic, influenced by interactions with family, school, and the social community. A holistic understanding of these two dimensions is a prerequisite for educators to design adaptive pedagogical methods, create a conducive, inclusive, and enjoyable classroom atmosphere, and respect the individual differences that exist among learners.

METHOD

a. Research Methods

This study employed a quantitative approach with a pre-experimental design of the One Group Pretest–Posttest type, as described by Sugiyono (2021:117). This design was chosen because field conditions did not allow the formation of a control group.

b. Research Procedures

The research procedure began with the administration of a pretest as a baseline measure of students' mathematics learning motivation. The intervention was then carried out by applying the Discovery Learning method in several learning sessions, followed by a posttest to measure changes in students' motivation.

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c. Population and Samples

The research was conducted at SDN 001 Singingi, with a population consisting of grade III A students. A total of 30 students were selected as the sample through purposive sampling, considering the class's readiness and the availability of the learning schedule.

d. Research Instruments

The primary instrument used was a closed-ended questionnaire on mathematics learning motivation. The instrument was tested for validity using Pearson's Product-Moment correlation and for reliability using Cronbach's Alpha. Both tests were processed with SPSS software to ensure the accuracy of measurement.

e. Data Collection Techniques

Data were collected through:

1. Questionnaires to measure students' learning motivation before and after the intervention.
2. Documentation to support the findings, including participant numbers, learning schedules, and other relevant records.

f. Data Analysis Techniques

The collected data were analyzed using classical assumption tests, including normality and linearity tests, to verify that the data met statistical requirements. Afterward, a paired sample t-test was conducted to assess the significance of differences between pretest and posttest results.

RESULTS AND DISCUSSION

1. Instrument Testing

In this study, the researcher conducted instrument validity testing using SPSS version 25. An instrument is considered valid if it can accurately and reliably capture data to measure the intended variable. The validity of the questionnaire, which assessed the application of the Discovery Learning method to enhance students' motivation in learning mathematics, was tested by comparing the calculated *r* value (*r* count) from 30 respondents with the critical value (*r* table). The testing was carried out using Pearson's correlation, supported by additional analysis with SPSS 25. Referring to the *r* table at a 5% significance level, the critical *r* value was set at 0.361. An item was categorized as valid if its *r* count exceeded the *r* table; conversely, items with lower values were considered invalid. The results showed that all 15 questionnaire items had *r* count values greater than the *r* table, meaning that none of the items failed to meet the validity criteria. Thus, the questionnaire regarding the application of the Discovery Learning method to foster students' motivation in mathematics learning can be categorized as valid and ready to be applied as a reliable research instrument.

Table 1. Results of Validity Testing

Item No.	r count	r table	Decision	Interpretation
1	0.397	0.361	Valid	High
2	0.607	0.361	Valid	High
3	0.390	0.361	Valid	High
4	0.610	0.361	Valid	High
5	0.560	0.361	Valid	High
6	0.589	0.361	Valid	High
7	0.690	0.361	Valid	High
8	0.507	0.361	Valid	High
9	0.500	0.361	Valid	High
10	0.704	0.361	Valid	High
11	0.578	0.361	Valid	High
12	0.361	0.361	Valid	High

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13	0.783	0.361	Valid	High
14	0.427	0.361	Valid	High
15	0.750	0.361	Valid	High

Source: Researcher's Processed Data, 2025

To further ensure the consistency and reliability of the research instrument, a reliability analysis was conducted using Cronbach's Alpha. The results of the reliability testing are presented in the following table.

Table 2. Results of Reliability Testing

Reliability Statics		Remark
Cronbach's Alpha	N Item	
0.853	15	Reliable / Good

Source: Researcher's Processed Data, 2025

The reliability analysis showed that the Cronbach's Alpha coefficient reached 0.853 for all 15 items. This indicates that the student learning motivation questionnaire has a high level of internal consistency and can be considered reliable. Referring to the interpretation guidelines of Cronbach's Alpha, instruments with coefficients above 0.70 are categorized as reliable. Therefore, this instrument is deemed appropriate to accurately measure the research variables.

2. Assumption Testing

In this study, a total of 15 statements met the validity and reliability criteria to measure students' mathematics learning motivation. The questionnaire was administered to 30 third-grade students of SDN 001 Singingi as the research sample. Prior to conducting further analysis, assumption testing was performed through a normality test to ensure that the distribution of the pretest and posttest data followed a normal pattern. Since the sample size was fewer than 50 respondents, the Shapiro-Wilk test was selected, as it provides greater accuracy for small samples. The decision rule for this test relies on the significance (Sig.) value: if Sig. > 0.05, the data are considered normally distributed, while Sig. < 0.05 indicates that the data deviate from normality.

Table 3. Normality Test Results

Tests of Normality			
	Statistic	df	Sig.
Pretest	.946	30	.135
Posttest	.948	30	.145

Source: Processed Research Data, 2025

The results of the normality test using the Shapiro-Wilk procedure showed that the significance value for the pretest data was 0.135, while the posttest data reached 0.145. Both values exceeded the threshold of 0.05, indicating that the data were normally distributed. In other words, the dataset met the normality assumption and was suitable for further analysis using parametric statistical procedures.

3. Linearity Test

To examine whether there was a linear correlation between students' pretest and posttest scores after the implementation of the Discovery Learning method, a linearity test based on ANOVA (Analysis of Variance) was conducted. This test aimed to ensure that the relationship between variables met the assumption of linearity, thereby justifying the use of regression analysis or other parametric tests.

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Table 4. Linearity Test Results

ANOVA Table

				Sum of Squares	df	Mean Square	F	Sig.
Posttest * Pretest	Between Groups	(Combined)		407.292	8	50.911	1.481	.223
		Linearity		27.256	1	27.256	.793	.383
		Deviation from Linearity		380.036	7	54.291	1.579	.196
	Within Groups			722.075	21	34.385		
	Total			1129.367	29			

Source: Processed Research Data, 2025

Referring to the results presented in Table 4, the significance value was 0.383 for the Linearity row and 0.196 for the Deviation from Linearity row. Since both values exceeded the threshold of 0.05, it can be interpreted that the relationship between the pretest and posttest scores was linear, with no indication of deviation from linearity. This finding indicates that the regression model applied in this study satisfies the basic assumption of linearity and is therefore appropriate for analyzing the effect of the Discovery Learning method on the mathematics learning motivation of third-grade students at SDN 001 Singingi.

4. Hypothesis Testing

To examine whether the Discovery Learning method had a significant effect on students' mathematics learning motivation, a Paired Sample t-Test was applied. This method was chosen because the data under examination consisted of paired scores, namely the pretest and posttest results from the same 30 students.

Table 5. t-Test Results

Paired Samples Test

		Paired Differences							
					95% Confidence Interval of the Difference				
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper	t	df	Sig. (2-tailed)
Pair 1	Pretest - Posttest	-20.433	6.383	1.165	-22.817	-18.050	-17.535	29	.000

Source: Processed Research Data, 2025

Referring to the results in Table 5, the Sig. (2-tailed) value was 0.000, which is smaller than the threshold of 0.05. Therefore, the null hypothesis (H_0) is rejected, and the alternative hypothesis (H_1) is accepted. This finding indicates that the implementation of the Discovery Learning method had a significant effect on students' mathematics learning motivation. The average posttest score increased by 20.433 points compared to the pretest. The calculated t-value was -17.535 with 29 degrees of freedom. Since the absolute value of the t-statistic greatly exceeded the critical t-table value of ±2.045 at the 5% significance level, it can be concluded that the observed difference was statistically highly significant. These results confirm that the

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Discovery Learning method effectively enhanced mathematics learning motivation among third-grade students at SDN 001 Singingi.

Discussion

The findings of this study confirm that the implementation of the Discovery Learning method had a tangible effect on enhancing the mathematics learning motivation of third-grade students at SDN 001 Singingi. Empirical evidence was obtained through a series of instrument tests, assumption tests, and hypothesis testing, which highlighted a significant difference between pretest and posttest scores after the intervention.

The instrument used to measure learning motivation underwent validity testing using Pearson Correlation, showing that all 15 questionnaire items met the validity criteria since the calculated r-values exceeded the r-table value of 0.361. The reliability test yielded a Cronbach's Alpha of 0.853, indicating a high level of internal consistency. This aligns with Alfitry et al. (2020:45), who state that valid and reliable instruments form the foundation of accurate and credible research data. Similarly, Oktafrizal et al. (2025:172) emphasized that reliable instruments are essential to objectively reflect student motivation, while Nazipurahman (2025:88) affirmed that validity and reliability are crucial when assessing the relationship between learning models and student motivation.

The pretest and posttest data were subjected to a normality test using the Shapiro-Wilk method, with results of Pretest = 0.135 and Posttest = 0.145. Since both values exceeded 0.05, the data were considered normally distributed and suitable for parametric analysis. The ANOVA linearity test revealed a significance value of 0.383 for Linearity and 0.196 for Deviation from Linearity, both greater than 0.05, indicating a linear relationship between pretest and posttest scores. These findings support the argument of Kusuma & Yudiono (2024:420) that Discovery Learning fosters a linear relationship between learning inputs and outputs due to students' active involvement in discovering concepts. Dewi (2025:69) also highlighted the consistency between initial conceptual understanding and final learning outcomes through this method, while Gaol et al. (2025:137) pointed out that established linearity reflects the effectiveness of the step-by-step guided discovery process.

Hypothesis testing using a Paired Sample t-Test showed a Sig. (2-tailed) value of 0.000, with an average posttest score increase of 20.433 points. The calculated t-value was -17.535 with 29 degrees of freedom, which far exceeded the critical t-table value of ±2.045 at the 5% significance level, confirming a statistically significant difference. These results are consistent with Fiska et al. (2025:270), who reported significant improvements in student motivation and learning outcomes through Discovery Learning compared to conventional methods. Setiawan et al. (2025:1618) further emphasized that the method encourages students to become more active in conceptual understanding, while Rahmiyati et al. (2025:233) affirmed its effectiveness in enhancing elementary school students' interest and achievement. Collectively, the results suggest that Discovery Learning not only improves motivation but also fosters a more dynamic, reflective, and sustainable learning experience.

Discovery Learning provides a learning environment in which students are given opportunities to actively observe phenomena, categorize information, connect concepts, and formulate conclusions independently. This process results in more meaningful learning experiences, thereby boosting intrinsic motivation. Irmawanti et al. (2025) argued that through independent exploration, students transform into subjects of discovery, which increases ownership of the learning process and strengthens motivation. Rahmawati (2025:37) added that integrating multimedia into Discovery Learning enhances critical thinking skills as students directly engage in uncovering principles. In her meta-analysis, Rasti (2025:54) found that this method significantly improved mathematics learning outcomes in elementary schools by stimulating intense cognitive engagement. Similarly, Widnyana (2025:62) highlighted that interactive multimedia-based Discovery Learning creates an enjoyable learning atmosphere that promotes independent exploration.

Amrillah et al. (2024:620) stressed that Discovery Learning builds students' self-confidence by positioning them as discoverers rather than mere recipients of information, thus creating satisfaction and pride

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in personal achievement. This was reflected in the significant posttest score improvements observed in this study. Silaban and Nasution (2025:385) also demonstrated that this model trains students to explore concepts independently, resulting in improved learning outcomes. Kamba, Hasan, and Akolo (2025:409) highlighted that the use of digital teaching materials based on Flipbooks made learning more interactive and deepened conceptual understanding. Meanwhile, Lumbantobing et al. (2025:104) found that integrating Wordwall media into Discovery Learning boosted motivation and contributed positively to the mastery of conceptual materials such as reaction rates.

Annawa et al. (2024:135) affirmed that Discovery Learning not only enhances academic performance but also stimulates critical thinking, as students are required to think logically and analytically when solving learning problems. Saputri and Hermawan (2025:150) highlighted that the use of animated videos in this method clarifies abstract concepts and significantly increases learning interest. Mugni and Amelia (2025:86) further added that PowerPoint media within Discovery Learning facilitates mathematical connections across concepts through systematic visualization.

When Discovery Learning is combined with other strategies, such as outdoor learning (Evyani, 2020), the outcomes still demonstrate a significant increase in learning motivation. This underscores that the essence of Discovery Learning—active participation and independent discovery—remains the key factor in fostering student motivation. Similar findings were reported by Sabrina et al. (2025:375), who showed improved science learning outcomes through critical and exploratory thinking approaches. Ramadani (2025:487) also demonstrated that combining Discovery Learning with Buzz Group techniques created a collaborative and active learning atmosphere, positively impacting students' mathematics learning outcomes.

Overall, the findings of this study indicate that the application of Discovery Learning has a significant effect on enhancing mathematics learning motivation among third-grade students at SDN 001 Singingi. Empirical evidence is seen in the statistically significant differences between pretest and posttest scores, alongside a notable increase in average scores after the intervention. Therefore, this approach can be considered an effective alternative pedagogical strategy for stimulating engagement and motivation in elementary school students.

CONCLUSIONS AND RECOMMENDATION

Based on the data analysis and hypothesis testing conducted, it can be concluded that the Discovery Learning method has a significant effect on enhancing students' motivation in learning mathematics. This finding is confirmed through the Paired Sample t-Test, which produced a significance value of 0.000 ($p < 0.05$), indicating a meaningful difference between pretest and posttest scores. The increase in posttest scores demonstrates that the application of this method successfully stimulated students' active engagement, encouraged more intensive participation, and strengthened their internal drive to learn. In other words, the discovery-based learning strategy has been proven to create a richer and more engaging learning experience, motivating students to explore concepts independently as well as collaboratively within groups.

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