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Abstract

This study aimed to determine the effect of differentiated learning models on the learning outcomes of fifth-grade students in mathematics at elementary schools in the 2023/2024 academic year. The study was conducted on fifth-grade students with a population of 21 students as one sample. The sampling technique used in this study was saturated sampling, where all populations were used as one sample. This study was an experimental study with a pre-experimental design, specifically a one-group pretest-posttest design. The pretest was used to measure students' initial abilities, while the posttest was conducted to measure the learning outcomes of fifth-grade students after carrying out treatment or action. Hypothesis testing in this study used the Paired Sample t-test, which was preceded by a validity test, reliability test, and normality test. The results of this study were seen from the hypothesis test carried out using the Sample Paired t-test technique, which obtained a significant value of 0.000. This means $0.000 < 0.05$, so H_1 was accepted. It can be concluded that there was an influence of the differentiated learning model on the learning outcomes of fifth-grade students in mathematics.

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1. Introduction

Knowledgeable, and competent individuals to help others grow and reach maturity (Darling-Hammond et al., 2020). The goal is for the learners to acquire the skills needed to manage their lives independently (Husamah et al., 2019). Mathematics is a universal language that reflects the logic and patterns around us (Kashyap, 2021). Mathematical intelligence is the ability to understand, use, and describe mathematical concepts in various situations of everyday life (Prastika, 2021; Kobandaha et al., 2019). Mathematical intelligence involves in-depth learning, developing critical skills, and instilling a strong interest in this subject (Ferdiansyah, 2023; Chasanah, 2021). Efforts to improve the quality of education depend largely on the quality of teachers in the teaching and learning process, so a system is needed that is by the demands of the times. However, many consider that teaching is still an art that depends heavily on the talent and personality of the teacher. This means that each educational institution is required to further improve the quality and quality of educational institutions (Julhadi 2020).

Mathematics is a compulsory subject to be given to all students starting from elementary school to equip students with the ability to think logically, analytically, systematically, critically, and creatively as well as the ability to work together (Kenedi et al., 2019; Ayal et al., 2019; Sarwanto et al., 2019)). These abilities are needed so that students can have the ability to obtain, manage, and utilize information to survive in conditions that are always changing, uncertain, and competitive. The characteristic of the

abstractness of mathematics is its non-simplicity which makes mathematics not easy to learn, and in the end many students are not interested in it. According to Adams in (Suwardi, 2014) that the method and approach in learning mathematics is greatly influenced by the teacher's view of mathematics and students in learning. Based on the results of observations and direct interviews with the homeroom teacher of grade V at SD Negeri 1 Rempek, the problem found is that students have difficulty understanding the materials in mathematics learning, especially for students who have fairly low thinking skills so they often lag behind students who have middle to high thinking skills, students are also seen as being busy when the teacher explains the learning material, there are still many students who are not able to solve math problems so that when they work on problems they often wonder how to solve them. This can be reviewed with the assumption of the students themselves who think that mathematics is difficult to understand, boring, and complicated. As a result, when they get the task of completing a math test, many students do not achieve the maximum score.

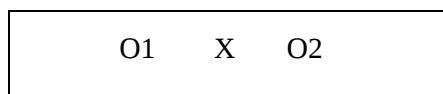
Kusuma & Luthfah (Ambarita, 2023) state that differentiated learning is a decision that can be accepted by reason (commonsense) made by teachers who are oriented towards student needs. When teachers respond to students' learning needs, it means that teachers differentiate learning by adding and adjusting time to obtain learning outcomes. The differentiated learning model is a learning model used to meet students' learning needs where teachers facilitate students according to their respective needs because each student has different characteristics so they cannot be given the same treatment (Marlina et al., 2023; Dapa., 2020). In the differentiated learning model, three types of model forms can be applied by teachers according to the needs of their students, where there are three important elements in the model, namely the differentiated content, process, and product models. Differentiated content is related to the learning material delivered by the teacher, the process is how students get information or how they learn, then the product is evidence of what they have learned and understood. One of the learning models that suits students' needs in learning is the differentiated learning model, this model will be able to stimulate students to study harder so that low understanding in receiving learning materials in mathematics lessons will increase. Therefore, the research questions in this study are as follows: Is there an influence of the differentiated learning model on the learning outcomes of fifth-grade students in Mathematics at Rempek 1 Elementary School?

2. Method

The research method used in this study was quantitative research. Quantitative research involves collecting data in the form of quantitative data or other types of data that can be quantified and processed using statistical techniques (Yusuf, 2017). The type of quantitative research used in this study was an experiment. The experimental research conducted in this study was a Pre-Experimental Design with a one-group pretest-posttest design. The pre-experimental design employed was the One-Group Pretest-Posttest Design, which includes a pretest before treatment is given, allowing the results of the treatment to be known more accurately through the post-test (Sugiyono, 2017).

The researcher used this design because the conditions and circumstances in the research school indicated that the average class size was less than 30 students. The research subjects were in class V with a population of 21 students. In this design, the researcher concluded that if the posttest score was higher, the treatment given was effective, and if the pretest score was higher than the posttest, the treatment given was not effective.

Figure 1
Research design



with:

O₁ = Pretest value (before treatment)

X = Treatment using a differentiated model

O₂ = Posttest value (after treatment)

Data analysis in this study uses the Paired Sample T-test. This test is used to compare the means of two related samples, namely the pre-test and post-test results from the same group. The goal of this test is to determine whether there is a significant difference between the pre-test and post-test scores after the implementation of an intervention or new teaching method. By calculating the average difference between the pre-test and post-test and analyzing the resulting p-value, researchers can assess the effectiveness of the intervention. If the p-value is smaller than the predetermined significance level (e.g., 0.05), it can be concluded that there is a significant difference between the pre-test and post-test scores, indicating that the intervention or teaching method used has a positive impact on improving students' learning outcomes.

3. Results and Discussion

This research was conducted at State Elementary School 1 Rempek, located in Dusun Telaga Maluku, Rempek Village, Gangga District, North Lombok Regency. This research was conducted on 21 fifth-grade students. This study aims to determine the learning outcomes of fifth-grade students in mathematics through the application of a differentiated learning model. This research was conducted with a pre-experimental design research design in the form of a one-group pretest-posttest design.

The data obtained in this study were taken using test questions from the results of the pre-test and post-test of students who were tested in class. The first step taken was to provide a pre-test sheet to the students who would be tested. Then, after getting the results of the pre-test, the researcher provided treatment in the form of teaching carried out by applying a differentiated learning model. After that, at the end of the learning, the researcher provided a post-test sheet to determine the extent to which the learning outcomes of fifth-grade students after providing treatment with a differentiated learning model. Based on the results of data collection obtained in this study from the results of the pre-test and post-test, namely in Table 1. Based on Table of 1, shows that the students' learning outcomes in mathematics are all in the low interval with a range of values < 65 with a frequency of 21 students. It can be said that the learning outcomes of fifth-grade students in mathematics are still very low. The post-test data on students' learning are as follows in Table 1.

Table 1
Pre-test result

No.	Name	Pre-Test	
		Value	Category
1.	Adzira Istiqomah	40	Low
2.	Ainun Maulida	53	Low
3.	Akbar Maulana	66	Middle
4.	Alaicia Khaira	40	Low
5.	Alya Amira Solihah	33	Low
6.	Amira Kalosa Aprilia	33	Low
7.	Andin Lada Mayanti	47	Low
8.	Arfa Keyza Atmanegara	53	Low
9.	Dzikrina Amalia Hanifa	47	Low
10.	Egi Hadid	27	Low
11.	Franda Adima Putri	60	Low
12.	Hanna Huwaida	47	Low
13.	Jenyta Septiana Salisna	53	Low
14.	Kayla Tansana	47	Low
15.	Nurul Aeni	33	Low
16.	Rafa Alfarihan	53	Low
17.	Rosyd Aldi Rizki	47	Low
18.	Trio Aji Setiawan	53	Low
19.	Vily Zelviana	60	Low
20.	Winda Fitria	33	Low
21.	Fazila Fuziana	27	Low
Total		952	-
Average		45.3333	-
Maximum		66	-
Minimum		27	-

The pre-test results for the 21 students reveal that the majority of students scored in the "Low" category, with scores ranging from 27 to 66. The total score across all students was 952, resulting in an average score of 45.33. The maximum score was 66, categorized as "Middle," while the minimum score was 27. This indicates that most students began with a relatively low level of understanding or proficiency in the subject matter.

The distribution of scores suggests a significant opportunity for improvement. The concentration of scores in the "Low" category highlights the need for targeted interventions or instructional strategies to address the gaps in students' knowledge and skills. By focusing on these areas, educators can aim to enhance student performance and ensure more students progress from the "Low" to the "Middle" or "High" categories in future assessments.

Table 2
Post-test results

No.	Name	Post-Test	
		Value	Category
1.	Adzira Istiqomah	80	High
2.	Ainun Maulida	87	High
3.	Akbar Maulana	93	High
4.	Alaicia Khaira	80	High
5.	Alya Amira Solihah	73	Middle
6.	Amira Kalosa Aprilia	73	Middle
7.	Andin Lada Mayanti	80	Middle
8.	Arfa Keyza Atmanegara	87	High
9.	Dzikrina Amalia Hanifa	87	High
10.	Egi Hadid	67	Middle
11.	Franda Adima Putri	93	High
12.	Hanna Huwaida	80	High
13.	Jenyta Septiana Salisna	87	High
14.	Kayla Tansana	80	High
15.	Nurul Aeni	73	Middle
16.	Rafa Alfarihan	87	High
17.	Rosyd Aldi Rizki	80	High
18.	Trio Aji Setiawan	87	High
19.	Vily Zelviana	93	High
20.	Winda Fitria	73	Middle
21.	Fazila Fuziana	67	Middle
Total		1707	-
Average		81.2857	-
Maximum		93	-
Minimum		67	-

Based on the post-test data of 21 students, there is a notable improvement in their performance compared to the pre-test results. The total score for all students is 1707, with an average score of 81.29, indicating a significant increase in overall performance. The scores now range from 67 to 93, with the majority of students falling into the "High" category and a smaller number in the "Middle" category. The highest score achieved is 93, while the lowest is 67. This distribution demonstrates a positive shift in student performance, suggesting that the intervention or teaching methods implemented were effective in enhancing their understanding and grasp of the material. Based on the data in Table 2, it can be seen that the learning outcomes of fifth grade students in mathematics are by expectations because by using a differentiated learning model there is an increase in the number of students who have completed compared to the pre-test results before being given treatment. Judging from the average value, it is 81.2857.

Based on the results of the pretest and posttest data, data normality tests and hypothesis tests can be carried out. The normality test is carried out to determine whether the two pre-test and post-test data used during the study are normally distributed or not. The normality test used in this study uses Shapiro-Wilk using the SPSS version 25 application which can be seen in the Table 3.

Table 3
Normality test

Tests of Normality						
	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Pretest	.178	21	.080	.941	21	.227
Posttest	.189	21	.048	.918	21	.078

a. Lilliefors Significance Correction

Based on the results of the normality test in the Test of Normality table, the results for the pretest data with the Kolmogorov-Smirnov normality test type obtained a sig value > 0.05, which is 0.080, then the results for the Shapiro-Wilk normality test obtained a Sig value of 0.227, meaning the Sig value on Shapiro-Wilk > 0.05. Therefore, the results of the pretest data are normally distributed. Furthermore, for the results of the post-test data on the Kolmogorov-Smirnov normality test, the sig value < 0.05 was obtained, which is significant 0.048, then the results for the Shapiro-Wilk test obtained a Sig value > 0.05, which is significant 0.078, so it can be said that the posttest data is normally distributed. Based on the data obtained by using the Shapiro-Wilk test above, it can be concluded that both pretest-posttest data obtained are normally distributed because of the Sig value > 0.05 so that it can be continued for hypothesis testing. Hypothesis testing in this study uses the Paired Sample T-test. The paired sample t-test is a comparative hypothesis test or comparison test. It aims to determine whether there is a difference in the average of two samples (two groups) that are paired or related. The basis for decision-making is as follows: (a). If the significance value (2-tailed) < 0.05, then H_0 is rejected and H_1 is accepted. (b). If the significance value (2-tailed) > 0.05 then H_0 is accepted and H_1 is rejected.

The following is a table of the results of the Paired Sample T-Test calculation (See Table 4).

Table 4
Paired sample t-test results

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Pre-test – Post-test	-33.048	7.730	1.687	-36.566	-29.529	-19.592	20	.000

Based on the Paired Sample T-Test (see Table 4), it can be seen that the Sig. (2-tailed) value is 0,000, Where 0,000 < 0,05, it can be said that there is a significant (real) influence. Based on this, this study hypothesizes that H_0 is rejected and H_1 is accepted. So, the conclusion is "there is an influence of the differentiated learning model on the learning outcomes of fifth-grade students in mathematics at Rempek 1 Elementary School".

After carrying out research procedures such as validity tests, reliability tests, normality tests, and hypothesis tests, the results of this study were obtained. The results of the study are seen from the results of the pretest data that the learning outcomes of fifth-grade students in mathematics are still said to be low with an average value obtained of 45.333. For student learning outcomes after conducting experiments or treatments, the average result is 78.381, meaning that there is a difference in student learning outcomes after using the differentiated learning model.

Increasing the learning outcomes of fifth-grade students in mathematics. This is because when learning using a differentiated learning model makes students more enthusiastic about learning. Where during learning students are facilitated to learn according to their needs. The application of the differentiated learning model carried out in this study is to facilitate students to learn according to their needs, where the learning needs of grade V students at SD Negeri 1 Rempek in mathematics subjects are that they need media.

In line with the opinion (Marlina, 2019) of teachers responding to students' learning needs, which means that teachers differentiate learning by adding, expanding, and adjusting time to obtain maximum learning outcomes. This is also in line with Rosaliana (2023) that learning with a differentiation strategy

can increase students' learning motivation. Furthermore, it was found that the success of this differentiated learning will be successful depending on class management. This was stated by (Pebriyanti, 2023) who stated that an educator's ability to choose an approach, strategy, or model can determine the success of students in learning. So, it can be concluded that the differentiated learning model has a significant influence on the learning outcomes of fifth grade students in mathematics at Rempek 1 Elementary School with the learning material of the area of flat shapes.

Differentiated learning involves modifying content, processes, products, and learning environments to cater to the varying abilities, interests, and learning styles of students (Ortega et al., 2018). In practice, this means that teachers might adjust the complexity of tasks, provide various types of resources, or use different methods to ensure that each student can engage with the material in a way that suits them best. The significant improvement observed in the students' post-test scores suggests that such tailored instruction effectively addresses individual learning needs and helps bridge gaps in understanding.

One of the key aspects of differentiated learning is its focus on student-centered teaching. By recognizing and addressing the unique strengths and weaknesses of each student, educators can create a more inclusive and supportive learning environment. This personalized approach helps students build confidence and competence in their mathematical skills, as evidenced by the increased scores in the post-test. The model's effectiveness highlights the importance of adopting instructional strategies that are responsive to the diverse needs of students rather than relying on a one-size-fits-all approach.

The positive results from this study have several practical implications for educators and policymakers. Firstly, it underscores the value of differentiated instruction in enhancing student learning outcomes. Schools and educational institutions should consider integrating differentiated learning strategies into their curricula to improve student achievement. Professional development for teachers can be a critical component of this integration, as it equips educators with the skills and knowledge needed to implement differentiated approaches effectively. Moreover, the study's findings can inform curriculum design and instructional planning. By incorporating elements of differentiation, educators can create more engaging and effective learning experiences that cater to the varying needs of their students. This might include developing a range of instructional materials, utilizing formative assessments to monitor progress, and providing targeted interventions to support students who are struggling.

4. Conclusion

Based on the results of the research conducted by the researcher, it can be concluded that the learning outcomes of grade V students before carrying out treatment or actions were measured using the pretest results obtained with an average of 45.333. Then the learning outcomes of grade V students after carrying out treatment or actions with a differentiated learning model measured using the posttest results obtained an average of 78.381. Therefore, seen from the results of the hypothesis test in the study using the Paired Sample T-Test Hypothesis test that the significance value obtained is 0,000 which is $0,000 < 0,05$. So, the results of the hypothesis test in this study are that there is an effect of the application of a differentiated learning model on the learning outcomes of grade V students in mathematics at SD Negeri 1 Rempek.

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