JPPIPA 11(4) (2025)

Jurnal Penelitian Pendidikan IPA

http://jppipa.unram.ac.id/index.php/jppipa/index

The Effectiveness of Implementing Learning Style Differentiation on Science Learning Interests and Outcomes in Elementary Schools

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Received: December 18, 2024
Revised: February 14, 2025
Accepted: April 25, 2025
Published: April 30, 2025

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DOI: 10.29303/jppipa.v11i4.10670

Abstract: From the results of interviews and observations in Class IV of Al-Akhyar Islamic Elementary Schoollow interest and learning outcomes were found. This was caused by teachers who only used the lecture method when explaining without analyzing the characteristics of their students. Therefore, this study was conducted with the aim ofexamines the influence of differentiation learning styles on interest and learning outcomes of elementary school science students. This type of research is a quasi-experiment. The population of the study was all fourth-grade students of SDIT Al-Akhyar Kudus, with a sample of class IV A as an experimental class with the (PBL) Problem Based Learning model with learning style differentiation and class IV B as a control class with the (PBL) Problem Based Learning model without learning style differentiation. Data collection used a learning interest questionnaire and learning outcome test. Data analysis was carried out descriptively (percentage of learning interest) and parametric inferential (normality test, homogeneity, Independent Sample T-test, and Ngain for learning outcomes). The results showed that students' learning interest increased significantly after being given differentiation learning, from 65.5% to 85.2%. The results of the N-gain test for the experimental class were 0.63 with a fairly effective category from the control class 0.52 with a less effective category. In conclusion, differentiated learning is effective in improving students' interest and learning outcomes.

Keywords: Differentiated learning; Learning outcomes IPAS; Learning styles

Introduction

Education is an important foundation for the progress of the nation. In line with Adelianty et al., (2024). Education is a need that must be met in social, national and state life. Education is an effort to guide, teach and hone skills that will make work easier in the future (Maryanti & Sartono, 2024). Khairunnisa et al. (2025) adding, education is a means to hone knowledge and skills so as to grow a quality generation. Quality education can occur if development and improvement are continuously carried out in the learning process that is adjusted to the needs of students (Al-Shehri & Salih, 2020). Teachers as educators have an obligation to create quality learning (Balqis & Andriani, 2024).

However, the implementation of education today has not changed much, where the learning system has not been adjusted to the needs of students and still assumes that all children have the same abilities. The role of educators here is very important, educators need to have sensitivity in understanding the characteristics of their students (Riany et al., 2024). Educators must be aware that each child has a different character (Amalia & Siswanto, 2024). The diversity of each individual including abilities, interests, and learning styles needs to be considered considering that each student grows in a

How to Cite:
Pratiwi, E. K., & Tyas, D. N. The Effectiveness of Implementing Learning Style Differentiation on Science Learning Interests and Outcomes in Elementary Schools. *Jurnal Penelitian Pendidikan IPA*, *11*(4), 243-253. https://doi.org/10.29303/jppipa.v11i4.10670

different environment (Febriana et al., 2023; Stefani et al., 2023). KH Dewantara in Azizah et al. (2024) explains, education is based on the principle of freedom which aims to guide students to achieve the highest happiness and safety. So in the teaching process, educators must respect diversity including differences in abilities in their students.

From the statement above, the government itself continues to strive to develop and perfect the curriculum in order to improve the teaching and learning process and lead education in a better direction (Darnawati & Yulianto, 2024). For this reason, the current curriculum, namely the independent curriculum, provides great freedom for each school and educator to develop materials and teaching methods according to student needs (Handiyani & Muhtar, 2022). Teachers are given the freedom to choose and match the learning materials needed according to the character of the students, so that students understand the material more deeply. However, there is still a gap between learning in the field because teachers should be able to provide learning that can facilitate the needs of each student, especially in the learning process. The lack of teacher attention in responding to the reality of different student abilities makes students less able to understand the material and makes students passive (Yunita et al., 2023). Of course, this will have an impact on student learning outcomes which will be less than optimal.

From the results of interviews conducted in class IV of SDIT Al Akhyar Kudus, problems were found, namely the lack of interest in learning for students and low learning outcomes for students in science subjects, as evidenced by the number of 30 students in class A, only 12 students had passed grades, then from 27 students in class B only 9 had passed grades. From the results of observations during science subjects learning, students tend to get bored while studying and still often play when the teacher explains and students' interest in learning is lacking. After interviews with students and further observations, this happened because the teacher only explained the material by lecturing and then giving assignments. In the end, the learning process carried out can make students passive and less active in participating. Students who are less active in learning activities will lose the opportunity to interact with the material directly so that it can cause students to have difficulty understanding science concepts well. So, as educators, we need to pay attention to learning models or learning styles and adjust them to the needs of our students.

Therefore, this research is important to help solve problems in improving the interest and learning outcomes of fourth grade students of SDIT Al Akhyar Kudus. From the problems and answers to student interviews that cause a lack of interest in learning and low learning outcomes, learning models or learning styles need to be improved. Teachers need to understand the character of students and their needs, especially during science learning. One approach that emphasizes the importance of understanding student character and teaching strategies according to needs is by conducting differentiated learning (Gheyssens et al., 2022; Ginja & Chen, 2020). This theory is based on Howard Gardner's thinking about Multiple Intelligences, which emphasizes that students have diverse intelligence and potential (Hanum & Saputra, 2023). Differentiated learning has a good influence when implemented in learning (Laumarang et al., 2023; Magableh & Abdullah, 2020; Suprayogi et al., 2024). Differentiated learning includes differentiating content, processes, and products according to student needs (Liou et al., 2023; Rachmadtullah et al., 2020). This approach makes the learning process diverse according to needs so that it will improve learning outcomes (Dalila et al., 2022; Sitanggang et al., 2022). Teaching with a differentiated approach can also be more effective in achieving learning objectives (Almomani, 2019; Cimermanová, 2018).

Science learning itself in elementary schools tends to emphasize direct experience and studying material from the surrounding environment (Apriliandani & Maryani, 2023). The need for students to understand science material will be useful in life and help students to solve real problems that occur in their environmen (Kristi & Andriani, 2023). So the appropriate learning model is the Problem Based Learning (PBL) model, students will practice analyzing problems and providing solutions to solving problems in science learning (Rieschka, 2020). This model also helps to increase students' activeness in gaining understanding (Saputri, 2020). So in this study, the Problem Based Learning (PBL) model with differentiated learning styles will be implemented in learning to improve learning interest and learning outcomes.

There are several studies related to the research that will be carried out, namely research by Ariani et al. (2024), in his research showed that the differentiated learning model is able to improve student learning outcomes, because this model emphasizes more on student activity. This is proven by the results of the study obtained in cycle 1 the number of students who achieved KKM was 66.67% or 18 out of 23 students. In cycle 2 the number of students who achieved KKM was 91.30% or 21 out of 23 students. This means that there was an increase in learning outcomes from cycle 1 to cycle 2 of 13.04%. Then research by Rohmah et al. (2023), this study shows that differentiation learning with PBL is effective in improving the learning outcomes of grade

III students of SDN Sambirejo 02 on the sub-themes studied. In addition, the research conducted by Amalia et al. (2024). Differentiation of learning styles has been proven to increase students' interest in learning, this is proven by the discovery of learning outcomes that increased from an average of 42.4 to 83.6.

Previous studies have shown that differentiated learning has a positive impact on student learning because differentiated learning is tailored to students' learning needs, such as the level of readiness, interests, and learning styles of each student. The research update with previous studies is that this study investigates the effectiveness of differentiated learning using the PBL learning model which will focus on the material of the forces around us in science learning. This study will apply the differentiated PBL model to the experimental group and undifferentiated PBL to the control group.

Considering the importance of increasing students' interest and learning outcomes in science learning in grade IV of SDIT Al-Akhyar Kudus, teachers need to be careful in choosing and determining the right learning model according to the characteristics and needs of students. Therefore, this study was conducted to examine the "Effectiveness of Differentiated Learning Styles on the Interests and Learning Outcomes of Science in Grade IV Students of SDIT Al-Akhyar Kudus".

Method

This research was conducted at SDIT Al-Akhyar Kudus. The research design used was a quasi-experimental with a nonequivalent control group. In accordance with Sugiyono (in Cantika, 2024) that the control group in a nonequivalent control group design does not fully control for external factors.

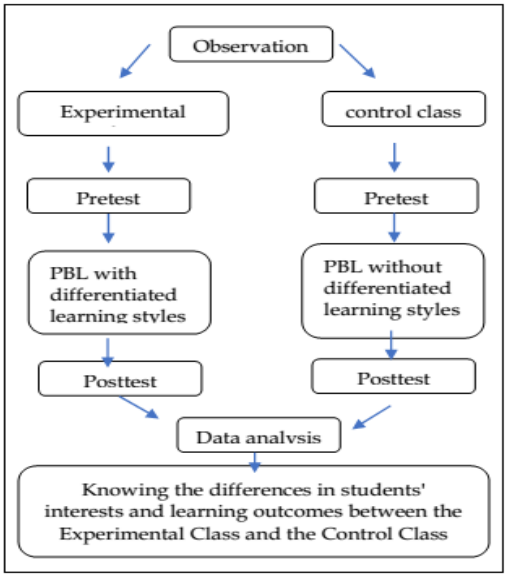

Figure 1. Research stages

This study used an experimental design, using class IV A as the experimental group and class IV B as the control group. The experimental group received instruction using the Problem-Based Learning (PBL) model, which was adapted to incorporate differentiation learning styles. The control group received PBL instruction without this differentiation.Both groups used the Problem-Based Learning (PBL) model. The difference is that the experimental group is PBL with learning style differentiation, while the control group is PBL without learning style differentiation. Table 1 presents the research design used in this study.

Table 1. Nonequivalent Control Group Design

O1	X	O2
O3		O4

Information:
O1 : Experimental group before treatment
O2 : Experimental group after treatment
X : Treatment of PBL model with learning style differentiation
O3 : Control group before treatment
O4 : GroupPBL model control without learning style differentiation

Data were collected using learning style observation sheets, adapted learning interest questionnaires (based on previous research), and validated achievement tests. Before the treatment was carried out, the experimental class was observed for their differentiation learning styles, learning interests, and worked on pretest questions. Furthermore, the PBL (Problem Based Learning) model was given treatment without differentiation learning styles. After the treatment was carried out, the experimental class completed the final interest questionnaire and posttest. Likewise with the control class before the treatment was carried out, the researcher observed students' learning interests and asked students to work on the pretest. Furthermore, the control class was not given treatment (using the PBL model without distinguishing differentiation learning styles) and continued by working on posttest questions.

This study tested two hypotheses, namely the null hypothesis (H0) which states that the application of differentiated learning styles is not effective in increasing the interest in learning science of grade IV students of SDIT Al-Akhyar Kudus, and the alternative hypothesis (Ha) the application of differentiated learning styles is proven to be more effective in increasing the interest in learning science of grade IV students of SDIT Al-Akhyar Kudus. The percentage of student learning interest was analyzed using descriptive

methods. Student learning outcome data were analyzed using parametric inferential statistics.

Table 2. Validity of Question Items

	Validity of Question Items
About Valid	1, 3 , 4, 5, 6, 7, 8, 9, 10, 11, 12, 15, 18, 20, 23, 24, 25, 26, 27, 28, 29, 30, 32, 33, 34, 38, 39,4 0
Invalid Issue	2, 3, 13, 14, 16, 17, 19, 21, 22, 31,35, 36, 37

By conducting a validity test on the instrument, the researcher obtained 26 questions that were said to be valid. However, in this study, only 25 questions were used as pretest and posttest questions.

Results and Discussion

Results

In this study, data obtained from observation sheets of students' learning styles in the experimental class, learning interest questionnaires and science learning outcome tests in the experimental class and control class will be analyzed. In this study, the experimental class studied the material "Forces Around Us" through differentiated learning style learning with the Problem Based Learning (PBL) model. While the control class studied the same material with the PBL model without differentiation.

Student Learning Style Analysis

In this study, the learning style instrument was given to students in the experimental class through a learning style observation sheet with a multiple-choice format (A, B, and C). In the assessment, option A corresponds to a visual learning style, option B corresponds to an auditory learning style, and option C corresponds to a kinesthetic learning style. After students fill out the questionnaire, their learning style will be determined based on their answer tendencies. The most dominant answer will be the basis for grouping students into certain learning style groups.

Table 3. Learning Style Analysis Results

Learning Styles	Many Students	Percentage
Visual	18	60%
hearing	12	40%
Kinesthetic	.	0%

Learning style analysis among 30 students in the experimental class showed that 18 students preferred visual learning and 12 students preferred kinesthetic learning. Table 3 presents the data on students' learning styles.

The results of the learning style percentage analysis show that 60% of the experimental class students are visual learners, 40% are auditory learners, and none are kinesthetic learners. These data support the conclusion that the class tends towards visual learning.

Data Analysis of Student Learning Interest Results

Information collected by researchers regarding students' learning interests in this study was obtained from data from administering interest questionnaires with indicators of feelings of pleasure, interest, attention and involvement in student learning before learning and after treatment in the experimental class. To find out the percentage of students' learning interest scores, it can be found by dividing the total score of each question by the maximum score and then multiplying it by 100% to obtain a percentage value.

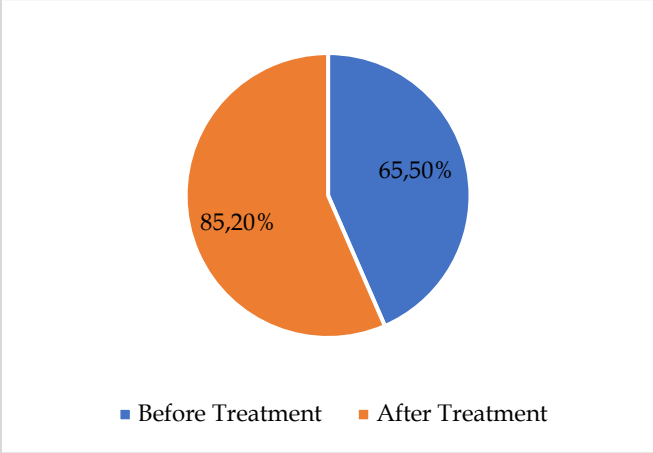

Figure 2. Percentage of student learning interest

The data in the diagram shows that there is an increase in the learning interest of fourth grade students of SDIT Al-Akhyar, Kudus Regency after being given a differentiated learning style learning treatment. Before being given the treatment, only 65.5% of students showed an interest in learning, but after being given the treatment, the number increased to 85.2%. This 19.7% increase shows that this learning method is effective in increasing students' learning interest.

Science Learning Outcome Analysis

Student learning achievement in this study is a cognitive learning achievement observed based on pretest and posttest score data. From the analysis of pretest and posttest data obtained from the experimental and control groups, the data will be presented in the form of descriptive statistics including total, average, standard deviation, highest score, and lowest score.

Based on table 4, shows that in the pretest results of the experimental class, the minimum value is 40 and the maximum value is 84. The pretest value of the control group shows a range of 40 to 80. The average pretest of the experimental class is 63.20 and the control class is 60.44. The posttest results of the experimental class have

a minimum value of 68 and a maximum value of 100. The posttest results of the control class have a minimum value of 64 and a maximum value of 96. The average posttest value of the experimental group (86.27) is higher than the average posttest value of the control group (81.33).

Table 4. Description of Science Learning Outcomes

	N	Range	Minimum	Maximum	Means
re-experimental test	30	44	40	84	63.20
ost-test experiment	30	32	68	100	86.27
re-test control	27	40	40	80	60.44
ost Test Control	27	32	64	96	81.33
alid N (based on list)	27				

Statistical analysis prerequisite test is an important stage in quantitative research before hypothesis testing is carried out. The results of this prerequisite test will determine the type of appropriate hypothesis test, namely parametric test or nonparametric test (Permana & Ikasari, 2023). Two common statistical prerequisite tests are the normality test, which is used to determine the normal distribution of data, and the homogeneity test, which is used to determine the homogeneity of variance between data groups. The results of the learning outcome normality test can be seen in table 5 which was analyzed using SPSS IBM 26.

Table 5. Normality Test Results

	Shapiro Wilk		
Class	Statistics	df	One.
Pre-exam Test	.957	30	.265
Post test Test	.961	30	.321
Pre-exam Control	.958	27	.328
Post test Control	.959	27	.348

Based on table 5 the results of the normality test can be seen in the Shapiro-Wilk column. The pretest and posttest data of both the experimental and control groups are known to be normally distributed, based on the results of the normality test. The pretest produced a significance value of 0.265 (experimental group) and 0.328 (control group) both of which exceeded the alpha level of 0.05. The posttest produced a significance value of 0.321 (experimental group) and 0.348 (control group) both of which exceeded the alpha level of 0.05.

In statistics, the homogeneity test is important to ensure the validity of several hypothesis tests. This test aims to test the equality of variance between two groups of data. The null hypothesis (H_0) states that the variance of the two groups is the same (homogeneous), while the alternative hypothesis (Ha) states that the variance of the two groups is different (heterogeneous). The decision is made based on the significance value (sig) obtained from the homogeneity test. A significance value (sig value) below 0.05 indicates that the null hypothesis (H_0) is rejected, and the alternative hypothesis (Ha) is accepted. This means that the variances of the two groups are statistically different. A significance value (sig value) greater than 0.05 indicates that we fail to reject the null hypothesis and reject the alternative hypothesis. This indicates that the variances of the two groups are statistically similar.

Table 6. Results of the Pretest Score Homogeneity Test

Homogeneity of Variance Test					
		Levene Statistics	df1	df2	Signature.
Learning outcomes	Based on average	.156	1	55	.694
	Based on the median	.176	1	55	.676
	Based on median and with adjusted df	.176	1	54,833	.676
	Based on trimmed average	.170	1	55	.682

Pre-test data from the experimental and control classes showed homogeneity of variance. The data, as shown in Table 8, support this conclusion. The homogeneity test yielded a significance value of 0.694, which is greater than the threshold set at 0.05.

The posttest data from the experimental and control classes also showed homogeneous variance. As shown in Table 9, the homogeneity test produced a significance value of 0.478, which is above the threshold of 0.05, which supports the conclusion of homogeneous variance in the posttest data from the experimental and control classes. After ensuring that the data meets the requirements of normality and homogeneity, the next step is to conduct hypothesis testing. In this study, the independent sample t-test was used to compare learning outcomes and determine whether the differences between the experimental and control groups were statistically significant.(Putri et al., 2021).

Table 7. Post-Test Data Homogeneity Test Results

Homogeneity of Variance Test					
		Levene Statistics	df1	df2	Signature.
Learning Outcomes	Based on Average	.510	1	55	.478
	Based on Median	.515	1	55	.476
	Based on median and with adjusted df	.515	1	54,909	.476
	Based on trimmed average	.505	1	55	.480

Hypothesis testing was used to assess the differences in the effectiveness of problem-based learning with and without learning style differentiation on student learning outcomes. The two-tailed significance value obtained from the independent sample t-test was 0.031. With a p-value of 0.031, which is below the 0.05 significance level, we reject the null hypothesis and accept the alternative hypothesis. This means that there is a statistically significant difference in student learning outcomes between groups. Problem-based learning, when adapted to different learning styles, has been shown to be more effective in improving student learning outcomes at SDIT Al-Akhyar, Kudus Regency.

Table 8. Independent Sample T-Test Results

Independent Sample Test										
		Levene's for Equality of Variance		t-Test for Equality of Means						
		F	Signature.	T	df	Sig. (2-tails)	Average Difference	Standard Error Difference	95% Confidence Interval of Difference Lower	On
Mark	Variance is assumed to be the same	.510	.478	-2.210	55	.031	-4.933	2.232	-9.406	-.460
	Equal variances are not assumed			-2.194	51,889	.033	-4.933	2.249	-9,446	-.421

After testing the data analysis requirements, the next step is to calculate the N-Gain. This test aims to measure how effective the changes in student learning outcomes are after being given certain treatments. The N-Gain calculation is done by finding the difference in pretest scores (before treatment) and posttest (after treatment), then divided by the maximum possible difference in scores with the pretest score.

Table 9. N-gain Calculation Results

Class	Average value		N-Gain Score	Interpretation	Profit Percentage N	Category
	Pre-exam	Post-exam				
Experiment	63.20	86.27	0.63	Currently	63%	Quite Effective
Control	60.44	81.33	0.52	Currently	52%	Less Effective

The experimental and control classes have different effectiveness in improving student learning outcomes. This can be seen from the difference in N-gain scores and N-gain percentages in table 9. In the experimental class, the average student score increased significantly after being given treatment, with an N-gain score of 0.63 (moderate category) and an N-gain percentage of 63% (quite effective). Meanwhile, in the control class, the increase in the average student score was not very significant, with an N-gain score of 0.52 (moderate category) and an N-gain percentage of 52% (less effective).

Discussion

This study aims to compare the effectiveness of the implementation of the Problem Based Learning (PBL) learning model that is adjusted to students' learning styles (differentiation) compared to the conventional PBL learning model (without differentiation) on the interests and learning outcomes of fourth grade students of SDIT Al-Akhyar, Kudus Regency. Students are divided into an experimental group (class IV A) and a control group (class IV B). The experimental group consists of 30 students, while the control group consists of 27 students.

In this study, the data collection techniques used were observation of learning styles in the experimental class, learning interest questionnaires, tests in the form

of pretests and posttests. For data analysis techniques, researchers used the help of SPSS IBM 26 for Windows software.

In the experimental class, students were grouped based on their learning styles. Learning styles are the way a person learns and thinks. The three main learning styles commonly known are visual, auditory, and kinesthetic (Sitorus, 2023). Learning in the experimental class is designed differently according to the students' learning styles. Based on the analysis conducted by the researcher, in class 4A students as an experimental class only get students who are classified as visual learning styles, namely 18 students and kinesthetic students as many as 12 students.

The Influence of Differentiated Learning Styles on Interest in Learning

From the results obtained from the interest questionnaire with indicators of feelings of pleasure, interest, involvement and student attention, it shows that the average student interest in learning before being given treatment was 65% and after being given treatment with a differentiated learning style was 85%. This means that there was an increase in learning interest of 19.7%. The results of the study showed that when learning was adjusted to students' learning styles, they became more involved and interested in learning. Therefore, it can be concluded that differentiated learning has a positive effect on students' learning interest.

The use of various media and teaching aids, as well as learning models that are appropriate to students' needs, also play a role in increasing interest in learning. This can trigger students' interest, feelings of pleasure, student involvement, and student attention in learning. Teachers also play an important role in increasing students' interest in learning. Teachers need to foster intrinsic motivation in students during the learning process. To foster intrinsic motivation, this can be done by connecting learning materials with students' interests or needs (Sitorus, 2023).

The Influence of Differentiated Learning Styles on Learning Outcomes

Descriptive statistics ofThe pretest learning outcome scores showed that the experimental class had a minimum score of 40 and a maximum score of 84. In the control class, the pretest scores ranged from a low of 40 to a high of 80. The average pretest score for the experimental class was 63.20 and the control class was 60.44. The posttest results for the experimental class had a minimum score of 68 and a maximum score of 100. The posttest scores for the control group ranged from 64 to 96, with an average of 81.33. The average posttest score for the experimental group was 86.27.

Based on the learning outcomes, the data were tested for normality and homogeneity of the data. Based on the Shapiro-Wilk normality test, the pretest learning outcome data in the experimental and control classes were declared normally distributed. This is indicated by a significance value (sig.) greater than 0.05, which is 0.265 for the experimental class and 0.328 for the control class.

The homogeneity of variance test on the pre-test scores showed no significant difference between the experimental and control groups ($p = 0.694$). This value is greater than the standard of 0.05, which is the limit for determining homogeneity. The statistical test confirmed that the pre-test data from the experimental and control groups showed homogeneity of variance.

The average posttest learning outcomes for the experimental group were 86.27, and the average for the control group was 81.33. This indicates that the experimental class obtained a higher posttest score than the control class. The normality of the posttest data was evaluated using the Shapiro-Wilk test. The results showed that the scores of the experimental ($p = 0.321$) and control ($p = 0.348$) groups were normally distributed, because the significance value exceeded the alpha level of 0.05.

In the posttest data homogeneity test for the experimental and control classes, the average significance value for the posttest data homogeneity test was 0.478. The posttest data from the experimental and control groups showed homogeneity of variance, because the observed value was greater than 0.05.

After passing the normality and homogeneity tests, the researcher continued the hypothesis testing to find out the comparison between the two classes. The independent sample t-test found a statistically significant difference ($p = 0.31$), which led to the rejection of the null hypothesis. The findings provide strong enough evidence to reject the null hypothesis and support the alternative hypothesis. It is concluded that learning style differentiation with a problem-based learning model is more effective in improving student learning outcomes than a problem-based learning model without learning style differentiation.

After being calculated with N-gain, the improvement in the experimental class was better (0.63 or 63%) compared to the control class (0.52 or 52%). Although both are in the moderate category, the experimental class showed a fairly effective improvement, while the control class was less effective.

Based on the hypothesis testing, it states that PBL model learning with differentiation learning style is more effective in increasing the interest and learning outcomes of science students in grade IV of SDIT Al-Akhyar, Kudus Regency. The increase in learning

outcomes in differentiation learning style is because learning with this strategy emphasizes the needs of students who require students to be skilled and sensitive in solving problems in their environment. In addition, this differentiation learning is able to improve students' creative thinking skills and collaborate between students in solving problems. According to Herwina (2021) Learning that is a learning experience tailored to students' interests can produce better learning outcomes because the work results are more meaningful and personally relevant.

This is also reinforced by Devi and friends who stated that differentiated learning assisted by Umang media can increase students' interest in learning, which can be seen from the increase in the student learning interest questionnaire which increased from 24.75% to 57% (Devi et al., 2024). Learning media has a very important role in creating effectiveness in learning (Aristaria et al., 2024). In addition, it is strengthened by research conducted by Amalia et al. (2024), The study showed that student learning outcomes increased after the implementation of differentiated learning strategies. Before using the strategy, the average student score was 42.4. Hypothesis testing with a significance value of less than 0.05 strengthens the findings, the results indicate that differentiated learning has a positive effect on student learning outcomes. Furthermore, through the N-Gain test, an average value of 0.5895 was obtained. This value indicates that differentiated learning strategies have a moderate level of effectiveness in improving student learning outcomes.

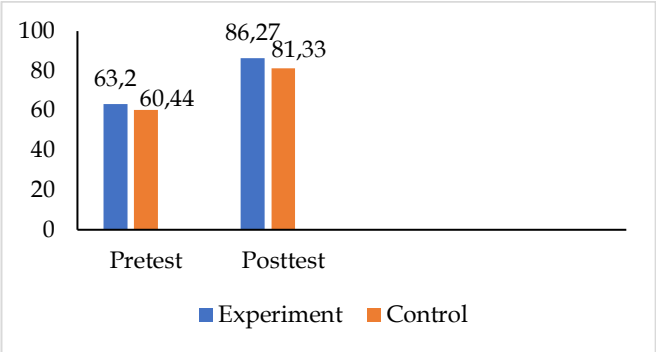

Figure 3. Science Learning Outcomes

This graph presents the pre-test and post-test learning outcome data for the experimental and control groups. The experimental group showed an increase in mean score from 63.20 to 86.27, while the control group's mean score increased from 60.44 to 81.33.

Conclusion

From the results of the analysis and tests conducted, it is proven that PBL learning with differentiation learning styles is more effective than PBL learning without differentiation learning styles. This is evidenced by the results of the N-gain test that occurred in the experimental class, namely 0.63 with a fairly effective category from the control class 0.52 with a less effective category. In addition, the effectiveness of this differentiation learning is also proven by the increase in student learning interest by 19.7% from 65.5% to 85.2%. Thus, the application of PBL learning with differentiation learning styles has proven to be effective in improving the quality of learning so as to increase interest and learning outcomes in science class IV of SDIT Al-Akhyar Kudus.

Acknowledgments

With full gratitude, the author expresses his gratitude to the presence of God Almighty for all the blessings of health and gifts that have been bestowed so that this research can be completed properly. The author also thanks the supervising lecturer for the guidance and direction given, the principal of SDIT Al-Akhyar Kudus for the permission and facilities provided, the teachers for their help and support, and the students who have participated in this research. The author also thanks his family and friends for their support and prayers during the research process.

Author Contributions

The contribution of the authors involved in the preparation of this scientific article consists of EKP (First Author) who played a role and played a role in conducting observations and research in one of the Elementary Schools that became the subject of research and writing this scientific article. Furthermore, DNT (Second Author) as a supervisor who has guided and provided direction in the preparation of this article.

Funding

This research did not receive any external funding.

Conflict of Interest

The author declares no conflict of interest.

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