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The Effect of the Experimental Method on Students' Science Learning Outcomes on the Topic of Force Altering an Object's Motion in Grade IV of SDN 4 Dawuan

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ABSTRACT

This study aimed to determine students' science learning outcomes before the implementation of the experiment method on the topic of force affecting the motion of objects, to determine students' science learning outcomes after the implementation of the experiment method, and to determine the effect of the experiment method on the science learning outcomes of fourth-grade students at SDN 4 Dawuan. The study employed a quantitative approach using a quasi-experimental method with a One Group Pretest-Posttest Design. The sample consisted of 35 students selected through a saturated sampling technique. Data were collected through learning outcome tests administered before and after the implementation of the experiment method. Data were analyzed using descriptive statistics, the Shapiro-Wilk normality test, the Paired Sample t-Test, and N-Gain analysis. The results showed that students' learning outcomes before the implementation of the experiment method were still low, with a mean pretest score of 4.34. Students' learning outcomes improved after the implementation of the experiment method, as indicated by a mean posttest score of 6.14 and an increase in the number of students who achieved learning mastery. The hypothesis test showed a significance value of 0.000 < 0.05 and an N-Gain score of 0.3828, which was categorized as moderate. The experiment method had a positive and significant effect on students' science learning outcomes.

Informasi Artikel

Kata Kunci:

Metode Eksperimen; Hasil Belajar; Pembelajaran IPA; Gaya dan Gerak; Sekolah Dasar

ABSTRAK

Penelitian ini bertujuan untuk mengetahui hasil belajar IPA siswa sebelum diterapkan metode eksperimen pada materi gaya dapat mengubah gerak suatu benda, mengetahui hasil belajar IPA siswa setelah diterapkan metode eksperimen, dan mengetahui pengaruh metode eksperimen terhadap hasil belajar IPA siswa kelas IV SDN 4 Dawuan. Penelitian menggunakan pendekatan kuantitatif dengan metode eksperimen semu (*quasi experiment*) dan desain *One Group Pretest-Posttest Design*. Sampel penelitian berjumlah 35 siswa yang dipilih menggunakan teknik *sampling jenuh*. Pengumpulan data dilakukan melalui tes hasil belajar sebelum dan sesudah penerapan metode eksperimen. Analisis data menggunakan statistik deskriptif, uji normalitas *Shapiro-Wilk*, uji *Paired Sample t-Test*, dan analisis N-Gain. Hasil penelitian menunjukkan bahwa hasil belajar siswa sebelum penerapan metode eksperimen masih rendah dengan nilai rata-rata *pretest* sebesar 4,34. Hasil belajar siswa setelah penerapan metode eksperimen meningkat dengan nilai rata-rata *posttest* sebesar 6,14 serta meningkatnya jumlah siswa yang mencapai ketuntasan belajar. Hasil uji hipotesis menunjukkan nilai signifikansi 0,000 < 0,05 dan nilai N-Gain sebesar 0,3828 kategori sedang. Metode eksperimen berpengaruh positif dan signifikan terhadap hasil belajar IPA siswa.

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1. Introduction

Education is one of the crucial aspects of developing high-quality human resources. Educational implementation in primary schools plays a vital role in shaping students' thinking abilities, attitudes, and skills from an early age. Natural Sciences (IPA) serves as a medium to develop scientific thinking skills through observing, questioning, experimenting, and concluding phenomena. Science learning is not only oriented toward conceptual mastery but also on the process of discovering knowledge through meaningful learning experiences. The *Kurikulum Merdeka* (Independent Curriculum) emphasizes the importance of student-centered learning to enable students to develop critical, creative, and problem-solving thinking skills optimally. Implementing learning activities that provide opportunities for students to be actively involved is a key factor in improving the quality of learning outcomes [5], [13].

The characteristics of primary school students place them in a developmental stage that requires concrete learning experiences to grasp concepts. A deep understanding of scientific concepts is more easily achieved when students are directly involved in learning activities that allow them to conduct simple observations and experiments. The topic "force can alter the motion of an object" is a science subject that requires students to understand the cause-and-effect relationship between an applied force and the resulting change in motion. A learning process that relies solely on teacher explanations often makes it difficult for students to comprehend this concept deeply. Hands-on learning experiences can help students connect theory with the phenomena they encounter in daily life. Active learning experiences also foster students' curiosity and engagement throughout the learning process [6], [11].

However, science education in primary schools still faces various obstacles that affect the quality of student learning outcomes. The instructional process is still largely dominated by the lecture method, leaving students passive and merely receiving information from the teacher [14]. This one-way learning approach severely limits students' opportunities to construct understanding through direct experience [8]. Consequently, students tend to memorize materials rather than understand the concepts deeply [14]. The low level of student engagement in the learning process also hampers the development of critical thinking and science process skills, which are fundamental goals of science education [21]. Ultimately, this situation leads to low student learning outcomes [8], [9].

Preliminary observations conducted in the fourth grade of SDN 4 Dawuan revealed that science learning was still carried out using a teacher-centered approach. The teacher delivered materials through oral explanations and assigned tasks straight from the textbook. Students spent most of their time listening without the opportunity to conduct hands-on experiments related to the lesson. As a result, students struggled to understand the relationship between force and the change in an object's motion. This suboptimal conceptual understanding contributed to low student learning outcomes regarding force and motion. This situation highlights an urgent need to implement teaching methods that can provide more concrete and meaningful learning experiences for students.

The experimental method is an effective instructional approach that can be used to improve the quality of primary school science learning. It offers students the chance to conduct experiments directly, allowing them to verify the concepts they are studying first-hand [6]. Experimental activities encourage students to observe, gather information, analyze trial results, and draw conclusions based on discovered facts [22]. This process makes students active agents in constructing their own knowledge rather than passive recipients of information from the teacher [11]. Direct experiential learning also boosts learning motivation and helps students understand concepts more thoroughly [20]. The use of the experimental method is highly aligned with the nature of science education, which emphasizes scientific processes in acquiring knowledge [18].

Various previous studies have shown that the experimental method has a positive impact on student learning outcomes. A study by Putri demonstrated that the experimental method significantly influences the improvement of science learning outcomes among primary school students [4]. Research findings indicate that implementing this method can enhance students' science process skills in science learning [7]. Additionally, a study by Pinasthika and Kaltsum found that the experimental method makes students more active and facilitates easier understanding of the concepts being studied [11]. Rahmawati et al. also found that the experimental method is capable of improving the comprehension of science concepts while simultaneously developing students' learning skills [12]. Other research findings suggest that the experimental method significantly enhances learning outcomes and student process skills compared to conventional learning [21].

The application of the experimental method is also in line with the objectives of science education, which emphasize the importance of discovering knowledge through scientific activities. Experimental activities allow students to gain more meaningful learning experiences because they are directly involved in the learning process. Conceptual understanding acquired through real-life experiences tends to be more durable and long-lasting than knowledge gained solely through rote memorization [11]. Furthermore, experimental activities offer students opportunities to develop critical thinking skills, collaborate, and communicate their

observational results [21]. Improving these skills is expected to support better learning outcomes, particularly in the topic "force can alter the motion of an object" [3], [17]. Based on this background, this study aims to analyze the effect of the experimental method on student learning outcomes regarding the topic "force can alter the motion of an object" in fourth-grade primary school

2. methods

2.1. Research Design

This study employs a quantitative approach with a quasi-experimental method. The quasi-experimental method is used to determine the effect of a specific treatment on the variables under study in situations where full control over all research variables is not possible [15], [16]. The specific research design utilized is the **One-Group Pretest-Posttest Design**. This design involves a single sample group that is given an initial test (pretest), followed by a treatment in the form of learning using the experimental method, and concludes with a final test (posttest). The difference between the pretest and posttest results is analyzed to determine the effect of the experimental method on student learning outcomes.

2.2. Research Location and Time

This study was conducted at SDN 4 Dawuan, Cirebon Regency, during the even semester of the 2025/2026 academic year. The research took place from February to March 2026. The selection of this research site was based on preliminary observations, which indicated that fourth-grade students' science learning outcomes regarding the topic "force can alter the motion of an object" were still relatively low. Furthermore, the existing science instruction was still dominated by conventional methods, meaning that the experimental method had not yet been optimally implemented

2.3. Population and Sample

The population of this study consisted of all students at SDN 4 Dawuan, Cirebon Regency, during the 2025/2026 academic year, totaling 177 students [16]. The research sample comprised all fourth-grade students, totaling 35 students. The sampling technique employed was saturated sampling (total sampling), a method in which every member of the target population is included in the sample [16]. This technique was selected because the number of research subjects was relatively limited, allowing all fourth-grade students to serve as respondents in the study.

2.4. Research Variables

This study involves two variables: an independent variable and a dependent variable. The independent variable in this study is the experimental method (X), which is an instructional method that directly engages students in activities such as experimenting, observing, recording data, discussing, and drawing conclusions. The dependent variable is the students' science learning outcomes (Y) on the topic "force can alter the motion of an object." Learning outcomes were measured within the cognitive domain, specifically covering the abilities to apply (C3), analyze (C4), evaluate (C5), and create (C6) [1], [2].

2.5 Research Instruments and Data Collection Techniques

The research instrument used in this study was a learning outcome test in the form of multiple-choice questions. The test was administered in two stages: a pretest prior to the implementation of the experimental method, and a posttest following the treatment. The test specifications (kisi-kisi soal) were developed based on the learning indicators for the topic "force can alter the motion of an object," encompassing the cognitive domains from C3 to C6. Data collection techniques included testing and documentation. The documentation technique was employed to obtain supporting data, including student records, instructional plans (perangkat pembelajaran), and photographic evidence of the research activities.

2.6. Instrument Testing

The research instrument was tested beforehand to determine its feasibility. The instrument testing included validity, reliability, item difficulty, and item discrimination tests. The validity test was conducted using Pearson's Product-Moment Correlation, while the reliability test used the Cronbach's Alpha coefficient.

The statistical data processing for the instrument testing was performed using SPSS software to ensure a valid and reliable instrument for the study.

2.7. Data Analysis Techniques

The research data were analyzed using both descriptive and inferential statistics. Descriptive statistical analysis was employed to determine the mean, minimum value, maximum value, and standard deviation of the pretest and posttest results. To determine the distribution of the research data, a normality test was conducted using the Shapiro-Wilk test. Hypothesis testing was performed using the Paired-Samples t-Test since the data were obtained from the same group before and after the treatment. Additionally, the Normalized Gain (N-Gain) analysis was utilized to determine the level of improvement in student learning outcomes following the implementation of the experimental method. The entire data analysis process was conducted using SPSS software at a significance level of 0.05 ($\alpha = 0.05$).

3. Results and Discussion

Research Findings

This study was conducted with 35 fourth-grade students at SDN 4 Dawuan. Prior to the instructional activities, all students took a pretest to determine their initial ability on the topic "force can alter the motion of an object." This pretest served as a baseline to assess the students' level of understanding before they received the treatment, which consisted of learning through the experimental method. Following the pretest, the learning process was carried out by implementing the experimental method, which directly engaged students in hands-on activities. Students were divided into several groups and given the opportunity to observe the effects of force on the motion of objects. The learning process concluded with a posttest to evaluate the students' learning outcomes after participating in the experimental-based lessons.

During the learning process, students demonstrated more active participation compared to their behavior before receiving the treatment. The experimental activities provided students with the opportunity to observe directly how force can affect the motion of an object. Students appeared enthusiastic while conducting experiments with their groups and actively discussed their findings to reach observational conclusions. Several students who were previously inactive began to confidently ask questions and express their opinions during the activities. Cooperation among group members also improved significantly, as each student had a specific task in conducting the experiments. These conditions indicate that the experimental method is capable of creating a more engaging learning environment and encouraging student involvement in the learning process.

The pretest results showed that the students' initial ability on the topic "force can alter the motion of an object" was still relatively low. The pretest data indicated that of the 35 students who took the test, 21 students (60.00%) had not yet achieved mastery learning (ketuntasan belajar). Only 14 students (40.00% of the total research participants) achieved passing marks. The mean score obtained by the students on the pretest was 4.34, with a minimum score of 0 and a maximum score of 9. These results indicate that most students still struggled to comprehend concepts related to the influence of force on the motion of objects. This condition illustrates that the students' initial understanding was still in the low category

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Table 1 Student Pretest Results

Kategori	Skor	Jumlah	Presentase
Belum Tuntas	0-50	21 siswa	60,00%
Tuntas	60-100	14 siswa	40,00%

The posttest results showed an improvement in learning outcomes after the students participated in learning activities using the experimental method. The obtained data indicated that 23 students (65.71%) had achieved mastery learning (*ketuntasan belajar*). The number of students who had not yet achieved mastery decreased to 12 students (34.29% of the total research participants). The mean posttest score obtained by the students was 6.14, with a minimum score of 1 and a maximum score of 10. This improvement indicates that students gained a better understanding after being directly involved in the experimental activities. These findings suggest that the experimental method

contributes positively to enhancing student learning outcomes on the topic studied

Table 2 Student Pretest Results

Kategori	Skor	Jumlah	Presentase
Belum Tuntas	0-50	12 siswa	34,29%
Tuntas	60-100	23 siswa	65,71%

A comparison between the pretest and posttest results indicates a clear improvement in learning outcomes following the implementation of the experimental method. The students' mean score increased from 4.34 on the pretest to 6.14 on the posttest. The number of students who achieved mastery learning also increased from 14 to 23 students. The maximum score, which was initially 9, rose to 10 after the treatment was administered. Similarly, the minimum score, which previously stood at 0, increased to 1 in the posttest results. These data demonstrate that instruction using the experimental method is capable of improving student learning outcomes on the topic "force can alter the motion of an object.".

Tabel 3 Comparison of Students' Pretest and Posttest Results

Kategori	Skor	*Pretest*	*Posttest*
Belum Tuntas	0-50	21 siswa (60,00%)	12 siswa (34,29%)
Tuntas	60-100	14 siswa (40,00%)	23 siswa (65,71%)

The research instruments used were first tested to ensure their suitability as data collection tools. Instrument testing included validity and reliability tests for all questions used in the study. The results of the validity test showed that all pretest and posttest questions had calculated r values greater than the table r. All questions used in the study were declared valid and able to measure the aspects to be studied. The results of the reliability test showed a Cronbach's Alpha value of 0.740 for the pretest instrument and 0.721 for the posttest instrument. These values are greater than 0.60, so all instruments were declared reliable and suitable for use in the study.

Tabel 4 Hasil Uji Validitas dan Reliabilitas Instrumen

Instrumen	Jumlah Soal	Rentang r Hitung	r Tabel	Keterangan Validitas	*Cronbach's Alpha*	Keterangan Reliabilitas
Pretest	10	0,457-0,616	0,334	Seluruh soal valid	0,740	Reliabel
Posttest	10	0,503-0,619	0,334	Seluruh soal valid	0,721	Reliabel

Descriptive statistical analysis was conducted to provide an overview of the research data before and after the treatment was given. The analysis results showed that the average pretest score was 4.34 with a standard deviation of 2.74. Posttest data showed an average score of 6.14 with a standard deviation of 2.55. The higher average score on the posttest indicates an increase in learning outcomes after students participated in learning using the experimental method. The maximum score on the posttest was also higher than the maximum score on the pretest. These findings indicate a change in learning outcomes for the better after the application of the experimental method in the learning process..

Tabel 5 Descriptive Statistical Analysis Results

Variabel	N	*Minimum*	*Maksimum*	*Mean*	*Std. Error*	*Std. Deviation*
Pretest	35	0,00	9,00	4,3429	0,46371	2,74336
Posttest	35	1,00	10,00	6,1429	0,43220	2,55692
Valid N (*listwise*)	35	-	-	-	-	-

A normality test was conducted to determine whether the research data were normally distributed. The Shapiro-Wilk test was used because the sample size was less than 50 students. The analysis results showed a significance value of 0.057 for the pretest data and 0.103 for the posttest data. The significance values for both data groups were greater than 0.05. These results indicate that the research data were normally distributed and met the requirements for parametric statistical testing. This condition allowed for further data analysis using hypothesis testing appropriate to the research design.

Tabel 6 Hasil Uji Normalitas

Data	*Sig. Shapiro-Wilk*	Keterangan
Pretest	0,057	Normal
Posttest	0,103	Normal

Hypothesis testing was conducted using a Paired Sample t-Test to determine differences in student learning outcomes before and after treatment. The analysis results showed a significance value (Sig. 2-tailed) of 0.000. This value is smaller than the significance level of 0.05 that has been set in the study. These results indicate that there is a significant difference between the pretest and posttest scores. The increase in average scores that occurred after treatment indicates that the experimental method has an impact on student learning outcomes. This finding shows that learning involving

experimental activities can help students understand the material better than before the treatment was given.

Tabel 7 Paired Sample t-Test Results

Data	Mean Difference	T	df	Sig. (2-tailed)	Keterangan
Pretest Posttest	-1,82857	-8,357	34	0,000	Signifikan

An N-Gain analysis was conducted to determine the level of improvement in student learning outcomes after participating in learning using the experimental method. The analysis results showed that the average N-Gain value was 0.3828. This value is in the moderate category based on the N-Gain interpretation criteria. These results indicate that the application of the experimental method was able to improve student learning outcomes with a fairly good level of improvement. The improvement obtained indicates a change in student abilities after participating in the learning process that involved direct experimental activities. This finding confirms the results of the previous analysis which showed an increase in learning outcomes after the application of the experimental method..

Tabel 8 N-Gain Analysis Results

N	*Minimum*	*Maximum*	*Mean N-Gain*	Kategori
35	0,00	1,00	0,3828	Sedang

3.2. Discussion

3.2.1. Students' Science Learning Outcomes Before Applying the Experimental Method to the Material: Force Can Change the Motion of an Object

Based on the research findings, the fourth-grade students' science learning outcomes prior to the implementation of the experimental method were relatively low. The pretest results indicated that the majority of the students had not achieved the established mastery learning criteria. The mean pretest score of 4.34 demonstrated that the students' initial understanding of the topic "force can alter the motion of an object" was not yet optimal. Furthermore, the number of students who had not achieved mastery was greater than those who had. This situation shows that most students still encountered difficulties in understanding concepts related to the influence of force on the motion of objects, illustrating that the students' initial ability before receiving the treatment was in the low category.

The low student learning outcomes before the treatment were presumably caused by the instructional process, which remained predominantly teacher-centered. Students mostly received information through the teacher's explanations without being given the opportunity to conduct direct observations and experiments. Consequently, students tended to be passive during the learning process. Conceptual understanding acquired through the lecture method is often merely rote memorization, which is less effective in helping students understand the relationship between concepts and real-life phenomena. Instruction that fails to actively engage students can also diminish their interest and learning motivation. Ultimately, this condition results in low student learning outcomes [8], [14].

The topic "force can alter the motion of an object" requires students to understand cause-and-effect relationships by observing specific events. A conceptual understanding of this topic is more easily attained if students can directly witness and verify the process of motion changes caused by a force. Learning that relies solely on verbal explanations often makes it difficult for students to visualize the concepts being studied. Given that primary school students are still at the concrete operational stage of development, they require tangible learning experiences to construct a better understanding. Instructional activities that do not provide direct experience can hinder the process of understanding science concepts. The findings of this study highlight the need for a more active teaching method capable of directly engaging students in the learning process [6], [11].

3.2.2. Students' Science Learning Outcomes After Applying the Experimental Method to the Material: Force Can Change the Motion of an Object

The research findings indicate an improvement in student learning outcomes following the implementation of the experimental method in science learning. This improvement is evident from the posttest mean score, which is higher than the pretest mean score. The number of students who achieved mastery learning also increased after the completion of the learning process. These results demonstrate that the experimental method is capable of helping students better understand the material being studied. The observed improvement in learning outcomes indicates that students gained a more meaningful learning experience during the instructional activities. This condition suggests that the experimental method can serve as an effective alternative instructional approach for the topic "force can alter the motion of an object."

The improvement in student learning outcomes occurred because the experimental method provides opportunities for students to be directly involved in the learning process. Students do not merely receive information from the teacher; instead, they conduct observations, perform experiments, engage in discussions, and draw conclusions based on the results obtained. These activities help students construct conceptual understanding through first-hand, real-world experiences. Direct experiential learning allows students to understand the

relationship between theory and the phenomena occurring in their surrounding environment. An instructional process that actively involves student activities can also stimulate curiosity and learning motivation. Consequently, this leads to a better understanding of the learning material compared to before [6], [20].

Furthermore, instruction utilizing the experimental method creates a more engaging and enjoyable learning atmosphere for students. Students become more active in asking questions, participating in discussions, and expressing their opinions throughout the learning activities. The active involvement of students at each stage of learning helps improve their concentration and attention toward the material being studied. Experimental activities allow students to verify the concepts they are studying first-hand, making the acquired knowledge more meaningful. The findings of this study are in line with previous research stating that the experimental method can enhance conceptual understanding, science process skills, and student learning outcomes in science education [10], [21]. Similar findings also indicate that students' direct involvement in experimental activities can help improve the quality of learning and the achievement of learning outcomes [7], [22].

3.2.3. The Influence of Experimental Methods on Student Learning Outcomes on the Material Force Can Change the Motion of an Object

Berikut adalah terjemahan bagian akhir pembahasan dan kesimpulan tersebut ke dalam bahasa Inggris akademik yang baik, benar, dan sesuai dengan standar penulisan jurnal ilmiah:

Data analysis results indicate that the experimental method influences the science learning outcomes of fourth-grade students regarding the topic "force can alter the motion of an object." This influence is reflected in the improvement of the students' mean scores between the pretest and posttest. The number of students who achieved mastery learning also increased following the implementation of the experimental method. The N-Gain analysis result of 0.3828 indicates that the improvement in learning outcomes falls into the medium category. These findings demonstrate that the experimental method contributes to enhancing students' understanding of force and motion concepts. The results of this study show that learning involving direct experience is more effective than instruction that relies solely on teacher-centered material delivery.

The hypothesis testing using the Paired-Samples t-Test yielded a significance value of 0.000, which is less than 0.05 ($p < 0.05$). This result indicates a significant difference between the pretest and posttest scores. The improvement in learning outcomes is not only evident descriptively but is also statistically proven. This finding demonstrates that the treatment, in the form of implementing the experimental method, exerts a significant influence on student learning outcomes. Experimental activities help students comprehend concepts through the process of direct discovery and verification, thereby making the learning experience more meaningful. Understanding acquired through hands-on experience tends to be easier to retain and apply in different situations [11], [18].

The findings of this study are in line with research conducted by Putri, which states that the experimental method has a positive and significant effect on primary school students' science learning outcomes [4]. Other research findings also indicate that the application of the experimental method can enhance science process skills and student learning outcomes compared to conventional instruction [7], [21]. The use of the experimental method provides opportunities for students to actively participate in every stage of learning, ensuring that the knowledge gained is not merely theoretical. The experimental activities performed by students help them understand concepts more deeply through concrete learning experiences. Learning that involves direct activities can also increase students' learning motivation and curiosity toward the material studied [20], [22]. These findings reinforce the results of this study, confirming that the experimental method is an effective instructional approach to improve primary school students' science learning outcomes.

Based on all the research results obtained, it can be concluded that the experimental method exerts a positive influence on students' science learning outcomes on the topic "force can alter the motion of an object." The implementation of the experimental method can enhance students' conceptual understanding through direct observation and experimental activities [19]. The improvement in student learning outcomes is demonstrated by an increase in mean scores, a higher number of students achieving mastery learning, and statistical testing that shows a significant effect. Furthermore, the experimental method is capable of creating a more active, engaging, and student-centered learning environment. Students' active involvement in the learning process provides a more meaningful experience compared to instruction that only focuses on verbal material delivery. Therefore, the experimental method can be utilized as an effective alternative instructional approach to improve science learning outcomes in primary schools.

4. Conclusion

Based on the research findings, it can be concluded that the science learning outcomes of fourth-grade students at SDN 4 Dawuan on the topic "force can alter the motion of an object" prior to the implementation of the experimental method were relatively low. The pretest results showed a mean score of 4.34, with the majority of students not yet achieving mastery learning. This condition indicates that the students' initial understanding

of the topic was not yet optimal before receiving the instructional treatment using the experimental method.

The results of the study demonstrate that the students' science learning outcomes improved after the implementation of the experimental method. This improvement is indicated by a posttest mean score of 6.14, which is higher than the pretest mean score of 4.34. The number of students who achieved mastery learning also increased from 14 students in the pretest to 23 students in the posttest. The N-Gain analysis result of 0.3828 falls into the medium category, indicating that the experimental method is capable of enhancing student learning outcomes on the topic "force can alter the motion of an object."

The implementation of the experimental method is proven to have a significant effect on the science learning outcomes of fourth-grade students at SDN 4 Dawuan. The Paired-Samples t-Test results yielded a significance value of 0.000 ($p < 0.05$), thus rejecting the null hypothesis (H_0) and accepting the alternative hypothesis (H_a). This finding indicates that the experimental method can be used as an effective instructional alternative to improve science learning outcomes in primary schools. Future research is recommended to utilize a control group and a larger sample size so that the effects of the experimental method can be analyzed more comprehensively. Subsequent studies could also expand this research to other science topics or measure aspects such as science process skills, critical thinking, and students' learning motivation.

References

[1] Aisyah, A. (2024). Penerapan metode *ice breaking* dalam meningkatkan hasil belajar siswa mata pelajaran pendidikan agama Islam, 2(2), 22–27.

[2] Angelia, N. (2024). Meningkatkan motivasi dan hasil belajar siswa kelas VIII pada mata pelajaran seni musik melalui implementasi model pembelajaran *Problem Based Learning* (PBL), 255–260.

[3] Dakhi, A. S., & Selatan, N. (2020). Peningkatan hasil belajar siswa, 8(2), 468–470.

[4] Putri, F. D. A. (2026). Pengaruh metode eksperimen terhadap hasil belajar IPA materi perubahan wujud benda siswa kelas III SD Negeri 17 Kota Pekanbaru, 7(1), 99–104.

[5] Fernando, Y., Andriani, P., & Syam, H. (2024). Pentingnya motivasi belajar dalam meningkatkan hasil belajar siswa, 2(3), 61–68.

[6] Ma'viyah, A. (2021). Metode eksperimen dalam pembelajaran sains untuk anak usia dini (*Experimental methods in science learning for e1arly childhood*), 3, 97–101.

[7] Noor, T. A., Julkarnaen, R. H., & Febriani, W. D. (2024). Penerapan metode eksperimen dalam pembelajaran IPA untuk meningkatkan keterampilan proses sains, 2(2), 109–110.

[8] Nur Rahmah, N. A. (2023). Analisis kesulitan belajar siswa sekolah dasar pada pembelajaran ilmu pengetahuan alam, 7(3), 929–956. https://doi.org/10.26811/didaktika.v7i3.1264

[9] Nurhayati Pakpahan, N., Napitupulu, R. P., & F. M. B. P. (2024). Pengaruh model pembelajaran *Team Games Tournament* terhadap hasil belajar siswa kelas V pada subtema 1 peristiwa kebangsaan masa penjajahan, 2(2), 212–238.

[10] Padila, H., Ngali, M., Makmun, Z., & Laili, N. (2025). Penerapan metode eksperimen sederhana pada mata pelajaran IPAS materi fotosintesis untuk meningkatkan hasil belajar siswa kelas IV SDNU Metro, 14, 441–451.

[11] Pinasthika, R. P., & Kaltsum, H. U. (2022). Analisis penggunaan metode eksperimen pada pembelajaran IPA di sekolah dasar, 6(4), 6558–6566.

[12] Rahmawati, D., Fitri, R., Matheos, Y., & Malaikosa, L. (2025). Analisis pemanfaatan metode eksperimental dalam mengembangkan keterampilan sains pada anak usia dini, 8, 1974–1982.

[13] Ramdani, N. G. (2023). Definisi dan teori pendekatan, strategi, dan metode pembelajaran, 2(1), 20–31.

[14] Safira, C. A., Setyawan, A., & Citrawati, T. (2020). Identifikasi permasalahan pembelajaran IPA pada siswa kelas III SDN Buluh 3 Socah, 10, 23–29.

[15] Saputra, D. (2025). Pengertian, fungsi, faktor penentu nilai akhir, serta skala pengukuran dan penilaian dalam evaluasi pendidikan, 9, 16746–16753.

[16] Saputra, N. (n.d.). *Metodologi penelitian kuantitatif.*

[17] Sarahono, F. R., Lase, A., Laoli, B., & Laoli, E. S. (2024). Penerapan model pembelajaran *Self Directed Learning* (SDL) untuk meningkatkan hasil belajar siswa, 5(2), 218–224. https://doi.org/10.30596/jppp.v5i2.20962

[18] Setiani, S., Susetyo, I., Wardhani, K., Santosa, A. B., William, N., & Pratiwi, D. J. (2022). Pengaruh model pembelajaran *Contextual Teaching and Learning* berbasis eksperimen terhadap literasi sains siswa kelas V SDN 1 Sukorame, 3(1), 1–9. https://doi.org/10.55933/tjripd.v3i1.364

[19] Sukma, Y. L., & Subekti, E. E. (2024). Penerapan metode eksperimen pada materi rangkaian listrik siswa sekolah dasar, 4(April), 149–154.

[20] Susilowati, D. (2023). Peningkatan keaktifan belajar peserta didik melalui implementasi metode eksperimen pada mata pelajaran IPAS, 17(1), 186–196. https://doi.org/10.30595/jkp.v17i1.16091

[21] Wilani, W., & Marjo, H. K. (2025). Implementasi metode eksperimen pada pembelajaran IPA untuk meningkatkan hasil belajar dan keterampilan proses siswa kelas VI SD, 4(3), 608–619.

[22] Budianti, Y., & F. M. (2021). Penerapan metode eksperimen sebagai alternatif solusi untuk meningkatkan pemahaman konsep pada mata pelajaran IPA siswa sekolah dasar, 9(2), 29–41.