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ENHANCING HIGH SCHOOL STUDENT ENGAGEMENT AND ACADEMIC ACHIEVEMENT: THE ANALYSIS OF THE PRACTICE REHEARSAL PAIRS METHOD

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Abstract
Low student engagement and suboptimal academic achievement remain persistent challenges in secondary education. In response, this study aimed to examine the effectiveness of the Practice Rehearsal Pairs (PRP) method in simultaneously enhancing student engagement and academic performance in a physics learning context. Utilizing a quasi-experimental design with a non-equivalent control group, the study involved 72 tenth-grade students from State Senior High School 5 Tanjung Balai, divided equally into experimental and control classes. Data on student engagement were collected through structured observation using a five-category engagement rubric, while academic achievement was assessed through pretest and posttest scores. The analysis employed descriptive statistics, paired sample t-tests, normalized gain (N-Gain), and Multivariate Analysis of Variance (MANOVA) to determine both separate and simultaneous effects of the intervention. Findings revealed that the PRP method significantly improved student engagement, with the experimental group shifting from predominantly "very less active" to 94.45% categorized as "active" or "very active." Academic performance also increased markedly, with a mean posttest gain of 17.92 points and an N-Gain score of 0.5463, categorized as medium and quite effective. MANOVA results indicated a statistically significant simultaneous effect on both engagement and achievement (Wilks' Lambda = 0.057, $p < 0.001$). These results suggest that PRP is an effective pedagogical strategy for fostering meaningful participation and cognitive gains in science education.

Keywords: Practice rehearsal pairs method, engaged learning, academic achievement

Introduction

In the current era of educational transformation, improving the quality of student engagement and academic achievement has become a critical agenda for educators, policymakers, and researchers worldwide (Bhardwaj et al., 2021; Carroll et al., 2021; Muthmainnah et al., 2023). Despite the widespread integration of competency-based curricula and student-centered pedagogies, the implementation of such approaches in actual classroom settings remains uneven and often ineffective (Adam et al., 2024; D'Angelo, 2021). One persistent challenge in secondary education is the low level of student engagement, which is frequently manifested through disinterest, passivity, and poor academic performance (Mekki et al., 2022; Schnitzler et al., 2021). Engagement, which encompasses behavioral, emotional, and cognitive dimensions, is a vital predictor of students' learning success and long-term academic development (Fredricks et al., 2005). Nevertheless, empirical findings reported by

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Baghoussi (2021) demonstrate that conventional instructional approaches, with an emphasis on teacher-based methods, remain prevalent in classroom practices. Such teacher-centered approaches, while efficient in content delivery, often fail to stimulate active participation, hinder student autonomy, and suppress collaborative learning potentials (Spooner, 2015).

Empirical findings from diverse educational contexts have consistently underscored the correlation between student engagement and improved academic achievement. For instance, Zheng & Warschauer (2015) reported that students who actively participate in learning activities tend to achieve higher academic outcomes compared to their disengaged peers. In response to this challenge, a variety of interactive learning methods have been introduced, including peer teaching, cooperative learning, and dialogic instruction. One such strategy that has gained scholarly attention is the Practice Rehearsal Pairs (PRP) method, which involves structured student pairing, repeated explanation rehearsal, and reciprocal feedback (Wibowo, 2020). According to research conducted by Syamsiah (2024), this method enhances students' learning outcomes when this method was implemented in biology classrooms. Despite these promising findings, the implementation of PRP in the Indonesian high school context, particularly within Pancasila Education, remains scarce and largely under-researched.

A preliminary study conducted by the researchers on September 06, 2024, at State Senior High School 5 Tanjung Balai, employing observations and unstructured interviews, found that the prevailing learning method employed by Pancasila Education teachers relied almost exclusively on one-way lecturing and textbook copying, resulting in widespread student boredom, fatigue, and disengagement. Of 36 students observed in class X.3, only 15 remained consistently seated during instruction, with the majority exhibiting classic indicators of disengagement such as frequent toilet breaks, leaning on the wall, yawning, and even falling asleep during class. These behaviors align with findings by Sitanggang et al. (2025), who noted that monotonous instructional methods significantly correlate with decreased attention span. Furthermore, interviews revealed that teachers had not fully utilized available professional development opportunities, whether school-organized or provided via national platforms such as the Merdeka Teaching Platform (PMM), thereby impeding pedagogical innovation and responsiveness to student needs.

These conditions highlight an urgent need for pedagogical reform and the systematic adoption of instructional models that can re-engage learners and revitalize classroom interactions. The PRP method, by promoting active listening, reciprocal explanation, and collaborative rehearsal, offers a theoretically grounded and empirically supported avenue to address these issues. However, without rigorous evidence of its effectiveness in improving student activeness and learning outcomes, particularly in Indonesian Pancasila Education classes, its broader applicability and impact remain speculative. Addressing this empirical void is not only a scholarly imperative but a pedagogical necessity, particularly in an educational landscape struggling with low student motivation and achievement. Therefore, this study aims to examine the effect of the Practice Rehearsal Pairs method on the activeness and learning outcomes of students quantitatively, thereby contributing to evidence-based pedagogical practices and supporting efforts to transform conventional classroom instruction into a more engaging, effective, and student-centered learning experience.

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Literature Review

Practice rehearsal pairs

The Practice Rehearsal Pairs (PRP) method is a pedagogical strategy that emphasizes collaborative rehearsal and reciprocal feedback between students working in pairs (Kamidi, 2019). This method is deeply rooted in cooperative learning theories, which suggest that social interaction enhances cognitive development and knowledge construction (Istarani, 2014). In alignment with this, Zaini et al. (2008) contends that cooperative learning models, particularly those incorporating Practice Rehearsal Pairs (PRP), effectively cultivate individual accountability and foster positive interdependence, both of which are recognized as critical components in the design of robust practice-assisted learning frameworks. Empirical evidence substantiates these theoretical perspectives. For instance, Yendoris & Ardi (2023) demonstrated that the implementation of Practice Rehearsal Pairs (PRP) led to significant improvements in students' conceptual understanding and engagement within english learning environments. In a similar vein, Mega (2019) reported that the integration of PRP fostered enhanced students, speaking skills viewed from motivation and cultivated more positive attitudes toward learning. These empirical findings underscore the pedagogical potential of PRP, not merely as a rehearsal strategy, but as a comprehensive instructional framework that harnesses the principles of social learning to promote deeper cognitive engagement and improved conceptual mastery.

Academic Achievement

Academic achievement is commonly defined as the extent to which students attain the intended learning outcomes, typically measured through assessments such as tests, assignments, and grades (Ardovino et al., 2000). Moore (2014) argued that mastery of cognitive skills depends largely on effective instructional design, which includes clearly defined objectives, ample practice opportunities, and timely feedback to facilitate progressive learning. Complementing this perspective, Chall (2002) emphasized that academic achievement results from a complex interplay of intellectual, motivational, and environmental factors, among which the quality of teaching and practice interactions play a pivotal role. The Practice Rehearsal Pairs (PRP) method exemplifies these principles by encouraging repeated rehearsal and meaningful peer interaction, thereby fostering deeper cognitive processing and sustained motivation. Empirical studies support this theoretical alignment. For example, Xu et al. (2023) demonstrated a positive correlation between student engagement and higher academic achievement across various disciplines. That findings affirm that academic achievement is influenced not only by individual capabilities but also critically dependent on instructional approaches that actively involve students in their learning process.

Methodology

Research design and approach of the study

This study employs a quasi experimental design to examine the effectiveness of the Practice Rehearsal Pairs (PRP) method in enhancing high school students' engagement and academic

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achievement. A quasi experimental approach is appropriate in educational settings where full randomization is not feasible due to institutional constraints. According to Creswell & Creswell (2017), quasi experimental designs involve the use of pre existing groups without random assignment while still allowing researchers to examine causal relationships through comparison of outcomes. In this study, two intact classes were selected purposively from State Senior High School 5 Tanjung Balai. One class was assigned as the experimental group, which received instruction using the PRP method, while the other class served as the control group, which was taught using conventional methods. The research procedure followed a pretest posttest nonequivalent control group design, in which both groups were administered a pretest to assess baseline academic achievement and engagement levels prior to the intervention.

Research site and participants

The research was conducted in SMAN 5 Tanjungbalai. This site support obtaining findings in accordance with the research problem and purpose of the research. Sampling in this study using non-probability sampling technique with purposive sampling type, the samples in this study were X.3 class students totaling 36 people and acted as experimental class and X.4 class totaling 36 people who acted as control class, so that the total sample size of this study was 72 students. The two classes were chosen because of the same number of students and have the same liveliness and average daily exam results of 75.75.

Tabel 1. *Description of participants*

Classification	Experiment class	Control class	Total Samples = 72 Participants
Male	17 participants	16 participants	
Female	19 participants	20 participants	
Total	36 participants	36 participants	
Average Score	75,75	75,75	

Data collection and analysis

The data collection technique in this study was conducted using a test instrument, consisting of 20 multiple-choice questions designed to measure students' cognitive learning outcomes before and after the implementation of the Practice Rehearsal Pairs (PRP) method. Both the pretest and posttest were administered to students in the experimental and control groups to assess learning achievement in a quantifiable manner.

The data analysis procedure was conducted through several statistically rigorous steps. Initially, descriptive quantitative analysis was used to summarize students' engagement and learning outcomes, including measures of central tendency and dispersion, to provide an overview of their performance before and after the intervention. Paired sample t-tests were performed to assess the statistical significance of differences between pretest and posttest scores within the experimental group, providing an appropriate method to evaluate the intervention's effect over time despite the absence of random assignment. To further interpret the magnitude of student learning improvement, the

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normalized gain score (N-Gain) was calculated. The interpretation of the N-Gain scores is presented in Table 2, while the effectiveness categories based on the N-Gain percentages are shown in Table 3.

Table 2. *Interpretation of N-Gain score*

N-Gain Range (*g*)	Interpretation
(g) > 0.70	High
0.31 ≤ (g) ≤ 0.70	Medium
(g) < 0.30	Low

(Meltzer, 2002)

Table 3. *Effectiveness categories based on N-Gain percentage*

N-Gain Percentage (%)	Effectiveness Category
81 – 100	High Effective
61 – 80	Effective
41 – 60	Quite Effective
21 – 40	Not Effective
≤ 20	Very Ineffective

(Meltzer, 2002)

In addition, a Multivariate Analysis of Variance (MANOVA) was employed to examine the simultaneous effects of the Practice Rehearsal Pairs method on two interrelated dependent variables: student engagement and academic achievement. According to Dattalo (2013), a p-value less than 0.05 for any of these statistics indicates a statistically significant multivariate effect of the independent variable on the combined dependent variables..

Findings

Findings on the enhancement of student engagement

One of the core objectives of this study was to examine whether the Practice Rehearsal Pairs method could meaningfully improve student engagement during classroom learning activities. Engagement was observed across three time points: before the intervention (initial), during the first meeting, and after the second meeting. To explore this, students were categorized into five levels of engagement: very active, active, moderately active, less active, and very less active. The comparison of engagement distributions across time points is presented in Table 4, which shows the percentage of students in each engagement category at each observation stage.

Table 4. *Student engagement category in control and experimental classes*

Engagement Category	Initial (%)		1st Meeting (%)		2nd Meeting (%)	
	Control	Experimental	Control	Experimental	Control	Experimental
Very active	0.00	0.00	0.00	0.00	0.00	5.56
Active	2.78	2.78	2.78	50.00	0.00	88.89
Moderately Active	5.56	2.78	8.33	13.89	0.00	5.56
Less Active	8.33	8.33	27.28	36.11	27.28	0.00
Very Less Active	83.33	86.11	61.11	0.00	72.22	0.00

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Table 4 shows that prior to the intervention, both the control and experimental classes had a dominant proportion of students in the "Very Less Active" category, with 83.33 percent and 86.11 percent respectively. After the second meeting, a remarkable shift was observed in the experimental class. Nearly 89 percent of the students were categorized as "Active," and an additional 5.56 percent reached the "Very Active" category. In contrast, the control class saw minimal improvement, with 72.22 percent of students still remaining in the "Very Less Active" category.

To verify whether these observed shifts in engagement were statistically significant, a paired sample t-test was conducted. This test compared student engagement scores before and after the intervention within each group to determine the presence of any meaningful changes. The results of the test are presented in Table 5.

Table 5. *Paired sample t-test results for engagement*

Group Class	Mean Difference	t	df	Sig. (2-tailed)
Control	0.00	0.000	35	1.000
Experimental	-30.47	-17.283	35	0.000

As shown in the Table 5, the control class exhibited no significant change in engagement, with a mean difference of 0.00 and a p-value of 1.000. In contrast, the experimental class showed a statistically significant increase in engagement after the implementation of the Practice Rehearsal Pairs method, with a mean difference of 30.47 and a highly significant p-value ($p < 0.001$). These findings confirm that the method had a meaningful and measurable positive effect on students' engagement in the learning process.

Findings on the Enhancement of Academic Achievement

In addition to engagement, this study also sought to evaluate the impact of the Practice Rehearsal Pairs method on students' academic achievement. Learning outcomes were measured through pretest and posttest scores administered to both the control and experimental classes. The goal was to identify whether the method resulted in a statistically and pedagogically significant improvement in student performance. A summary of the average pretest and posttest scores, along with the difference in means for both groups, is presented in Table 6.

Table 6. *Pretest and posttest scores*

Group Class	Mean Scores		
	Pretest	Posttest	Difference
Control	69.78	67.50	-2.28
Experimental	67.92	85.84	+17.92

As seen in the Table 6, both groups started with comparable pretest scores, indicating a relatively similar level of initial academic ability. However, after the intervention, the experimental class showed a substantial increase in posttest scores, with a gain of 17.92 points. On the other hand, the control class experienced a slight decline in performance, with a decrease of 2.28 points. To determine whether

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these changes were statistically significant, a paired sample t-test was performed within each group. The results of this analysis are shown in Table 7.

Table 7. *Paired sample t-test for academic achievement*

Group Class	Mean Difference	t	df	Sig. (2-tailed)
Control	+2.28	1.543	35	0.132
Experimental	-17.92	-14.913	35	0.000

Based on Table 7, the control group did not exhibit a statistically significant difference between pretest and posttest scores ($p = 0.132$). In contrast, the experimental class demonstrated a highly significant improvement in academic achievement, with a p-value less than 0.001 and a large mean difference of 17.92 points. To further evaluate the magnitude of the learning gain in the experimental group, an N-Gain analysis was conducted. The results are presented in Table 8.

Table 8. *N-gain score for academic achievement (experimental class)*

Indicator	Value	Interpretation/ Category
N-Gain Range (*g*)	0.5463	Medium
N-Gain Percentage (%)	54.63%	Quite Effective

Based on the normalized gain score in Table 8, the academic improvement of students in the experimental class falls within the medium category, with a gain percentage of 54.63%, which is considered quite effective. These results support the conclusion that the Practice Rehearsal Pairs method significantly enhanced students' academic achievement in the learning process.

Findings of the Multivariate Analysis on the Practice Rehearsal Pairs Method

To evaluate the combined effect of the Practice Rehearsal Pairs method on both student engagement and academic achievement, a Multivariate Analysis of Variance (MANOVA) was conducted. This analysis was chosen to assess whether the method had a statistically significant simultaneous impact on the two interrelated dependent variables. MANOVA provides a more comprehensive view of the treatment effect by considering potential correlations between the variables. The multivariate test results are summarized in Table 9 below.

Table 9. *N-gain score for academic achievement (experimental class)*

Test	Value	F	df1	df2	Sig. (p)
Wilks' Lambda	0.057	570.180	2	69	0.000
Pillai's Trace	0.943	570.180	2	69	0.000
Hotelling's Trace	16.527	570.180	2	69	0.000
Roy's Root	16.527	570.180	2	69	0.000

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As indicated in the Table 9, all four multivariate statistics yielded highly significant results ($p < 0.001$). Both Wilks' Lambda and Pillai's Trace confirm that the observed differences between the experimental and control groups across the two dependent variables are not due to chance. Wilks' Lambda, in particular, had a value of 0.057, suggesting a strong multivariate effect of the intervention. To understand the contribution of each dependent variable to this overall effect, univariate analyses were conducted. These results are summarized in Table 10.

Table 10. *Tests of between-subjects effects*

Dependent Variable	F	Sig. (p)	R^2 (Adjusted)
Student Engagement (Y_1)	1078.491	0.000	0.938
Academic A(Y_2)	196.977	0.000	0.734

The univariate results in Table 10 indicate that the Practice Rehearsal Pairs method had a very strong effect on student engagement, accounting for 93.8% of the variance in engagement scores (Adjusted $R^2 = 0.938$), which reflects a substantial proportion of the variability explained by the intervention. Similarly, the method had a strong effect on academic achievement, explaining 73.4% of the variance in posttest scores (Adjusted $R^2 = 0.734$). These high values of adjusted R^2 demonstrate that the method not only produced statistically significant differences but also explained a large amount of variance in both key outcome variables, underscoring the practical and educational significance of the intervention. Both effects were statistically significant ($p < 0.001$).

In summary, the MANOVA findings demonstrate that the Practice Rehearsal Pairs method produced a significant and substantial simultaneous impact on student engagement and learning outcomes. These results reinforce the conclusion that the method is highly effective not only in enhancing individual learning dimensions but also in improving the overall quality of the learning experience.

Discussion

This study aimed to investigate the effectiveness of the *Practice Rehearsal Pairs* (PRP) method in enhancing both student engagement and academic achievement, as well as to examine the simultaneous influence of the method on both variables through multivariate analysis. The results of the study provide compelling evidence of the positive impact of PRP implementation in secondary education contexts. The descriptive and inferential analyses revealed that students in the experimental group experienced substantial gains in both engagement and achievement compared to those in the control group. The engagement levels of students increased dramatically, with 94.45% of learners categorized as "active" or "very active" by the second meeting, while the control group remained predominantly "very less active." This finding aligns with Fitriani et al. (2024), who found that PRP significantly improved student motivation and engagement in science learning.

The significant mean differences in academic achievement, supported by a paired sample t-test ($p < 0.001$), further validate the efficacy of PRP in supporting cognitive learning outcomes. These findings corroborate of Nurrika et al. (2016), who documented increased learning outcomes in ICT lessons. In both cases, the structured and repetitive practice embedded in PRP facilitated deeper understanding and better knowledge retention. The normalized gain (N-Gain) analysis in this study

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also showed that the PRP method was pedagogically effective, yielding a gain of 0.5463 (54.63%), categorized as medium and quite effective.

Importantly, the multivariate analysis (MANOVA) provided robust statistical evidence of the simultaneous effect of the PRP method on engagement and achievement. Wilks' Lambda was 0.057 with a significance value of 0.000, indicating a strong multivariate effect. This was further supported by Pillai's Trace (0.943) and large F-values across all multivariate tests. These findings strongly reject the null hypothesis and support the alternative, namely, that the PRP method significantly affects both dependent variables concurrently. Univariate follow-up analyses revealed that the PRP method explained 93.8% of the variance in student engagement and 73.4% in academic achievement, based on adjusted R^2 values.

Taken together, the findings of this study suggest that the *Practice Rehearsal Pairs* method is not only statistically significant but also pedagogically sound and theoretically grounded. It effectively addresses the dual challenge of increasing student participation while simultaneously raising learning outcomes. Therefore, it holds considerable promise for integration into instructional practices, especially in contexts where student passivity and low achievement persist as challenges.

Conclusion

The present study concludes that the Practice Rehearsal Pairs (PRP) method has a statistically and pedagogically significant impact on improving both student engagement and academic achievement. The findings demonstrate that students in the experimental group experienced a substantial increase in active participation and academic performance, as indicated by significant gains in engagement categories, higher posttest scores, and medium N-Gain effectiveness. Multivariate analysis further confirmed a strong simultaneous effect of the PRP method on both dependent variables, with large adjusted R^2 values (0.938 for engagement and 0.734 for achievement), thus providing robust support for the rejection of the null hypothesis. These results affirm the method's effectiveness not only in enhancing cognitive outcomes but also in promoting active, collaborative learning environments that align with socio-constructivist learning theories.

In light of these findings, it is recommended that educators incorporate the PRP method as an alternative instructional strategy, particularly in contexts where student engagement is low and traditional methods prove ineffective. Schools and teacher training programs should consider embedding practice-rehearsal techniques into lesson planning to encourage student-centered and interaction-rich learning. Furthermore, curriculum developers and policymakers may explore integrating PRP as part of broader active learning reforms, given its proven ability to foster both academic mastery and interpersonal competence. Future research may extend this work by exploring the long-term retention effects of PRP and its adaptability across subjects, educational levels, and diverse learner profiles.

Disclosure statement

No potential conflict of interest was reported by the authors.

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