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# Active Reading Experience and Classroom Engagement as Predictors of Academic Scholastic Performance in Physical Science

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**Abstract:** This study examined the predictive role of active reading experience and classroom engagement in determining academic performance in Physical Science among Grade 11 students. A total of 300 students from two public. Senior high schools in Bukidnon, Philippines, participated in the study. Standardized survey instruments were used to assess active reading experience (technology use, reading purpose, and physical strategies), classroom engagement (participation, involvement, and preparation), and academic performance.

Descriptive findings revealed that students demonstrated high levels of active reading and classroom engagement, particularly in goal-directed reading and application of physical strategies like summarizing and note-taking. Technology-assisted reading strategies were moderately utilized. Correlational analysis indicated a significant relationship between purposeful reading and academic performance, while regression analysis confirmed classroom engagement as a stronger predictor of academic success than active reading experience.

These findings highlight the importance of fostering student-centered, reflective, and interactive learning environments in science education. The study contributes to Sustainable Development Goal 4 (Quality Education) by offering evidence-based recommendations to enhance engagement and performance in Physical Science through strategic instructional practices.

**Keywords:** active reading experience, classroom engagement, academic performance, Physical Science, metacognition, secondary education, student motivation

## I. Introduction

Academic performance in Physical Science remains a significant challenge across various educational settings (El Qryefy et al., 2024). Many students struggle with understanding abstract concepts, solving complex problems, and applying scientific principles to real-world situations. Consequently, a considerable number of students demonstrate inadequate comprehension and skills in Physical Science, negatively impacting their overall academic performance and limiting their future opportunities in the scientific field (Zulkiffli et al., 2024).

Mastering Physical Science is not only important for academic achievement but also for personal and societal advancement. A strong foundation in this discipline equips students with critical thinking and problem-solving skills, as well as an enhanced understanding of the natural world. These skills are applicable in various aspects of life, fostering innovation, informed decision-making, and responsible citizenship. Furthermore, excelling in Physical Science opens up numerous higher education and career opportunities, especially in fields that are vital for economic growth and technological progress. Therefore, improving academic performance in Physical Science is essential for the success of individual students and the advancement of society as a whole (Zulkiffli et al., 2024).

To improve learning outcomes, academics are focusing more and more on finding the variables that have a major impact on students' academic success in certain courses. This study explores the intricate relationships between academic success in Physical Science and two important variables: classroom engagement and active reading experience (Puusepp et.al., 2024).

The research aims to provide insights that can guide targeted interventions to improve academic performance in Physical Science. Key findings of Boateng (2024) suggest that reading and writing activities promote students' active involvement in constructing knowledge through questioning, reflecting, and analyzing ideas. These experiences facilitate understanding and interpretation of scientific concepts, encouraging knowledge acquisition through interactions with texts, teachers, and peers. The positive impact of reading and writing activities implies their potential as effective tools for enhancing teaching and learning in Physical Science, supporting students in achieving academic success through meaningful engagement and knowledge construction (Boateng, 2024).

It is shown that active reading experiences, characterized by deep comprehension and personal relevance, are positively associated with academic achievement across various subjects. This suggests that students who actively engage with reading materials may demonstrate higher levels of understanding and performance in science courses (Fasco et. al., 2024).

Moreover, studies by Xafizovna (2024) emphasize effects of reading experience and classroom engagement on academic performance, suggesting that these factors work together to either facilitate or impede student success in specific academic settings. Understanding how these elements interact within the context of Physical Science education is crucial for developing targeted interventions that can enhance student achievement.

Exploring the knowledge that can be gleaned to guide focused interventions aimed at enhancing academic achievement in Physical

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Science is crucial for developing effective strategies to support student success in this subject area. Research by Orhani et.al., (2024) highlight the importance of targeted interventions that address specific areas of need. By understanding the factors that contribute to success in Physical Science, educators can tailor interventions to meet the unique requirements of students, ultimately enhancing their learning outcomes. Additionally, studies by Ellies (2024) underscore the value of evidence-based practices in education, emphasizing the need for interventions grounded in research and data to maximize their impact. By leveraging research-informed knowledge, educators can design interventions that are more likely to yield positive results and improve academic achievement in Physical Science.

It emphasizes the significant positive impact of reading and writing activities on teaching and learning in Physical Science, highlighting their potential as effective tools for enhancing academic success through meaningful engagement and knowledge construction. They stress the importance of active involvement in constructing knowledge through questioning, reflecting, and analyzing ideas, promoting students' understanding and interpretation of scientific concepts in a student-centered environment (Balaoro, 2024). The insights suggest that reading and writing activities play a crucial role in fostering students' academic achievement by encouraging interactions with texts, peers, and teachers, ultimately supporting a common understanding of topics through discussions and writing tasks. This underscores the value of incorporating active reading experiences and classroom engagement as predictors of scholastic performance in Physical Science, offering a pathway for enhancing teaching practices and student learning experiences in this academic setting (Bukhari et.al., 2024).

The complex interplay between Grade 11 students' active reading experience, classroom engagement, and academic performance in Physical Science remains largely unexplored. While research suggests reading choice can positively influence engagement and comprehension, and that engaged reading is shaped by classroom practices, the specific mechanisms by which these factors mediate science achievement are unclear. Additionally, targeted interventions to improve Physical Science performance are lacking, as most studies have focused on reading and engagement in general or on science achievement without considering these psychosocial factors. An integrative study examining the unique dynamics of learning in this specific academic domain could reveal key insights to guide the development of evidence-based programs aimed at boosting student success in this critical subject area (Rizal and Sts, 2024).

The theoretical foundation for this study is grounded in Engagement Theory, as proposed by Fredricks, Blumenfeld, and Paris (2004). This theory posits that student engagement is a multidimensional construct encompassing behavioral, emotional, and cognitive aspects. Behavioral engagement refers to students' active participation in learning activities, such as attending classes, following instructions, and completing assignments. Emotional engagement involves students' positive and negative reactions to their learning experiences, teachers, peers, and the school environment. Cognitive engagement pertains to students' investment in their learning, their willingness to exert effort, and their use of self- regulated learning strategies.

According to Engagement Theory, these three dimensions of engagement are interrelated and contribute to students' academic success. By examining active reading experiences and classroom engagement as predictors of academic scholastic performance in physical science, this study aligns with the principles of Engagement Theory, which emphasizes the importance of fostering a learning environment that promotes students' active involvement, positive emotions, and cognitive investment in their academic pursuits (Nguyen et.al., 2023).

This study is also anchored in Self-Determination Theory (SDT), proposed by Ryan and Deci (2000). SDT is a broad framework for understanding human motivation and personality that focuses on the degree to which an individual's behavior is self-motivated and self-determined. The theory posits that people have three innate psychological needs - autonomy, competence, and relatedness - that must be satisfied for optimal growth, integrity, and well-being. Autonomy refers to the need to feel in control of one's own behaviors and goals, competence is the need to feel capable and effective, and relatedness involves developing close personal relationships. When these needs are met, people tend to be intrinsically motivated and engage in activities out of interest and enjoyment rather than external rewards or pressures. SDT distinguishes between different types of extrinsic motivation that vary in their degree of autonomy and internalization. By examining active reading experiences and classroom engagement as predictors of academic performance, this study aligns with SDT's emphasis on the importance of autonomy, competence, and relatedness in fostering intrinsic motivation and optimal functioning.

Figure 1 illustrates the conceptual framework of the study, highlighting the three key variables. The first independent variable is the active reading experience, which involves reading with intent and understanding, allowing learners to assess its relevance. According to Butler & Palilonis (2015), the aspects of active reading experience include the use technology, purpose, and physical strategy. The second independent variable is classroom engagement or participation. Baraquia (2019) identifies the factors of classroom engagement as involvement in science lessons and tasks, active participation in science learning, and efforts dedicated to preparation in the subject. The dependent variable in this framework is academic performance in Physical

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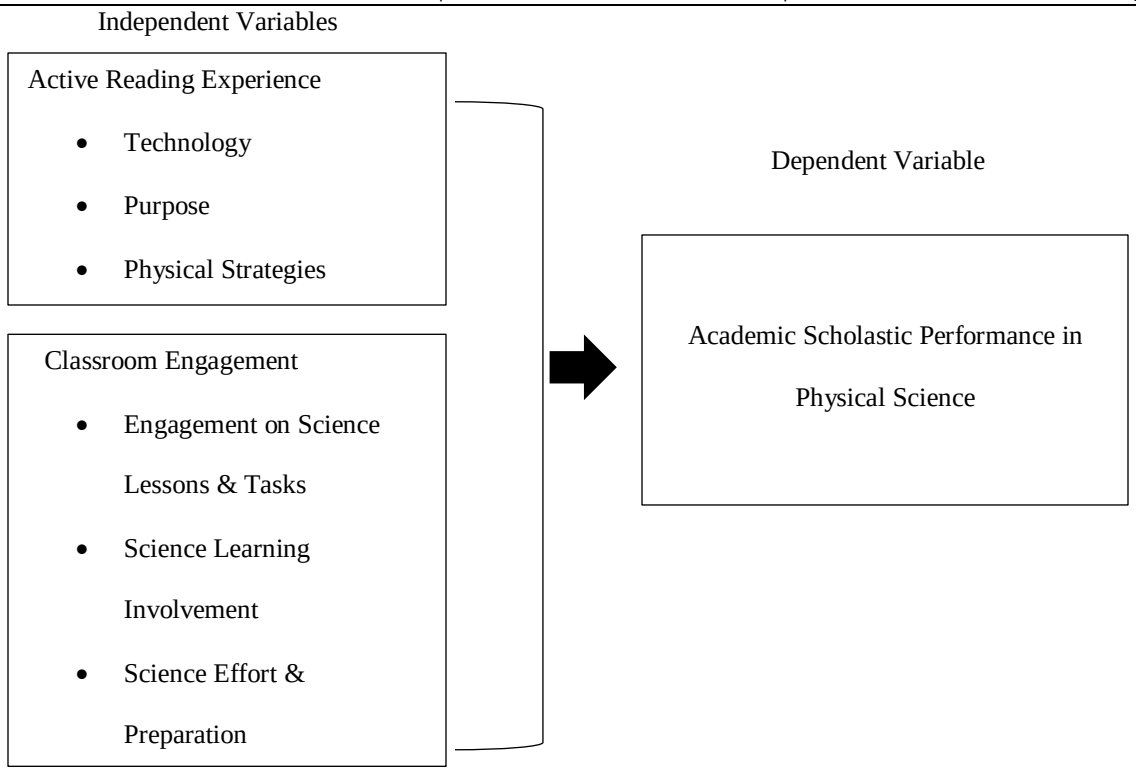



Figure 1. The Conceptual Framework of the Study

Science, which is measured through the subject grade.

While previous studies have investigated the separate impacts of active reading strategies (Jugas, 2024) and classroom engagement techniques (Baflor & Paglinawan, 2024) on student learning outcomes, there is a notable research gap regarding their combined effects on academic performance, particularly in the realm of Physical Science. Much of the existing research tends to either focus on overall academic success or on disciplines other than Physical Science. Additionally, there are few studies that have looked at how various active reading methods—such as annotating, summarizing, and questioning—interact with the diverse elements of classroom engagement, including student participation, interaction, and the dynamics between teachers and students, in relation to physical science achievement (Johnson & Smith, 2023). This study seeks to address this gap by exploring the joint predictive influence of these two important factors on academic performance in Physical Science, aiming to provide a deeper understanding of strategies to enhance student achievement in this vital subject.

The primary goal of this study is to investigate the active reading experience and classroom engagement as predictors of academic scholastic performance in Physical Science. This study aims to accomplish the following goals. First, to determine the level of active reading experience of students in terms of use of technology, purpose and physical strategies. Second, classroom engagement in terms of involvement, effort and preparation.

Third, to assess the academic scholastic performance in Physical Science. Fourth, to determine if there is a significant relationship between active reading experience, classroom engagement and academic scholastic performance in Physical Science. Lastly, to identify which domain of active reading experience and classroom engagement influence the academic scholastic performance in Physical Science.

The study is closely linked to several Sustainable Development Goals (SDGs). It primarily supports SDG 4: Quality Education. By exploring the factors that affect academic performance in physical science, the study helps to enhance understanding of ways to improve learning outcomes and educational quality. Additionally, its emphasis on active reading and classroom engagement highlights the need for innovative and effective teaching strategies, which is also connected to SDG 4. Ultimately, enhancing science education promotes critical thinking and problem-solving abilities, which are essential for SDG 9: Industry, Innovation, and Infrastructure, as well as SDG 17: Partnerships for the Goals, since scientific progress is vital for sustainable development and relies on collaborative initiatives.

The results will provide important insights into effective teaching strategies, which could guide the creation of specific interventions aimed at improving student learning and academic performance in this difficult subject. By pinpointing critical factors that contribute to success, the study paves the way for developing more engaging and effective educational settings that promote a better grasp of physical science and enhance performance. This may lead to increased student confidence and motivation, ultimately benefiting their future academic and career prospects.

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## II. Method

This chapter deals with the methodology and procedure that will employ in this study. It includes the research design, place and duration of the study, sampling procedure, data gathering and instrument administration, validity and reliability of the instruments used, scoring procedure, and statistical treatment of the data.

### Research Respondent

This study employed a convenience sampling technique to recruit participants, specifically Grade 11 students enrolled in Physical Science courses at Dologon National High School and Bukidnon National School of Home Industries. These students shared several important traits in common: they are all in Grade 11, indicating a comparable level of academic maturity. Their ages, typically ranging from 16 to 17 years, indicated a similar developmental stage and social context. This study utilized a convenience sample of 300 Grade 11 Physical Science students from Dologon National High School and Bukidnon National School of Home Industries. A sample size of 300 is commonly deemed adequate for many research studies (Cohen, 1988).

The criteria for including participants in this study were clearly established to maintain consistency among them. The participants comprised Grade 11 students taking Physical Science at Dologon National High School and Bukidnon National School of Home Industries. A basic proficiency in English was required, as it was the language utilized in the study's tools. Students who were absent for a significant time during data collection or who were unwilling to participate were not included. This approach guaranteed that all respondents had the requisite background. Private schools and students from other grade levels was not part of the study. Participants in this study were made aware that they could withdraw at any time without facing any consequences. If a qualified respondent chose to withdraw, they were asked to notify the researcher either verbally or in writing. Their choice was honored, with no pressure to continue. Data from participants who withdrew before finishing the questionnaire were not included in the analysis. This approach ensured that the study's findings were derived solely from those who willingly completed it.

The study was conducted in two separate Maramag School Districts: Maramag I will take place at Dologon National High School in P-5 of barangay Dologon, Maramag, Bukidnon, while Maramag II will occur at Bukidnon National School of Home Industries in North Poblacion, Maramag, Bukidnon.

### Materials and Instruments

A rigorously adapted and validated survey instrument served as the primary data collection tool for this study. Derived from established instruments with demonstrated efficacy in comparable research domains, the questionnaire underwent a meticulous adaptation process. Prior to implementation, the survey's reliability and contextual relevance were ascertained through a comprehensive validation process conducted by subject matter experts. Furthermore, the instrument was translated and refined to guarantee clarity and cultural sensitivity for the target participant population. The questionnaire's central objective is to evaluate the extent to which individual learning tools facilitate learners' active reading objectives and enhance their active reading experiences, ultimately contributing to increased classroom engagement. These constructs are hypothesized to exert a predictive influence on academic scholastic performance in Physical Science.

This study used three validated measures to evaluate essential variables: active reading experience, classroom engagement, and academic performance, specifically designed for senior high students in the Maramag District, Division of Bukidnon. To assess the Active Reading Experience variable, an instrument created by Butler and Palilonis (2015) was employed. This tool featured a 5-point Likert scale (1=Never, 5=Always) that evaluated different aspects of active reading experience, including technology, purpose and physical strategies.

The Classroom Engagement in Science, is evaluated using a 5-point Likert scale modified from Barquia (2019), examined student participation through three main indicators: engagement in science lessons and tasks, participation in science learning activities, and the effort and preparation they apply to science. This scale ranged from 1 (Never) to 5 (Always) and measured students' active involvement in class discussions and lab work, their dedication to completing assignments and projects, and the effort they put into studying for science-related activities. Higher scores indicated a higher level of engagement, signifying a more effective learning environment and a stronger commitment to science education among students.

And, the research implemented the Duay and Doble (2022) tool to evaluate academic performance. This tool featured a 5-point Likert scale, with options from 1 (strongly disagree) to 5 (strongly agree), to gauge different factors related to academic achievement. The materials included the questionnaire, printed versions for participants, and data collection sheets for capturing responses. Statistical software was then utilized for analyzing the gathered data. To ensure consistency, all three instruments utilize a 5-point Likert scale, with overall scores determined by averaging responses across different dimensions. This approach allows for standardized interpretation, categorized as follows: 1.00 – 1.80 (Very Low), 1.81 - 2.60 (Low), 2.61 - 3.40 (Moderate), 3.41 - 4.20 (High), and 4.21 - 5.00 (Very High). This consistent scale enables meaningful comparisons of Grade 11 students' attitudes toward active reading experience, classroom engagement and academic scholastic performance, thereby enriching the study's interpretative insights.

### Design and Procedure

The research utilized a mix of descriptive and inferential statistical methods to meet its goals. To assess the level of active reading

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experience, descriptive statistics such as means, standard deviations, and frequencies are calculated for various areas including technology use, purpose, and physical strategies. Similarly, classroom engagement is evaluated using descriptive statistics for participation, effort, and preparation. Academic performance is measured through descriptive statistics focused. To explore the connections between active reading experience, classroom engagement, and academic performance, inferential statistics like correlation coefficients and regression analysis was applied. Correlation coefficients revealed the strength and direction of the relationships among the variables (Anderson et.al, 2008), while regression analysis identified which aspects of active reading experience and classroom engagement significantly predicted performance in Physical Science. This combination of statistical methods offered a thorough understanding of the interactions among the variables and aid in fulfilling the research objectives.

The method of collecting data for this study was carefully organized. First, the researcher presented a formal letter and a comprehensive research proposal to the Superintendent of the Division of Bukidnon to request authorization for the study. Once the Superintendent granted approval, the researcher reached out to the School Principals of Maramag District and shared details about the sanctioned project and discussed the data collection methods, including the instruments used, the timeline, and measures taken to ensure confidentiality and anonymity. Approval from the principals was needed before data collection could begin in their schools. Parental consent is also required after receiving principal approval, as the students who will participate in the study as respondents are ages 16 and 17. All participants provided informed consent, ensuring they were aware of the study's aims, risks, and benefits. Data confidentiality was preserved through anonymization and secure storage. At the beginning of the study, the University's Ethics Review Committee granted thorough ethical approval, validating that the research proposal met the highest ethical standards. The committee evaluated the ethical dimensions of the study, leading to the issuance of an official UMERC Compliance Certificate -2025-101. This certification verified that the research complied with all university ethical standards. By adhering to these principles and securing UMERC approval, the study was designed to meet strict ethical guidelines, protect the rights of participants, and ensure a secure and transparent method for data collection to ensure adherence to ethical standards. Throughout the study, secure data storage and handling practices were established to safeguard participant privacy and uphold the integrity of the research. This careful process of securing permissions and following ethical guidelines ensured that the research was conducted responsibly and validly.

Moreover, the researcher aimed to comprehend each concept and idea presented by different authors for each variable, ensured that there is no imitation of their knowledge in the study. The researcher identified and referenced the authors and proponents relevant to the study. Additionally, a proper definition of any terms associated with the research was provided. An appropriate model was also employed throughout the research. Importantly, the researcher acknowledged that they do not lay claim to the work of others and honestly reported the study results based on the data collected. There was no alterations or additions to the data performed by the researcher. The researcher recognized her contribution to this study, while also acknowledged herself as the primary author and her advisor as the co-author.

## III. Result and Discussion

This study investigated the predictive relationship between active reading experiences, classroom engagement, and academic performance in Physical Science. The results presented herein demonstrate the significant influence of both active reading strategies and active participation in classroom activities on student achievement. Specifically, the researcher analyzed the extent to which these two factors, individually and in combination. The discussion will explore the implications of these findings for pedagogical practices, highlighting the importance of fostering both active reading habits and engaging classroom environments to optimize learning outcomes in Physical Science education.

### Level of Active Reading Experience in Physical Science

Table 1 illustrates how students engage actively in reading within Physical Science, assessed through specific indicators. It examines the effectiveness of student interactions with scientific texts or materials based on their use of tools (technology), cognitive intention (purpose), and reading methods (physical strategies). The overall descriptive level is high, indicating that students generally demonstrate a robust active reading experience in this discipline.

Table 1 Level of Active Reading Experience in Physical Science

| **Indicators** | **SD** | **Mean** | **Descriptive Level** |
|---|---|---|---|
| Technology | 0.95 | 3.35 | Moderate |
| Purpose | 0.60 | 4.09 | High |
| Physical Strategies | 0.58 | 4.11 | High |
| **Overall** | **0.49** | **3.85** | **High** |

The highest means are found in Physical Strategies (4.11) and Purpose (4.09), suggesting that students effectively implement reading techniques such as highlighting and summarizing and read with specific goals in mind. With a moderate score for Technology (3.35), it indicates that while digital tools support reading, their integration and optimization for active reading in

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science are not fully realized. An overall score of 3.85 reflects that students generally practice active reading strategies effectively within Physical Science.

As students show a strong engagement level with clear reading objectives, educators should clearly define learning goals and promote metacognitive strategies like self-questioning or goal-setting prior to reading. The study's result aligns with Smith and Young (2023). The moderate score for Technology highlights the necessity to enhance the use of interactive digital resources, such as simulations, educational applications, or augmented reality, to improve engagement and understanding of scientific texts through strengthening technology integration. And lastly, given the high score in physical strategies, it's beneficial for teachers to instruct students on scientific reading methods. This can be further enriched by incorporating note-taking strategies, concept mapping, and annotation techniques as discussed by Ismailli (2024).

The findings indicate that students actively engage with reading in science, particularly through goal-driven and strategy-oriented methods. However, technology utilization requires further enhancement. Thus, for science education, there is a need for a more deliberate integration of digital tools and explicit literacy strategies rooted in scientific inquiry.

**Technology**

Students' feedback on their utilization of technological tools to enhance active reading in Physical Science assesses specific actions such as taking notes, saving content, and recording audio notes. Notably, the activity of note-taking received a high rating, while the overall average score was moderate, indicating potential for better integration of technology in science reading practices.

Digital Note-Taking suggests that students are relatively comfortable utilizing devices for note-taking, reflecting a positive inclination towards combining tech tools with active reading strategies. Saving Materials & Recording Notes methods have yet to be widely adopted, potentially indicating insufficient training, confidence, or perceived usefulness in employing these techniques. Overall, moderate use signifies that although students are open to using technology, there is still a need for systematic guidance in employing these tools for reading science material.

Educators should foster intentional technology use in reading by: first, demonstrating and teaching the use of digital tools such as OneNote, Notion, or Google Keep for annotating texts and organizing thoughts. Techniques like highlighting and tagging notes in PDFs or eBooks can enhance engagement with scientific literature. Second, encouraging audio learning approaches, given that "recording audio notes" received the lowest score, teachers can motivate students to use voice memos to summarize ideas, especially benefiting auditory learners. This can serve both as a revision aid and a tool for metacognitive reflection. This parallels to the study of Sullivan and Anderson (2023).

And overall, the moderate scores might indicate uneven access to technology or limited exposure to advanced digital reading techniques. Schools should work towards providing equal access and incorporate technology skill development within science education. This result is consistent with O'Connor and Taylor (2025) study.

While students are starting to implement digital strategies in their science reading, their engagement largely remains superficial. There exists a significant opportunity for science educators to deliberately create digital reading activities, guide students toward sophisticated technological strategies, and cultivate practices that shift reading from a passive to an active, analytical process, thereby enhancing deeper understanding of scientific concepts.

**Purpose**

The study assessed a strong foundation in active reading strategies among Physical Science students across all behaviors. Information retrieval emerged as a particularly strong skill, closely followed by comprehension of textual structure. These high ratings indicate proficiency in locating key information and understanding the organization of scientific texts, both crucial components of scientific literacy and inquiry. Synthesizing information and overall text comprehension were also rated highly, suggesting a capacity for in-depth processing of scientific content. However, the relatively lower rating for analyzing material accuracy implies a potential area for development. While students demonstrate strong abilities in information extraction and understanding, explicit instruction and opportunities to critically evaluate the accuracy and reliability of scientific materials may be beneficial in fostering higher-order scientific inquiry and critical thinking skills.

The observed outcomes align with existing research, suggesting the efficacy of strategic reading skills in fostering scientific comprehension (Hattan and Kendeou, 2024). Specifically, the robust performance in synthesis lends support to integrated and inquiry-based learning models, which encourage interdisciplinary connections as proposed by Baker and Rogers (2023). Conversely, the relatively weaker performance in analytical reasoning corroborates Liu and Kim (2024) call for increased emphasis on scientific argumentation and critical evaluation within science education. Furthermore, consistent with Vygotsky's (1978) social constructivist theory, the findings highlight the continuing relevance of collaborative and scaffolded reading activities in supporting student comprehension.

These results indicate students possess proficient active reading abilities, particularly in purposeful and structural comprehension; however, pedagogical strategies should prioritize the development of analytical and critical thinking skills to facilitate a more nuanced and comprehensive understanding of scientific concepts.

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**Physical Strategies**

The study's findings reveal a prevalent adoption of active reading strategies among students, with the majority of examined techniques exhibiting "High" frequency of use. Notably, oral recitation following each section or main topic received the most elevated rating, suggesting its widespread application and potential effectiveness. While summarizing, question generation, and highlighting also demonstrated high utilization rates, underscoring the beneficial role of organizing, summarizing, and engaging with the content to facilitate comprehension.

These results underscore the value of incorporating active, physical strategies such as highlighting, outlining, summarizing, and recitation into Physical Science pedagogy. Research indicates that these techniques are associated with enhanced learning and retention (Nguyen and Lee, 2024). Moreover, the application of active reading aligns with principles of metacognitive learning, empowering students to self-regulate and monitor their understanding through reflective practices (Zhang and Tang, 2023). Therefore, educators teaching science should prioritize these strategies to promote critical thinking and foster deeper student engagement with complex subject matter. By encouraging students to actively process and interact with information, rather than passively absorbing it, instructors can cultivate a more dynamic and effective learning environment, ultimately leading to improved learning outcomes.

**Level of Classroom Engagement in Physical Science**

Table 2 presents an evaluation of classroom engagement within Physical Science, examining multiple facets of student participation. Specifically, it analyzes student engagement during instruction, their general involvement in science learning activities, and the extent of their effort and preparedness related to the subject matter.

Student engagement in this study was demonstrably high across all measured indicators, evidenced by mean scores ranging from 4.10 to 4.19, consistently categorized as "High." The indicator "Engagement on Science Lessons and Tasks" yielded the highest mean score (4.19), suggesting a particularly strong student investment in and enthusiasm for the presented science curriculum. This is further supported by the overall mean engagement score of 4.14, indicating sustained and robust engagement with the subject matter.

Table 2 Level of Classroom Engagement in Physical Science

| **Indicators** | **SD** | **Mean** | **Descriptive Level** |
|---|---|---|---|
| Engagement on Science Lessons and Tasks | 0.62 | 4.19 | High |
| Science Learning Involvement | 0.66 | 4.14 | High |
| Science Effort and Preparation | 0.61 | 4.10 | High |
| **Overall** | **0.46** | **4.14** | **High** |

These findings underscore the importance of cultivating interactive and participatory learning environments within science education. Existing literature (Wang and Liu, 2024) establishes a strong correlation between student engagement and academic success, motivation, and depth of learning. Increased engagement facilitates comprehension and retention of complex information, a crucial factor in subjects such as Physical Science, which necessitate understanding intricate concepts and applying problem-solving skills. Therefore, the results advocate for the implementation of pedagogical strategies that promote active participation, hands-on activities, and collaborative learning opportunities. Such approaches are likely to enhance student engagement, potentially leading to improved academic performance and more favorable overall learning outcomes. The observed high levels of engagement emphasize the continued need for dynamic and thoughtfully planned instruction that fosters student motivation and sustained investment in the learning process.

**Science Lessons and Tasks**

The data reveal a strong positive trend of student engagement in science. Specifically, the highest-rated items, "I am inspired to learn new things in Science class" and "My Science lessons and performance tasks are important and relevant to my life" , highlight the perceived motivational value and relevance of the science curriculum to students' lives. It further supports the conclusion of substantial student engagement.

These findings align with established literature (Parker and Johnson, 2023) emphasizing the crucial link between engagement and student motivation in science education. The perception of relevance and stimulation in science lessons fosters intrinsic motivation, as evidenced by high ratings on items related to inspiration and curiosity. This intrinsic motivation, characterized by engagement driven by inherent enjoyment and satisfaction (Barker and Lee, 2023), suggests a positive learning environment.

Pedagogically, these results advocate for instructional design that prioritizes meaningful, relevant, and inquiry-based learning experiences. Educators are encouraged to cultivate learning environments that connect to real-world issues and provide opportunities for active learning, such as hands-on activities, exploration, and real-life applications. Such approaches are likely to

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enhance student engagement and intrinsic motivation, thereby fostering improved academic performance and a more dynamic science learning environment.

**Science Learning Involvement**

Student engagement was demonstrably high. The item pertaining to the appreciation of the scientific method yielded a particularly high, indicative of a strong student valuation of scientific inquiry. Similarly, positive ratings were observed for items concerning group discussions and creative activities, suggesting that students are actively participating in diverse facets of their science learning. It further substantiates this high level of engagement.

These findings underscore the value of interactive, experiential, and collaborative pedagogies in science education. The observed impact of group activities aligns with Vygotsky's (1978) social constructivist theory, which posits that collaborative learning facilitates deeper comprehension through social interaction and peer dialogue. Furthermore, the pronounced appreciation for the scientific method suggests an understanding of its fundamental role in critical thinking and problem-solving, skills identified by Johnson and Wong (2023) as crucial for academic success.

Therefore, educators should continue to prioritize the design of learning environments that foster collaboration, creativity, and the practical application of the scientific method. By intentionally incorporating activities that nurture these competencies, instructors can amplify student engagement and cultivate a more effective, inquiry-driven learning atmosphere. This pedagogical approach has the potential to enhance academic performance, promote scientific literacy, and ultimately prepare students for future academic and professional pursuits.

**Science Effort and Preparation**

The study's findings reveal a significant commitment to learning among science students, as evidenced by high mean scores across measured indicators of effort and preparation. The item pertaining to test preparation ("I prepare thoroughly before the summative test or exam in Science") garnered the highest rating, highlighting the priority students place on assessment readiness. High scores on items related to timely task completion, material review, and active class participation further suggest a strong sense of academic responsibility and dedication to science achievement.

These results reinforce the established link between diligence, preparation, and positive academic outcomes in science (Thomas & Carson, 2024). The emphasis on exam preparation points to its role in facilitating comprehension of complex scientific concepts and enhancing performance. Furthermore, the observed engagement in classroom discussions underscores the value of active learning strategies (Peterson & Chen, 2025), where students actively participate in their learning process.

The implications for educators are clear: fostering a learning environment that encourages student responsibility, collaborative engagement, and active participation is crucial for enhancing both engagement and academic success. Pedagogical approaches incorporating frequent formative assessment, peer discussion, and collaborative activities can further bolster student effort and preparation. Moreover, emphasizing the development of effective study skills, time management strategies, and self-regulation techniques will equip students with essential tools for success, not only in science but also in broader academic pursuits and beyond. The findings underscore the importance of cultivating a supportive and dynamic learning environment that promotes academic and personal growth.

**Level of Academic Scholastic Performance in Physical Science**

Table 3 presents an evaluation of academic performance in Physical Science, with specific attention paid to the influence of student study habits, learning strategies, and academic self-perception.

The data reveals a strong trend of high academic achievement, with average scores spanning 4.07 to 4.59, categorized within the "High" to "Very High" range. Student responses to survey items such as "I believe that maintaining a healthy lifestyle (e.g., exercise, sleep) helps my studies" (Mean = 4.59) and "I feel confident in my ability to perform well academically" (Mean = 4.29) were particularly positive, indicating both a strong sense of self-efficacy and an understanding of the link between holistic wellness and academic outcomes.

High ratings were also observed for items pertaining to time management, study strategies, goal orientation, and peer collaboration, suggesting proactive engagement, organizational skills, and a strong commitment to academic success within the student population.

Table 3 Level of Academic Scholastic Performance in Physical Science

| Items | SD | Mean | Descriptive Level |
|---|---|---|---|
| I effectively manage my study time. | 0.61 | 4.07 | High |
| I take organized notes during lectures. | 0.70 | 4.08 | High |
| I regularly review my notes and study materials. | 0.58 | 4.13 | High |

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| | | | |
|---|---|---|---|
| I participate in group study sessions with classmates. | 0.62 | 4.19 | High |
| I find it easy to understand the material presented in my subjects. | 0.60 | 4.11 | High |
| I seek help from teachers or peers when I do not understand something. | 0.58 | 4.30 | Very High |
| I set specific academic goals for myself each school year. | 0.63 | 4.33 | Very High |
| I feel confident in my ability to perform well academically. | 0.61 | 4.29 | Very High |
| I use effective study techniques (e.g., summarization, self-testing). | 0.63 | 4.30 | Very High |
| I believe that my study habits positively influence my academic performance. | 0.62 | 4.29 | Very High |
| 11. I often review past exam papers to prepare for upcoming tests. | 0.66 | 4.18 | High |
| I create a study schedule and stick to it regularly. | 0.64 | 4.24 | Very High |
| I find a quiet place to study without distractions. | 0.61 | 4.42 | Very High |
| I engage in discussions about course material with my peers outside of class hours. | 0.64 | 4.37 | Very High |
| I believe that maintaining a healthy lifestyle (e.g., exercise, sleep) helps my studies. | 0.58 | 4.59 | Very High |
| **Overall** | **0.29** | **4.26** | **Very High** |

These results reinforce the critical role of cultivating effective study habits and time management skills within science education. Consistent with prior research (Lopez & Thomas, 2023), the data highlights the significant positive correlation between well-developed study skills (organization, goal setting, active review) and academic performance. The high endorsement of self-regulated learning strategies, such as structured study schedules, review of previous assessments, and help-seeking behaviors, supports the principles of metacognitive learning, emphasizing students' active monitoring and control of their learning processes (Nguyen & Patel, 2025). The recognition of a healthy lifestyle as integral to academic success further underscores the growing understanding of the interconnectedness between physical well-being and cognitive function (Miller & Wong, 2025).

Therefore, educators should consider a pedagogical approach that integrates not only content delivery but also explicit instruction in effective study techniques, time management principles, and the significance of a balanced lifestyle. Creating a supportive learning environment that fosters student confidence and encourages help-seeking behaviors is also crucial. By emphasizing these skills and habits, educators can empower students to achieve enhanced success in science and across their academic pursuits.

**Correlation between Active Reading Experience and Academic Scholastic Performance in Physical Science**

Table 4 investigates the statistical association between active reading practices and academic achievement in Physical Science. Specifically, the table presents correlation coefficients and associated p-values to evaluate the magnitude and statistical significance of the relationships between distinct dimensions of active reading (Technology, Purpose, and Physical Strategies) and students' scholastic performance.

Table 4 Correlation between Active Reading Experience and Academic Scholastic Performance in Physical Science

| **Active Reading Experience** | **Academic Scholastic Performance** | ***P* VALUE** |
|---|---|---|
| Technology | .005 | .938 |
| Purpose | .158** | .006 |
| Physical Strategies | .270** | .000 |
| **Overall** | **.173**** | **.003** |

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Statistical analysis revealed a significant positive correlation between academic scholastic performance in Physical Science and two aspects of active reading: "Purpose" ($r = 0.158$, $p < 0.01$) and "Physical Strategies" ($r = 0.270$, $p < 0.01$). These results, indicated by the double asterisk significance level, suggest that students demonstrating a stronger sense of purpose when reading and those employing physical strategies, such as highlighting or summarizing, tend to achieve higher academic outcomes. Conversely, no statistically significant relationship was found between the "Technology" aspect of active reading and academic performance ($p = 0.938$), suggesting that technology use alone does not predict higher achievement in this context.

These findings underscore the importance of fostering purposeful reading and encouraging the implementation of physical strategies in science education. As supported by existing literature (Kirkpatrick et al., 2022), a clear purpose can drive deeper engagement with the text, thereby facilitating improved learning. Similarly, the use of physical strategies known to enhance comprehension and retention, such as summarizing and note-taking (Terry et al., 2025), aligns with the observed positive correlation. The non-significant effect of technology implies that its mere integration into the learning process is insufficient to enhance academic performance without a parallel emphasis on purposeful learning and active engagement.

Therefore, educators should prioritize pedagogical approaches that cultivate purposeful reading habits and incorporate active processing strategies. While technology can serve as a valuable supplementary tool, it should not supplant established active reading techniques that promote comprehension and retention. Designing lessons that encourage students to engage purposefully with the material and utilize strategies such as summarizing and question generation can facilitate deeper content internalization and contribute to improved academic outcomes in science.

**Correlation between Classroom Engagement and Academic Scholastic Performance in Physical Science**

Table 5 investigates the statistical association between dimensions of classroom engagement and academic achievement in Physical Science. Specifically, the table employs correlation coefficients and associated p-values to evaluate the magnitude and statistical significance of relationships between classroom engagement indicators (engagement with science lessons and tasks, involvement in science learning, and effort and preparation in science) and scholastic performance.

Table 5 Significance of the Relationship between Classroom Engagement and Academic Scholastic Performance in Physical Science

| **Classroom Engagement** | **Academic Scholastic Performance** | ***P* Value** |
|---|---|---|
| Engagement on Science Lessons and Tasks | .181** | .002 |
| Science Learning Involvement | .122* | .035 |
| Science Effort and Preparation | .169** | .003 |
| **Overall** | **.214**** | **.000** |

This study reveals a statistically significant positive relationship between various facets of classroom engagement and academic performance in Physical Science. Specifically, "Engagement on Science Lessons and Tasks" ($r = 0.181$, $p = 0.002$), "Science Learning Involvement" ($r = 0.122$, $p = 0.035$), and "Science Effort and Preparation" ($r = 0.169$, $p = 0.003$) all exhibit significant positive correlations with academic performance. The overall correlation between classroom engagement and academic performance is robust and statistically significant ($r = 0.214$, $p < 0.001$).

These findings align with previous research (Adams et al., 2023) highlighting the crucial role of student engagement in academic success. The observed positive associations suggest that heightened participation, active involvement in science learning, and diligent preparation are predictive of improved academic outcomes.

The implications for pedagogical practice are considerable. Educators should prioritize the design and implementation of engaging and interactive science lessons. Strategies such as hands-on activities, collaborative discussions, and real-world applications may prove effective in fostering student engagement and, consequently, enhancing academic performance. Furthermore, encouraging proactive preparation for lessons and assessments is likely to contribute to academic success. By cultivating a learning environment that emphasizes engagement, teachers can facilitate students' realization of their full academic potential in science.

**Regression Analysis of the Influence of Active Reading Experience and Classroom Engagement on Academic Scholastic Performance in Physical Science**

Table 6 investigates the impact of active reading experience and classroom engagement on academic performance in Physical Science. It employs regression analysis to quantify this relationship, presenting unstandardized coefficients (B), standardized coefficients (β), t-statistics, and associated significance levels (Sig.) for each predictor variable.

The regression analysis revealed divergent relationships between predictor variables and academic performance. Active Reading Experience exhibited a positive but non-significant relationship ($B = 0.062$, $\beta = 0.104$, $t = 1.699$, $p = 0.090$) with academic achievement. Conversely, Classroom Engagement demonstrated a statistically significant positive relationship ($B = 0.111$, $\beta = 0.173$, $t = 2.824$, $p = 0.005$) with academic performance.

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These findings suggest that classroom engagement, unlike active reading experience, exerts a significant influence on students' academic success. This is consistent with prior research (Jenkins et al., 2004) highlighting the importance of engagement in facilitating deeper learning processes and improved academic outcomes.

Table 6 Significance of the Influence of Active Reading Experience and Classroom Engagement on Academic Scholastic Performance in Physical Science

| **Academic Scholastic Performance** | | | | | |
|---|---|---|---|---|---|
| (Variables) | | *B* | β | *t* | *Sig.* |
| Constant | | 3.561 | | 21.135 | .000 |
| Active Reading Experience | | .062 | .104 | 1.699 | .090 |
| Classroom Engagement | | .111 | .173 | 2.824 | .005 |

Pedagogically, the results underscore the importance of prioritizing strategies that foster classroom engagement, such as interactive discussions, hands-on activities, and collaborative group work, to enhance student performance in Physical Science. While active reading strategies may still be beneficial, fostering a dynamic and participatory learning environment appears to have a more pronounced impact on academic success.

## IV. Conclusion and Recommendation

This study reveals differential impacts of active reading experience and classroom engagement on academic performance in Physical Science. While active reading, particularly the combination of purposeful reading and physical strategies, exhibits positive correlations with academic achievement, its overall effect is less pronounced than that of classroom engagement. Specifically, technology use in active reading did not significantly correlate with academic success, suggesting it is not independently sufficient to enhance performance.

Conversely, classroom engagement, encompassing active participation, learning involvement, and dedicated effort, demonstrates a strong and statistically significant relationship with academic success and serves as a more potent predictor of performance than active reading. This reinforces existing literature underscoring the critical role of active student involvement in fostering deeper comprehension and superior academic outcomes in Physical Science.

The findings suggest that while cultivating effective reading strategies is beneficial, prioritizing the creation of a highly engaging and participatory learning environment is paramount for maximizing student achievement in this discipline.

To optimize student learning in Physical Science, this study recommends a multifaceted approach centered on cultivating active and engaged learning environments. Educators should prioritize the creation of dynamic and participatory classrooms characterized by hands-on activities, interactive discussions, and collaborative group projects that connect theoretical concepts to real-world applications. In conjunction with these engagement strategies, explicit instruction in active reading techniques, such as purpose-driven reading, summarization, annotation, and self-questioning, is crucial for enhancing comprehension and academic achievement. The integration of digital tools, including note-taking applications, annotation software, and interactive simulations, can augment traditional pedagogical methods and provide students with novel learning experiences. Fostering metacognitive skills through goal-setting, self-assessment, and reflective practices will further promote deeper understanding and improved academic performance. Furthermore, collaborative learning opportunities facilitated through small-group discussions and problem-solving exercises are essential for the development of critical thinking abilities. Students should be encouraged to demonstrate consistent effort and preparedness in their studies, including timely completion of assignments, active participation in class discussions, and diligent preparation for examinations. Finally, promoting a holistic approach to student well-being, encompassing physical activity, adequate rest, and mental health support, is paramount, as these factors significantly influence academic success. By strategically implementing these recommendations, educators can cultivate a more engaging and effective learning environment in Physical Science, ultimately leading to improved student performance, enhanced knowledge retention, and a deeper understanding of scientific principles.

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