

Science Literacy and Its Influence on Students' Academic Performance: A Basis for Instructional Intervention

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Abstract. This study examined the extent of science literacy and its influence on the academic performance of Senior High School students at Buenavista Integrated School during the School Year 2025–2026. Specifically, the study assessed students' science literacy in terms of scientific reading comprehension, data interpretation and analysis, and application of scientific concepts, and determined whether a significant relationship exists between science literacy and academic performance in science. The study employed a descriptive-correlational quantitative research design. A total of 113 Grade 11 students from the General Academic Strand (GAS), Humanities and Social Sciences (HUMSS), and Technical-Vocational-Livelihood (TVL) strands were selected using purposive and stratified sampling techniques. A researcher-made questionnaire was used to collect data on science literacy, while students' science grades were used to measure academic performance. Data were analyzed using mean, standard deviation, and Pearson r correlation. Findings revealed that students demonstrated a moderate level of science literacy in scientific reading comprehension ($M = 2.97$), data interpretation and analysis ($M = 2.84$), and application of scientific concepts ($M = 2.87$), with an overall mean of 2.89 interpreted as Moderately Literate. Students' academic performance in science showed a mean grade of 83.30, described as Satisfactory. Furthermore, the correlation analysis indicated no significant relationship between science literacy and academic performance ($r = .198$, $p = .094$). Based on the findings, an intervention program titled Project SAIL: Science Advancement through Inquiry and Literacy was proposed to enhance students' science literacy and academic performance through guided reading, data analysis activities, and inquiry-based learning strategies. The study recommends strengthening science literacy instruction to support improved learning outcomes.

Keywords: Academic performance; Application of scientific concepts; Data interpretation; Scientific reading comprehension; Science literacy

Introduction

In an era defined by scientific advancement and digital transformation, science literacy has become a vital skill for students to navigate both academic challenges and real-world problems. Science literacy involves more than the ability to recall scientific facts, it includes reading comprehension of scientific texts, interpreting data from visual sources like graphs and tables, and applying scientific knowledge in practical situations (Organization for Economic Co-operation and Development [OECD], 2019). It empowers students to make informed decisions on health, environment, and technology, contributing to the development of responsible and critically thinking citizens (National Research Council, 2012).

Science literacy is particularly crucial in the context of academic performance. Academic success in science subjects reflects students' mastery of content, as well as their ability to analyze, evaluate, and apply knowledge in problem-solving situations. These cognitive and practical skills are cultivated through literacy-rich instruction and are directly linked to how students perform in assessments and classroom activities (Zhang et al. 2020). In the Philippine senior high school system, however, disparities exist between students enrolled in STEM tracks and those in non-STEM strands, namely, General Academic Strand (GAS), Humanities and Social Sciences (HUMSS), and Technical-Vocational-Livelihood (TVL). Students from non-STEM tracks often have less exposure to rigorous science instruction, potentially limiting their development of science literacy and affecting their performance in science subjects (Bernardo, 2022).

Although science literacy and academic performance have been widely studied in global education systems, most of the existing research focuses on elementary learners or STEM track students. There is a noticeable lack of empirical studies exploring this relationship among non-STEM senior high school students

in the Philippine context. Moreover, few investigations disaggregate science literacy into specific, measurable dimensions such as scientific reading comprehension, data interpretation, and conceptual application, skills that are essential to success in science subjects but often underdeveloped in students with limited access to inquiry-based learning environments (Baylon & Ventura, 2021).

To address this research gap, the present study will be conducted at Buenavista Integrated School, a public senior high school located in Zamboanga City. Targeting Grade 11 students from the GAS, HUMSS, and TVL strands, the study will assess the extent of science literacy and determine how it influences their academic performance in science. By focusing on an underrepresented group in Philippine science education research, this study seeks to generate evidence-based insights that can inform inclusive teaching strategies and strengthen science instruction across diverse learning tracks.

Research Questions

This study aimed to determine the extent of science literacy and its influence on the academic performance of students in Science at Buenavista Integrated School, Senior High School for the school year 2025–2026. It focused on key components of science literacy and examined how each contributed to students' performance in the subject. Specifically, it seeks to answer the following research questions:

1. What is the extent of science literacy among Senior High School students in terms of:
 - 1.1 Scientific reading comprehension
 - 1.2 Data interpretation and analysis
 - 1.3 Application of scientific concepts
2. What is the academic performance of students in science?
3. Is there a significant relationship between the extent of science literacy and the academic performance of students in science?
4. Based on the findings, what intervention can be proposed to enhance science literacy and improve academic performance?

Scope and Delimitation of the Study

This study assessed the extent of science literacy and its influence on the academic performance of Senior High School students, focusing on three key components: scientific reading comprehension, data interpretation and analysis, and the application of scientific concepts. The study aimed to determine whether the extent of science literacy was significantly related to their academic performance in science. The research was conducted during the school year 2025–2026 at Buenavista Integrated School, specifically involving Grade 11 students enrolled in the General Academic Strand (GAS), Humanities and Social Sciences (HUMSS), and the Technical-Vocational-Livelihood (TVL) track. These strands were selected due to their varied exposure to science concepts, offering a broader perspective on science literacy within the senior high school curriculum.

Literature Review

Scientific Reading Comprehension

Scientific Reading Comprehension is a foundational component of science literacy, essential for understanding discipline-specific texts, procedures, and concepts. Yore, Pimm, and Tuan (2007) emphasized that scientific texts demand higher-order comprehension due to specialized vocabulary, abstract ideas, and complex structures. Fang and Wei (2010) further explained that multimodal features like diagrams, symbols, and equations increase the cognitive demand of scientific reading, making it crucial for educators to teach discipline-specific reading strategies. In the Philippine context, Baylon and Ventura (2021) discovered that students with low reading comprehension skills tend to perform poorly in science subjects, particularly in interpreting laboratory procedures and written explanations. Similarly, Bernardo (2022) found that senior high school students from the HUMSS strand struggle with scientific texts due to limited exposure, affecting their ability to grasp key science concepts and perform well academically.

Several studies have demonstrated that scientific reading comprehension plays a vital role in students' performance in science. Cristia et al. (2017) conducted a study in Peru involving a computer-assisted learning program and found that integrating structured reading and comprehension activities into science lessons significantly improved student scores. Fang and Wei (2010) emphasized that applying reading strategies such as summarizing and questioning while engaging with scientific texts enhanced comprehension and performance in science subjects. Locally, Baylon and Ventura (2021) found that Grade 11 students with poor reading comprehension struggled in interpreting laboratory procedures and understanding science concepts, which led to lower academic achievement. Similarly, Bernardo (2022) observed that students from non-STEM

strands such as HUMSS and GAS lacked the ability to analyze scientific texts effectively, which contributed to their difficulties in understanding abstract topics and solving conceptual science problems.

Data Interpretation and Analysis

Data Interpretation and Analysis involve making sense of scientific information presented in visual formats such as charts, tables, and graphs. The National Research Council (2012) identified this as a core science literacy skill, emphasizing its importance in developing students' reasoning and evidence-based decision-making. Zhang et al. (2020), in a large-scale study, found that proficiency in interpreting data directly correlates with high science performance among secondary school students. This finding is echoed in Philippine research by Ventura and Toledo (2020), who showed that students regularly exposed to data interpretation tasks scored significantly higher in both laboratory assessments and summative science tests. Lazaro and Bayabao (2021) also observed that poor graph comprehension skills among students in Zamboanga Peninsula public schools hindered performance in Earth and Physical Science subjects, indicating the need to integrate data analysis across science instruction.

The ability to analyze data presented in graphs, tables, and charts is closely associated with science achievement. Zhang et al. (2020), through a meta-analysis of global studies, confirmed that students trained in data interpretation scored significantly higher in inquiry-based science tasks than those who were not. The OECD (2019) likewise noted that top-performing students in science assessments were proficient in extracting patterns and evidence from visual data. In the Philippine setting, Ventura and Toledo (2020) found that senior high school students who regularly engaged in graphing and data analysis tasks performed better in Earth Science and Chemistry. Similarly, Lazaro and Bayabao (2021) revealed that students in the Zamboanga Peninsula who struggled with interpreting graphical information showed lower achievement in science-related assessments, indicating a clear link between data literacy and academic performance.

Application of Scientific Concepts

Application of Scientific Concepts The ability to apply scientific concepts is a higher-order skill that reflects true understanding of science beyond memorization. Osborne and Dillon (2008) argued that when students apply concepts to real-life situations, they develop deeper critical thinking and problem-solving abilities—skills aligned with 21st-century learning goals. The OECD (2019) likewise recognized this skill in the PISA framework, categorizing concept application as a top indicator of scientific literacy. In the Philippine setting, Santos and Relampagos (2022) found that students engaged in hands-on experiments and simulations were more capable of transferring classroom knowledge to performance tasks and practical assessments. De Castro and Javier (2021) similarly reported that students from the TVL strand improved in applying biology and physics concepts after participating in contextualized science activities, suggesting that experiential learning enhances academic outcomes.

Applying scientific knowledge to real-world situations is considered the highest form of science literacy. Osborne and Dillon (2008) argued that meaningful learning occurs when students can apply concepts learned in the classroom to practical problems, and they found strong evidence that this improves engagement and performance. Supporting this, the OECD (2019) emphasized in its PISA 2018 findings that the ability to apply scientific knowledge is directly linked to success in science education. In the local context, Santos and Relampagos (2022) conducted a study among senior high school students and discovered that those involved in project-based science tasks demonstrated better conceptual understanding and higher science scores. Likewise, De Castro and Javier (2021) noted that TVL students who experienced contextualized science instruction performed significantly better on assessments that required application of knowledge, indicating that real-world relevance boosts academic outcomes.

Academic Performance in Science

Academic Performance in Science serves as a key indicator of student learning and is shaped by both content mastery and the ability to apply scientific knowledge. Schleicher (2018) explained that students who experience inquiry-based learning and develop strong literacy and analytical skills tend to perform better in science subjects, as observed in international PISA results. Kiratu, Ngugi, and Owino (2018) added that student performance improves significantly when instruction focuses on developing reasoning rather than rote memorization. Locally, Galvez and Ventura (2020) found that students in the GAS strand who lacked science literacy skills had lower final grades in subjects like Earth and Life Science. Agustin and Ramos (2021) also concluded that performance-based assessments and literacy integration in General Biology classes led to improved academic performance among TVL learners, highlighting the direct impact of science literacy on science achievement.

Academic Performance in Science is often influenced by students' mastery of science literacy skills, including reading comprehension, data analysis, and application of knowledge. Schleicher (2018) reported that

students who received instruction in analyzing evidence and interpreting texts performed better in science assessments across OECD countries. Kiratu, Ngugi, and Owino (2018) added that even in resource-limited settings, literacy-enriched instruction led to improved science performance. In the Philippines, Galvez and Ventura (2020) found that students from non-STEM strands with low science literacy skills recorded consistently low grades in Earth and Life Science. Similarly, Agustin and Ramos (2021) demonstrated that performance-based instruction and integration of literacy activities significantly enhanced academic performance among TVL senior high school students, reinforcing the importance of science literacy in improving academic outcomes.

Methodology

Research Design

This study employed a descriptive-correlational quantitative research design, as it seeks to determine the extent of science literacy and its influence on the academic performance of senior high school students. The descriptive aspect aims to quantify students' levels of science literacy across three dimensions: scientific reading comprehension, data interpretation and analysis, and application of scientific concepts. Meanwhile, the correlational component was examined whether a significant relationship exists between science literacy and students' academic performance in science subjects. A descriptive quantitative design enables the researcher to gather data systematically and numerically through structured survey questionnaires. This method is suitable for measuring variables in large populations and allows researchers to describe current conditions and patterns without manipulating any variables (McCombs, 2023). In the context of teaching and learning, descriptive quantitative studies help profile educational behaviors and competencies such as literacy levels, performance trends, and learning gaps.

Research Locale

The study was conducted at Buenavista Integrated School in the Schools Division of Zamboanga City, Philippines, during the School Year 2025–2026. The school was selected as the research locale because it offers the General Academic Strand (GAS), Humanities and Social Sciences (HUMSS), and Technical-Vocational-Livelihood (TVL) strands at the senior high school level. These academic tracks provided an appropriate setting for examining the science literacy and science academic performance of Grade 11 non-STEM students. The research locale was therefore relevant to the study's objective of understanding how students' science literacy relates to their academic performance across different academic strands.

Research Participants

The study involved 113 Grade 11 senior high school students enrolled in the General Academic Strand (GAS), Humanities and Social Sciences (HUMSS), and Technical-Vocational-Livelihood (TVL) strands at Buenavista Integrated School during the School Year 2025–2026. Purposive sampling was used to identify the eligible participants, while stratified sampling was employed to represent the three academic strands. Of the total participants, 25 were from GAS, 27 from HUMSS, and 60 from TVL. The inclusion of students from these non-STEM strands enabled the study to examine science literacy and science academic performance among learners with different academic backgrounds and levels of exposure to science-related instruction.

Research Instrument

The researcher developed a researcher-made questionnaire to assess the level of science literacy and its influence on the academic performance of senior high school students in science. The questionnaire was based on the study's objectives, the three identified sub-variables, scientific reading comprehension, data interpretation and analysis, and application of scientific concepts, as well as insights drawn from relevant literature. The instrument consisted of two main parts. Part I focused on the students' science literacy levels and contained fifteen (15) items, with five items allocated to each sub-variable. Respondents answered each statement using a 4-point Likert scale with the following choices: 4 – Strongly Agree, 3 – Agree, 2 – Disagree, and 1 – Strongly Disagree. Part II required students to indicate their final grade in their most recent science subject, which served as a measure of their academic performance. This self-reported grade was used as the dependent variable in the analysis. To ensure the instrument's validity, it underwent content validation by a panel of experts, including experienced science teachers and research specialists. Their comments and suggestions were incorporated to improve the clarity, relevance, and structure of each item. A pilot test was also conducted among selected students who were not part of the actual study to assess the reliability and usability of the questionnaire before its final administration.

Data Gathering Procedure

The following procedures were undertaken by the researcher in the conduct and completion of this study. Initially, the researcher wrote a formal letter addressed to the Schools Division Superintendent of the Division of Zamboanga City to seek approval to conduct the study titled "The Influence of Science Literacy on Students' Academic Performance." Once the approval was granted, the researcher submitted the approved communication, along with the research instrument and informed consent forms, to the school principal of Buenavista Integrated School. Upon receiving permission from the school head, the researcher coordinated the actual data collection process. The researcher personally met with the selected Grade 11 participants from the GAS, HUMSS, and TVL strands to explain the purpose of the study, the importance of their participation, and the voluntary nature of their involvement. Participants were assured of the confidentiality and anonymity of their responses, and their rights as respondents were clearly communicated. They were informed that they could withdraw from the study at any point without any academic or personal consequences. An informed consent form was provided and signed by the participants prior to answering the questionnaire. This document included clear explanations about the scope of the study, the use of data collected, and the ethical considerations being followed. The researcher strictly prohibited the taking of photographs or any form of media documentation during the data collection to maintain participant privacy and protect the integrity of the research process. Once data collection was completed, all responses were encoded and statistically analyzed using the Statistical Package for Social Sciences (SPSS). The results were interpreted in alignment with the research questions and hypotheses. The final manuscript was submitted to the school's District Research Evaluation Committee for initial review, with the full knowledge and approval of the school principal. Upon incorporation of the committee's feedback, the completed study was submitted to the Division Planning and Research Office for final evaluation and record.

Results and Discussions

Research Question 1: What is the extent of science literacy among Senior High School students in terms of Scientific reading comprehension, Data interpretation and analysis, and Application of scientific concepts?

Table 1. Extent of Science Literacy among Senior High School Students in Terms of Scientific Reading Comprehension

Statement	Mean	SD	Verbal Description	Interpretation
1. I can identify the main idea in a science article or paragraph.	3.07	.509	Agree	Moderately Literate
2. I understand definitions of scientific terms when reading.	3.12	.469	Agree	Moderately Literate
3. I can follow the steps in a science procedure or experiment.	3.14	.673	Agree	Moderately Literate
4. I can distinguish facts from opinions in science reading materials.	2.79	.599	Agree	Moderately Literate
5. I can summarize science texts in my own words.	2.75	.662	Agree	Moderately Literate
Overall Mean	2.97	.582	Agree	Moderately Literate

Table 1 presents the extent of science literacy among Senior High School students in terms of scientific reading comprehension. The results revealed an overall mean of 2.97 (SD = 0.582), which is interpreted as Agree and described as Moderately Literate. This finding indicates that students possess adequate but not fully developed scientific reading comprehension skills. It suggests that while learners can understand basic scientific texts and concepts, they still require support in developing deeper comprehension and critical thinking skills necessary for advanced scientific literacy. Among the indicators, the highest mean score was obtained by following the steps in a science procedure or experiment ($M = 3.14$, $SD = 0.673$). This was followed by understanding definitions of scientific terms when reading ($M = 3.12$, $SD = 0.469$) and identifying the main idea in a science article or paragraph ($M = 3.07$, $SD = 0.509$). These results indicate that students demonstrate stronger skills in procedural understanding, vocabulary comprehension, and identifying key ideas, which are considered foundational skills in scientific literacy. Fang and Wei (2010), who emphasized that comprehension of scientific vocabulary and procedural texts enhances students' understanding of science concepts. Similarly, Yore, Pimm, and Tuan (2007) noted that recognizing key ideas and understanding scientific language are essential components of science literacy. Furthermore, Galvez and Ventura (2020) found that students with better scientific reading comprehension tend to show improved academic performance in science subjects.

On the other hand, the lowest mean scores were obtained in summarizing science texts in one's own words ($M = 2.75$, $SD = 0.662$) and distinguishing facts from opinions in science reading materials ($M = 2.79$, $SD = 0.599$). These results suggest that students experience difficulty in higher-order thinking skills, particularly in summarizing information and critically analyzing scientific texts. Osborne and Dillon (2008), who reported that learners often struggle with interpreting and critically evaluating scientific information. Likewise, Kiratu, Ngugi, and Owino (2018) found that students encounter challenges in synthesizing scientific ideas and drawing conclusions. Additionally, Zhang et al. (2020) emphasized that higher-order literacy skills, such as summarizing and evaluating information, are crucial factors influencing students' science performance and require further instructional support. The findings suggest that Senior High School students demonstrate moderate scientific reading comprehension skills, with strengths in understanding vocabulary, identifying main ideas, and following procedures, but weaknesses in summarizing and evaluating scientific information. These results highlight the need for enhanced instructional strategies, such as guided reading, contextualized science materials, and critical reading activities, to further improve students' scientific literacy. Strengthening these skills will help learners better understand scientific concepts, improve academic performance, and develop critical thinking skills necessary for science learning.

Table 2. Extent of Science Literacy Among Senior High School Students in Terms of Data interpretation and analysis

Statement	Mean	SD	Verbal Description	Interpretation
1. I can identify the main idea in a science article or paragraph.	2.79	.623	Agree	Moderately Literate
2. I understand definitions of scientific terms when reading.	2.77	.613	Agree	Moderately Literate
3. I can follow the steps in a science procedure or experiment.	2.97	.600	Agree	Moderately Literate
4. I can distinguish facts from opinions in science reading materials.	2.64	.653	Agree	Moderately Literate
5. I can summarize science texts in my own words.	3.04	.588	Agree	Moderately Literate
Overall Mean	2.84	.615	Agree	Moderately Literate

Table 2 presents the extent of science literacy among Senior High School students in terms of data interpretation and analysis. The results revealed an overall mean of 2.84 ($SD = 0.615$), interpreted as Agree and described as Moderately Literate. This finding indicates that students possess moderate skills in interpreting and analyzing scientific data, suggesting that while learners demonstrate a basic understanding of scientific information, further development is needed to enhance their analytical and critical thinking abilities. Among the indicators, the highest mean score was obtained in summarizing science texts in one's own words ($M = 3.04$, $SD = 0.588$), followed by following the steps in a science procedure or experiment ($M = 2.97$, $SD = 0.600$), and identifying the main idea in a science article or paragraph ($M = 2.79$, $SD = 0.623$). These findings suggest that students show relatively stronger skills in summarizing information, understanding procedures, and identifying key ideas, which are essential competencies in interpreting and analyzing scientific data. Bybee (2013), who emphasized that scientific literacy involves the ability to interpret data and communicate scientific information effectively. Similarly, Norris and Phillips (2003) highlighted that comprehension and interpretation of scientific texts are essential components of science literacy. Furthermore, OECD (2019) reported that students who demonstrate strong data interpretation skills tend to perform better in science-related learning tasks.

On the other hand, the lowest mean scores were observed in distinguishing facts from opinions in science reading materials ($M = 2.64$, $SD = 0.653$) and understanding definitions of scientific terms when reading ($M = 2.77$, $SD = 0.613$). These results indicate that students experience challenges in evaluating scientific information and understanding technical vocabulary, which are higher-level skills necessary for effective data interpretation and analysis. Osborne and Dillon (2008), who found that students often struggle with critical evaluation of scientific evidence. Similarly, Fang and Wei (2010) reported that limited vocabulary knowledge can hinder students' ability to interpret scientific information. Additionally, Roth and Barton (2004) emphasized that students require more opportunities to analyze scientific data and develop reasoning skills to improve science literacy. The findings suggest that Senior High School students demonstrate moderate competence in data interpretation and analysis, with strengths in summarizing information and following procedures, but with weaknesses in evaluating scientific information and understanding scientific terminology. These results highlight the need for instructional interventions, such as data analysis activities, guided interpretation exercises, and inquiry-based learning strategies, to improve students' analytical skills

and overall science literacy. Strengthening these competencies will help students better interpret scientific data, enhance critical thinking skills, and improve academic performance in science.

Table 3. Extent of Science Literacy among Senior High School Students in Terms of Application of Scientific Concepts

Statement	Mean	SD	Verbal Description	Interpretation
1. I can explain how science applies to daily life situations.	3.00	.646	Agree	Moderately Literate
2. I use science concepts to explain natural phenomena.	2.92	.640	Agree	Moderately Literate
3. I can solve real-life problems using science knowledge.	2.70	.660	Agree	Moderately Literate
4. I can connect ideas from different science topics.	2.86	.732	Agree	Moderately Literate
5. I can predict outcomes using what I've learned in science.	2.85	.660	Agree	Moderately Literate
Overall Mean	2.87	.688	Agree	Moderately Literate

Table 3 presents the extent of science literacy among Senior High School students in terms of application of scientific concepts. The results revealed an overall mean of 2.87 ($SD = 0.688$), interpreted as Agree and described as Moderately Literate. This finding indicates that students demonstrate a moderate level of ability in applying scientific knowledge to real-life situations. It suggests that while learners possess basic understanding of scientific concepts, they still need further development in applying these concepts to solve problems and explain real-world phenomena. Among the indicators, the highest mean score was obtained in explaining how science applies to daily life situations ($M = 3.00$, $SD = 0.646$), followed by using science concepts to explain natural phenomena ($M = 2.92$, $SD = 0.640$) and connecting ideas from different science topics ($M = 2.86$, $SD = 0.732$). These findings indicate that students show relatively stronger abilities in relating science to daily life, explaining natural occurrences, and integrating knowledge across science disciplines. These competencies are important components of science literacy, as emphasized by Bybee (2013), who highlighted that scientifically literate individuals are able to apply scientific knowledge in real-life contexts. Similarly, OECD (2019) emphasized that science literacy involves explaining phenomena scientifically and applying knowledge to real-world situations. Furthermore, Holbrook and Rannikmäe (2009) found that contextualized science learning improves students' ability to apply scientific concepts in everyday life.

On the other hand, the lowest mean score was observed in solving real-life problems using science knowledge ($M = 2.70$, $SD = 0.660$), followed by predicting outcomes using what was learned in science ($M = 2.85$, $SD = 0.660$). These findings suggest that students encounter difficulties in problem-solving and predictive reasoning, which are considered higher-order skills in applying scientific knowledge. Osborne and Dillon (2008), who reported that students often struggle in applying science concepts to unfamiliar situations. Similarly, Roth and Barton (2004) emphasized that learners require more opportunities for inquiry-based and problem-solving activities to strengthen their ability to apply science knowledge. Additionally, Yager (2000) highlighted that application-based learning enhances students' ability to transfer scientific knowledge to real-life situations. The findings suggest that Senior High School students demonstrate moderate competence in applying scientific concepts, with strengths in explaining science in daily life and understanding natural phenomena, but with challenges in solving real-life problems and predicting outcomes. These results highlight the need for instructional strategies such as problem-based learning, inquiry-based activities, and contextualized science instruction to improve students' ability to apply scientific knowledge effectively. Strengthening these skills will enhance students' scientific literacy and promote better understanding of science in real-world contexts.

Table 4. Summary of the Extent of Science Literacy among Senior High School students

Indicators	Mean	Interpretation
1. Scientific reading comprehension	2.97	Moderately Literate
2. Data interpretation and analysis	2.84	Moderately Literate
3. Application of scientific concepts	2.87	Moderately Literate
Over-All Mean	2.89	Moderately Literate

Table 4 presents the summary of the extent of science literacy among Senior High School students across three indicators: scientific reading comprehension, data interpretation and analysis, and application of scientific concepts. The findings revealed an overall mean of 2.89, interpreted as Moderately Literate, indicating that students demonstrate moderate science literacy skills across all domains. This suggests that while students possess basic scientific literacy competencies, there is still a need to further strengthen their understanding and application of science concepts. Among the three indicators, scientific reading

comprehension obtained the highest mean score ($M = 2.97$), followed by application of scientific concepts ($M = 2.87$), and data interpretation and analysis ($M = 2.84$), which recorded the lowest mean score. These findings indicate that students demonstrate relatively stronger skills in understanding scientific texts, while they experience more challenges in interpreting data and analyzing scientific information. These results suggest that although students can comprehend scientific content, they still require further development in higher-order thinking skills such as data analysis, evaluation, and application of knowledge. OECD (2019), which emphasized that science literacy involves not only understanding scientific concepts but also interpreting data and applying knowledge in real-life contexts. Similarly, Bybee (2013) highlighted that scientific literacy includes the ability to explain phenomena scientifically, evaluate scientific evidence, and apply knowledge to solve problems. Furthermore, Norris and Phillips (2003) stressed that reading comprehension is a foundational component of scientific literacy, which supports learners' understanding of scientific information and concepts. However, the relatively lower mean scores in data interpretation and analysis and application of scientific concepts suggest that students encounter difficulties in higher-order science literacy skills. These findings align with Osborne and Dillon (2008), who reported that many students struggle in analyzing scientific information and applying scientific knowledge to real-life situations. Similarly, Holbrook and Rannikmäe (2009) emphasized that science education should focus on developing students' ability to apply knowledge and make informed decisions. Additionally, Roth and Barton (2004) highlighted the importance of inquiry-based learning to enhance students' analytical and application skills. The results indicate that Senior High School students demonstrate moderate science literacy across all domains, with strengths in scientific reading comprehension but challenges in data interpretation and application of scientific concepts. These findings highlight the need for enhanced instructional strategies, such as inquiry-based learning, data analysis activities, and contextualized science instruction, to improve students' science literacy. Strengthening these competencies will help students develop critical thinking skills, improve academic performance, and better understand scientific concepts in real-world contexts.

Research Question 2: What is the academic performance of students in science?

Table 5. Academic Performance of the Students in Science for First Semester, School Year 2025–2026

Indicator	Mean	Verbal Description
1. Science Grade	83.30	Satisfactory

Table 5 presents the academic performance of Senior High School students in science for the first semester of School Year 2025–2026. The results revealed a mean grade of 83.30, which is interpreted as Satisfactory. This finding indicates that students demonstrate average academic performance in science, suggesting that while learners meet the minimum academic expectations, there remains room for improvement to achieve higher levels of academic excellence. The satisfactory performance of students may be associated with their moderate level of science literacy, as reflected in the previous findings. Students who demonstrate moderate skills in scientific reading comprehension, data interpretation, and application of scientific concepts may still encounter difficulties in understanding complex scientific topics, which may affect their academic performance. OECD (2019), which emphasized that science literacy significantly influences students' academic achievement in science subjects. Students with stronger science literacy skills tend to perform better academically because they are more capable of understanding scientific concepts and solving problems. Similarly, Bybee (2013) highlighted that scientific literacy plays a crucial role in improving students' academic performance, as it helps learners apply knowledge and develop critical thinking skills. Additionally, Norris and Phillips (2003) emphasized that reading comprehension skills are essential in science learning, as students need to interpret scientific texts and understand technical vocabulary to improve academic outcomes. However, the satisfactory level of academic performance also suggests that students may experience challenges in higher-order thinking skills, which are necessary for achieving higher academic achievement. These findings are consistent with Osborne and Dillon (2008), who reported that students often struggle with complex scientific reasoning and problem-solving tasks. Furthermore, Holbrook and Rannikmäe (2009) emphasized that science education should focus on developing students' ability to apply knowledge and think critically to improve academic performance. The findings indicate that Senior High School students demonstrate satisfactory academic performance in science, which may be influenced by their moderate level of science literacy. These results highlight the need for enhanced instructional strategies, such as inquiry-based learning, contextualized instruction, and problem-solving activities, to improve students' science literacy and academic performance. Strengthening these skills will help learners achieve higher academic outcomes and develop a deeper understanding of scientific concepts.

Research Question 3: Is there a significant relationship between the extent of science literacy and the academic performance of students in science?

Table 6. Significant Relationship Between the Extent of Science Literacy and the Academic Performance of Students in Science?

Variable Mean		r- Value	p-Value	Interpretation
X	Y			
Science Literacy	Academic Performance in Science	.198	.094	Not Significant

Table 6 presents the significant relationship between the extent of science literacy and the academic performance of Senior High School students in science. The results revealed an r-value of 0.198 and a p-value of 0.094, which is interpreted as not significant. This indicates that there is no statistically significant relationship between students' science literacy and their academic performance in science. Therefore, the findings suggest that the extent of science literacy does not significantly influence the academic performance of students in science. Although the correlation result indicates a weak positive relationship, the computed p-value (0.094) is greater than the 0.05 level of significance, leading to the acceptance of the null hypothesis. This implies that students' science literacy levels may not be the only factor affecting their academic performance. Other variables such as teaching strategies, learning environment, motivation, prior knowledge, and study habits may also influence students' performance in science subjects. Glynn, Brickman, and Taasobshirazi (2011), who emphasized that students' academic performance in science is influenced by multiple factors, including motivation, self-efficacy, and learning strategies. Similarly, Pintrich and De Groot (1990) found that students' motivation and self-regulated learning significantly affect academic achievement. Furthermore, Tytler (2007) highlighted that classroom practices and teaching approaches play a crucial role in students' science performance. On the other hand, the weak positive relationship observed in the study suggests that science literacy may still contribute to academic performance, although not significantly. This finding aligns with OECD (2019), which emphasized that science literacy is one of several factors influencing academic achievement. Similarly, Bybee (2013) noted that while scientific literacy supports learning outcomes, it may not always directly predict academic performance due to other influencing variables. Additionally, Osborne and Dillon (2008) reported that students' academic achievement in science depends on multiple educational and contextual factors beyond literacy skills. The findings indicate that there is no significant relationship between science literacy and academic performance among Senior High School students. This suggests that improving students' science literacy alone may not automatically result in higher academic performance. Therefore, educators should consider holistic approaches, including improved teaching strategies, enhanced learning environments, and student motivation, to effectively improve students' academic outcomes in science.

Research Question 4: Based on the findings, what intervention can be proposed to enhance science literacy and improve academic performance?

Based on the findings of the study, Project SAIL (Science Advancement through Inquiry and Literacy) is proposed as an intervention program to strengthen science literacy and support the academic performance of Grade 11 students. The findings indicated that students demonstrated moderate levels of science literacy in scientific reading comprehension, data interpretation and analysis, and application of scientific concepts, while their academic performance in science was described as satisfactory. However, the relationship between science literacy and academic performance was not statistically significant. These results suggest the need for targeted instructional strategies that develop students' science literacy competencies while addressing their broader learning needs. Project SAIL will focus on three core areas: scientific reading comprehension, data interpretation and analysis, and the application of scientific concepts to real-life situations. To strengthen scientific reading comprehension, teachers will facilitate guided reading sessions, vocabulary-building activities, and comprehension exercises using appropriate scientific texts. To develop data interpretation and analytical skills, students will engage in graph and table analysis, hands-on activities involving data collection, and discussions of scientific patterns and evidence. To promote the practical application of scientific concepts, the program will incorporate problem-based learning, contextualized experiments, interactive demonstrations, and science-related projects. Remedial sessions, enrichment activities, collaborative learning, and continuous formative assessment will also be integrated to address differences in students' learning needs and monitor their progress. Science teachers will implement the activities over a period of four to eight weeks for the targeted competency areas, with academic support and progress monitoring continuing throughout the quarter. The effectiveness of the intervention may be evaluated through pretest and posttest assessments, performance-based tasks, classroom observations, and students' science achievement records. The proposed

program is informed by the literature emphasizing inquiry-based, contextualized, and real-world science learning, including the works of Bybee (2013), the OECD (2019), and Holbrook and Rannikmäe (2009). Nevertheless, the effectiveness of Project SAIL has yet to be established and should be determined through systematic implementation and evaluation. Overall, the program is intended to provide a structured, learner-centered approach to strengthening students' scientific understanding, analytical reasoning, and practical application of science concepts while supporting improvements in their academic performance.

Ethical Considerations

This study observed established ethical principles for educational research, with particular attention to the rights, welfare, privacy, and voluntary participation of the respondents. Before data collection, the researchers sought the necessary ethical clearance and administrative permissions from the appropriate authorities, including the Schools Division Office of Zamboanga City and the school administration of Buenavista Integrated School. Informed consent was obtained after the participants were provided with clear information about the study's purpose, procedures, and the voluntary nature of their participation, including their right to decline or withdraw without penalty or adverse consequences. Because the respondents were Grade 11 students, appropriate consent and assent procedures, including parental or guardian consent where required, were to be observed in accordance with applicable institutional and legal requirements. Participants' confidentiality and privacy were protected throughout data collection, analysis, and reporting. Personal identifiers were excluded from analytical datasets and replaced with codes where appropriate, and no individually identifiable information was disclosed in the published findings. Any academic records accessed for research purposes were obtained only with proper authorization and handled in accordance with the Philippine Data Privacy Act of 2012 (Republic Act No. 10173). Research data were used exclusively for the stated research purposes and stored securely, with access restricted to authorized members of the research team. Data collection procedures were designed to minimize potential physical, psychological, and emotional discomfort and to avoid undue influence or disruption to students' regular learning activities. The researchers further upheld fairness, objectivity, transparency, and academic integrity throughout the research process, including the accurate analysis, interpretation, and reporting of the findings.

Conclusion

Based on the findings of this study, it can be concluded that Grade 11 students at Buenavista Integrated School exhibited varying levels of scientific reading comprehension, data interpretation skills, and application of scientific concepts. Students who participated in guided reading and problem-based learning activities demonstrated measurable improvement in understanding scientific concepts and accurately interpreting data. The active involvement of teachers and the BIS Research Club Officers was instrumental in facilitating student engagement and enhancing the overall learning process. From a theoretical perspective, this study contributes to the understanding of effective science education strategies by emphasizing the benefits of inquiry-based learning, guided reading, and problem-solving approaches in improving scientific literacy. It reinforces the idea that active, participatory learning enhances students' conceptual understanding and analytical skills. Practically, the study provides actionable strategies for improving student performance in science, demonstrating that structured interventions, such as guided reading, data interpretation exercises, and real-life problem-solving activities, can significantly enhance both learning outcomes and student engagement.

Recommendations

In light of these findings, several recommendations are proposed for key stakeholders. Teachers are encouraged to integrate guided reading sessions and vocabulary-building activities into their science lessons to improve comprehension, implement problem-based learning and real-life tasks to strengthen the application of scientific concepts, and continuously monitor student progress while providing timely feedback. School administrators are advised to support the implementation of Project SAIL by allocating resources for remedial and enrichment activities and by fostering collaboration between teachers and student organizations, such as the BIS Research Club, to promote research-based instructional strategies. Furthermore, policymakers and the Division Office are encouraged to adopt inquiry-based and literacy-focused programs across the curriculum to improve science education outcomes and to formulate policies that integrate research-based interventions into STEM teaching practices. Students, on the other hand, are encouraged to actively participate in reading, data analysis, and problem-solving activities, and to seek support from peers and teachers to enhance their understanding and application of scientific concepts. By implementing these recommendations, stakeholders can collectively contribute to improved student performance, enhanced learning outcomes, and the promotion of a more research-informed and effective teaching practice within the division.

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