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THE ENGAGEMENT OF NON-STEM STUDENTS AND THEIR ACADEMIC PERFORMANCE IN EARTH AND LIFE SCIENCE TOWARDS A PROPOSED ACTION PLAN

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ABSTRACT

This study explores the relationship between student engagement and academic performance in Earth and Life Science among Grade 11 senior high school students. It aims to assess the levels of behavioral, emotional, and cognitive engagement and examine how demographic factors such as age, sex, and strand influence these dimensions. Using a quantitative descriptive-correlational design, data were collected through a structured engagement questionnaire and academic performance records. Results indicated a high overall level of engagement, with behavioral engagement ranking the highest and cognitive engagement the lowest. Significant differences in engagement levels were found based on demographic variables.

Findings revealed a high level of student engagement (mean = 0.614), suggesting that engagement behaviors are frequently observed among non-STEM students. The correlation analysis showed no significant relationship between overall engagement and academic performance, leading to the acceptance of the null hypothesis.

These results highlight the importance of identifying factors that influence student engagement. As suggested by Fredricks, Blumenfeld, and Paris (2004), enhancing behavioral, emotional, and cognitive engagement can significantly shape student learning experiences. Educators and school administrators may design targeted interventions to strengthen these engagement dimensions, fostering improved academic outcomes and enriching students' educational experiences.

KEYWORDS: *Behavioral Engagement, Cognitive Engagement, Earth and Life Science, Student Performance*

INTRODUCTION

Science has a place in society as it helps people make decisions about real-life issues such as climate, health, and technology. Earth and Life Science is a major subject for senior high school students that falls under the core subjects which provides basic concepts of facts related to the natural world and living organisms. Not everyone is a fan of science, most particularly those who belong to strands other than STEM. At the school where the researcher teaches, non-STEM students have an average rating that lies 60% below the passing 75% based on DepEd Order No. 8, s. 2015. For the previous academic years, around five students out of forty failed in this subject which rather explicitly brings out the need for more support to these students learning science.

Non-STEM learners behave with the notion that science has nothing to do with their future endeavors; therefore, interest and confidence are not elicited. The level of engagement varies from that of STEM learners. For this reason, instructors must keenly observe their behavior and modify strategies that will work for them in class. Earth and Life science subjects may not directly pave the way for these students to a scientific profession but can be avenues through which they pick up lessons toward better-informed and responsible citizenship.

It is in fact a real struggle for teachers to make science appealing to non-STEM students. Positive disposition towards the subject would enhance engagement and improve performance. Based on classroom observations, HUMSS and ABM strands students, who come from a background of reflective and discussion-based learning, show better engagement in science compared to TVL-ICT students (Estrella et al., 2023). Female students mostly manifest greater emotional and cognitive engagement than their male counterparts; therefore, this may reflect in their performance (Nguyen & Park, 2022).

This study looks at the level of engagement of Grade 11 non-STEM students with Earth and Life Science and its impact on their academic performance. It seeks to expose teachers to the challenges faced by such students and how a method of teaching that is better, different, and more inclusive can be implemented. The more interactive and related the lessons are, the easier it will be for students to understand content and develop a liking for learning.

The study hopes to guide teachers so they can help and motivate non-STEM students to perform well in science. Through a warm and meaningful class setup plus tying science topics to real life, all students-strands notwithstanding-can lay a good base for learning the subject of science and develop more confidence in learning.

Objective of the study

1. To enhance students' confidence and curiosity in Science through experiential learning.
2. To create classroom environments that promote scientific inquiry and exploration.

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3. To boost students' belief in their ability to perform and succeed in Science.
4. To integrate engaging, real-world strategies that make Science meaningful and fun.

METHODOLOGY

This chapter presents the research design, population and sampling technique, research procedure, research instrumentation, along with the validation and reliability of the chosen tool.

Population and Sampling Technique

The researcher used total enumeration sampling, involving all students from selected non-STEM strands during the first semester of S.Y. 2024–2025. The respondents included all students from two HUMSS sections, two ABM sections, and one TVL-ICT section, all of whom took Earth and Life Science as a core subject. The total number of participants was 150, with 35 students each from Sections A and B, 30 students each from Sections C and D, and 20 students from Section E.

Statistical Treatment of Data

The data gathered from the respondents were treated using the following tools:

Frequency and Percentage were used to determine the respondent's profile

Mean and Standard Deviation were used to determine the level of engagement in different factors, such as behavioral, cognitive, and emotional. It is also used in determining the

Analysis of Variance (ANOVA) was used to compare the level of engagement of the respondents to their profiles, such as age, sex, and stand.

Pearson Product-Moment Correlation was used to test the correlation between the respondents' level of engagement and the academic performance in Earth and Life Science.

RESULTS

Problem number 1. What is the profile of the respondents in terms of age, sex, and strand?

Table 1

Demographic Profile of the Respondents

		Mean	Standard Deviation	Count	Column N %
Age		16.47	0.63		
Strand	TVL-ICT			20	13.3%
	HUMMS			70	46.7%
	ABM			60	40.0%
Gender	Male			63	42.0%
	Female			87	58.0%

The 150 respondents had an average age of 16.47, showing a typical senior high school age group. Most were female (58%) and came from HUMSS (46.7%) and ABM (40%), while only 13.3% were from TVL-ICT. This means the findings mostly reflect academic track students. The larger number of female participants may have also influenced engagement and performance, as gender can affect motivation and learning styles (Fredricks et al., 2004).

Problem Number 2. What is the level of engagement of the respondents in terms of Behavioral engagement, Cognitive engagement, and Emotional engagement?

Table 2

Level of Engagement of the Respondents in Terms of Behavioral Engagement

	Mean	Std. Deviation	Verbal Interpretation
I am asking questions in class or contributing to class discussions.	2.91	0.81	High
I am raising my hand in class.	2.93	0.77	High
I am participating in small group discussions.	3.15	0.73	High
I am doing all my homework.	3.41	0.83	High
I am coming to class every day on time.	3.35	0.77	High
I am taking notes in class.	3.14	0.87	High
I am getting a good grade.	3.06	0.76	High
I am receiving prompt written or oral feedback from faculty on my academic performance.	2.52	0.85	High
I am making sure to study for the upcoming quizzes and exams.	3.09	0.83	High
I am doing well on a test.	2.99	0.76	High
Behavioral Engagement	3.05	0.52	High

Legend: 4 3.50 - 4.00 Very High 3 2.50 - 3.49 High 2 1.50 - 2.49 Low 1 1.00 - 1.49 Very Low

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The study involved 150 senior high school students with an average age of 16.47. Most were female (58%) and from the HUMSS (46.7%) and ABM (40%) strands, while fewer came from TVL-ICT (13.3%). This means the results mostly apply to academic track students. The higher number of female respondents may have affected engagement and performance, as gender can influence learning behavior (Fredricks et al., 2004).

Table 3
Level of Engagement of the Respondents in Terms of Cognitive Engagement

	Mean	Std. Dev.	Verbal Interpretation
I am making a class presentation.	2.81	0.80	High
I am working on a paper or project that requires integrating ideas or information from previous resources.	3.06	0.74	High
I am putting together ideas or concepts from different courses when completing assignments or during class discussions.	3.03	0.71	High
I am using an electronic medium to discuss or complete an assignment.	2.89	0.78	High
I am discussing ideas from readings or classes with faculty members outside of class.	2.41	0.79	High
I am putting forth effort.	2.94	0.73	High
I am using email to communicate with a teacher.	2.02	0.91	High
I am discussing grades or assignments with a teacher.	2.71	0.88	High
I am working harder than I thought I could to meet a teacher's standards or expectations.	2.71	0.82	High
I am going to the teacher's office during office hours to review assignments or tests or ask questions.	2.32	0.85	High
I am thinking about the subjects between class meetings.	2.83	0.78	High
I am reviewing class notes between classes to ensure I understand everything.	2.89	0.76	High
I am applying what I have learned to my life.	3.07	0.78	High
Cognitive Engagement	2.74	0.47	High

Legend: 4 3.50 - 4.00 Very High 3 2.50 - 3.49 High 2 1.50 - 2.49 Low 1 1.00 - 1.49 Very Low

Students showed high cognitive engagement (M = 2.74), especially in applying lessons to real life (M = 3.07) and using prior knowledge in projects (M = 3.06). This suggests strong critical thinking and deeper learning. However, engagement was low in communicating with teachers outside class, like through email (M = 2.02) or follow-ups (M = 2.32).

Table 4
Level of Engagement of the Respondents in Terms of Emotional Engagement

	Mean	Std. Dev	Verbal Interpretation
I am including diverse perspectives in class discussions and writing assignments.	2.98	0.80	High
I am working with other students on projects.	3.23	0.76	High
I am working with classmates to prepare class assignments.	2.88	0.86	High
I am tutoring or teaching other students voluntarily.	2.61	0.87	High
I am participating in a community-based project as part of a regular subject.	2.61	0.92	High
I am having serious conversations with other students who are very different from me in terms of their religious, political opinions, or personal values.	2.88	0.93	High
I desire to learn everything during the discussion.	3.13	0.77	High
I am confident that I can learn and do well in class.	3.01	0.76	High
I am having fun in class.	3.09	0.88	High
I am working with teachers on activities.	2.89	0.83	High
I am talking about career plans with a teacher or adviser.	2.75	0.90	High
Emotional Engagement	2.91	0.56	High

Legend: 4 3.50 - 4.00 Very High 3 2.50 - 3.49 High 2 1.50 - 2.49 Low 1 1.00 - 1.49 Very Low

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Students showed high emotional engagement (M = 2.91), especially in group work (M = 3.23) and their desire to learn (M = 3.13), suggesting motivation and a strong sense of belonging. However, lower scores in voluntary teaching and community involvement (M = 2.61) show less emotional connection beyond the classroom.

Table 5

Composite Table on the Level of Engagement of the Respondents

	Mean	Std. Deviation	Verbal Interpretation
Behavioral engagement	3.05	0.52	High
Cognitive engagement	2.74	0.47	High
Emotional engagement	2.91	0.56	High
Level of Engagement in Earth and Life Science Subject	2.90	0.47	High

Legend: 4 3.50 - 4.00 Very High 3 2.50 - 3.49 High 2 1.50 - 2.49 Low 1 1.00 - 1.49 Very Low

Findings show high overall engagement, strongest in behavior (M = 3.05), then emotional (M = 2.91), and cognitive (M = 2.74). Students actively participate and show motivation, but lower cognitive scores suggest less critical thinking and help-seeking outside class.

Problem Number 3. What is the academic performance of the respondents in Earth and Life Science during the First Semester?

Table 6

Academic Performance of the Respondents in Earth and Life Science During the First Semester

	Mean	Standard Deviation
First Semester General Average in Earth and Life Science	89.07	5.97

The average grade of 89.07 shows strong performance, likely driven by students' high behavioral and emotional engagement. Their active participation and motivation contribute to their academic success.

Problem Number 4. Is there a significant difference in the level of engagement of the respondents when grouped according to their profile?

Table 7

Test of Significant Difference on the Level of Engagement of the Respondents When Grouped According to Profile

	t	df	Sig. (2-tailed)	Decision	Remarks
Age - Level of Engagement in Earth and Life Science Subject	204.026	148	0.000	Reject	Significant
Gender - Level of Engagement in Earth and Life Science Subject	-26.467	149	0.000	Reject	Significant
Strand - Level of Engagement in Earth and Life Science Subject	-9.632	149	0.000	Reject	Significant

The analysis showed a significant difference in engagement by age, gender, and strand (p = 0.000). Female students and those in HUMSS and ABM had higher engagement than TVL-ICT students, suggesting they respond better to reflective and communication-based activities.

Problem Number 5. Is there a significant relationship between the level of engagement of the respondents and their academic performance in Earth and Life Science during the first semester?

Table 8

Correlation Between the Level of Engagement of the Respondents and Their Academic Performance in Earth and Life Science During the First Semester

		Level of Engagement in Earth and Life Science Subject
First Semester General Average in Earth and Life Science	Pearson Correlation	.601**
	Sig. (2-tailed)	0.000
	N	150

**. Correlation is significant at the 0.01 level (2-tailed).

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A strong positive correlation ($r = 0.601$, $p < 0.01$) shows that higher engagement leads to better grades. This confirms that behavioral, emotional, and cognitive engagement are key to academic success (Fredricks et al., 2004, as cited in Ramirez et al., 2024).

CONCLUSION

It found that students show high engagement in Science class where there are provisions for interactive teaching but their academic performance is not uniformly high. Innovative tools and parental support positively inject the outcome, yet most of the students cannot relate science to real life. A Targeted Action Plan shall then be proposed comprising inquiry-based learning, real-world application, confidence building, and a better classroom environment as the setup to assist understanding and performance uplift.

RECOMMENDATIONS

The major recommendations which can be drawn from this study are collaborative and inquiry-based teaching strategies to improve engagement, support interventions for example remedial sessions to help struggling students, visual aids and technological tools in learning, strengthening home-school partnerships, and peer support. Lessons should be associated with real-life situations. Future researchers may implement the Action Plan proposed herein focusing on aspects of curiosity, vocabulary, and confidence while tracking the development of changes about feedback and performance.

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