ISSN (Online): 2455-3662
EPRA International Journal of Multidisciplinary Research (IJMR) - Peer Reviewed Journal
Volume: 11| Issue: 3| March 2025|| Journal DOI: 10.36713/epra2013 || SJIF Impact Factor 2025: 8.691 || ISI Value: 1.188

MEDIATING EFFECT OF STUDENT ENGAGEMENT ON THE RELATIONSHIP BETWEEN ATTITUDE TOWARDS SCIENCE AND SCIENCE ACHIEVEMENT

Leogine Lyle Guadalquiver, Jose Marie E. Ocdenaria. Ph.D
St. Mary's College of Tagum, Inc.
Tagum City, Davao del Norte

Article DOI: https://doi.org/10.36713/epra20565
DOI No: 10.36713/epra20565

ABSTRACT

This quantitative study examined the mediating effect of student engagement on the relationship between attitude towards science and science achievement. A descriptive-correlational research design with mediation analysis was employed, involving 202 Grade 11 students from four private schools in the Diocese of Tagum, selected through simple random sampling. The study utilized two adopted questionnaires and one researcher-made questionnaire, with mean, Pearson r correlation, and Sobel z test as statistical tools. The results show that students exhibit a highly manifested attitude towards science and are actively engaged in science-related activities. Their science achievement is high, suggesting effective understanding and application of scientific concepts. A significant relationship was found between attitude towards science and both science achievement and student engagement. However, student engagement does not significantly correlate with science achievement and does not mediate the relationship between attitude and achievement. This indicates that while engagement may enhance interest and participation, it does not necessarily translate into improved science achievement. The findings suggest that other factors, such as instructional methods or cognitive abilities, may have a stronger influence on students' science achievement. These findings suggest that efforts should focus on directly strengthening students' attitudes toward science, as it plays a crucial role in their achievement. While engagement is strongly linked to attitude, it does not independently influence science achievement, indicating a need to explore how engagement can be effectively translated into better performance. Therefore, interventions should prioritize fostering a positive attitude while identifying ways to enhance the impact of engagement on science achievement.

KEYWORDS: *Science Education, Students Engagement, Attitudes Toward Science, Science Achievement, Quantitative Research, Descriptive And Correlational Designs, Mediation Analysis, Tagum City, Davao Del Norte, Philippines*

INTRODUCTION

Science is vital for national competitiveness, scientific literacy, and student competency in a rapidly evolving society (Hong et al., 2022). However, science achievement remains a global concern, as reflected in TIMSS 2023 and PISA 2022, where many Southeast Asian countries, including the Philippines, demonstrated declining performance (OECD, 2023; Mullis et al., 2020). In the Philippines, PISA 2022 ranked the country third to last among 81 nations, with only 23% of students reaching Level 2 science literacy, well below the OECD average of 76%. Local assessments, such as the National Achievement Tests (NAT), further highlight low science proficiency among Filipino students.

Within the Diocese of Tagum, senior high school students exhibit similar challenges, with only 43% scoring within the satisfactory range (75-79%) and 11% scoring below 75% in science assessments. Experts and instructors emphasize the need for targeted interventions to improve science competency. Research suggests that attitude towards science and student engagement significantly impact science achievement (Mao et al., 2021; Martin et al., 2021). However, limited studies explore the mediating role of science engagement in this relationship.

This study investigates the mediating effect of student engagement on the relationship between attitude toward science and science achievement among Grade 11 students in private schools within the Diocese of Tagum (SY 2023-2024). The findings aim to inform innovative strategies for improving science proficiency and addressing challenges in 21st-century education, with dissemination planned through manuscript distribution and research conferences.

STATEMENT OF THE PROBLEM

This study examined whether science engagement significantly mediated the relationship between attitude toward science and science achievement among Grade 11 students in private schools in the Diocese of Tagum.

Specifically, this sought answers to the following questions:

1. What is the level of attitude towards science of students in terms of:
   1.1. enjoyment;
   1.2. confidence;
   1.3. usefulness; and
   1.4. interest?
2. What is the extent of engagement of students in terms of:

ISSN (Online): 2455-3662
EPRA International Journal of Multidisciplinary Research (IJMR) - Peer Reviewed Journal
Volume: 11| Issue: 3| March 2025|| Journal DOI: 10.36713/epra2013 || SJIF Impact Factor 2025: 8.691 || ISI Value: 1.188

2.1. engagement on science lessons and tasks;
2.2. science learning involvement; and
2.3. science effort and preparation?

3. What is the level of science achievement of students?
4. Is there a significant relationship between:
   4.1. attitude towards science and science achievement of students?
   4.2. students engagement and science achievement of students?
   4.3. attitude towards science and students engagement?
5. Does students engagement significantly mediate the relationship between attitude towards science and science achievement of students?

METHODOLOGY

This chapter outlines the research design, participants, instruments, data collection, and statistical tools used.

Research Design

This quantitative study used a descriptive-correlational design with mediation analysis to examine student engagement's role between attitudes toward science and achievement. Data were collected through validated instruments and a researcher-made test, then statistically analyzed.

Research Respondents

A stratified random sample of 202 Grade 11 students from four private schools in the Diocese of Tagum (SY 2023-2024) participated. The research covered areas in Davao del Norte and Davao de Oro.

Figure 1. Local Map of Davao Del Norte and Davao de Oro

Research Instruments

The study used two adopted instruments, the Attitude Towards Science Scale and the Students' Science Engagement Scale (SSES), along with a researcher-made summative test. These were validated, pilot-tested, and aligned with the study's focus. The Attitude Towards Science Scale (Ozcan, 2020) had 36 five-point Likert items, while the SSES (Baraquia, 2019) included 22 items across three engagement dimensions. The summative test, consisting of 50 items, measured science achievement based on the Department of Education's third-quarter curriculum. A table of specifications ensured coverage, and the test underwent pilot testing and item analysis.

Statistical Treatment of Data

The study utilized statistical tools to analyze the data effectively. Mean measured students' attitudes, engagement, and achievement, while standard deviation assessed score variability. Pearson's r examined relationships between variables, and regression analysis determined predictive effects. The Sobel test was considered but not applied due to the absence of a mediation effect.

RESULTS AND DISCUSSION

In this section, the researcher presents the results from the gathered data. Results are presented in tabular forms accompanied by discussion in text format and literature where similar findings exist.

Extent of Attitude Toward Science in terms of Enjoyment

Table 1 shows students' attitudes toward science in terms of enjoyment. The highest-rated item was "I enjoy learning new information about science" (M = 4.30, very high), while the lowest was "Doing research on science subjects is perfect for me" (M = 3.22, moderate). The category mean (3.78, high) indicates a generally positive attitude, with minimal variability (SD = 0.959).

Level of Attitude Towards Science of Students in Terms of Confidence

Table 2 presents students' confidence in science. The highest-rated item was "I am working on improving my ability to answer questions about science" (M = 4.23, very high), while the lowest was "I am good at solving science problems" (M = 3.19, moderate). The category mean (3.53, high) indicates generally strong confidence, with minimal variability (SD = 0.975).

ISSN (Online): 2455-3662
EPRA International Journal of Multidisciplinary Research (IJMR) - Peer Reviewed Journal
Volume: 11| Issue: 3| March 2025|| Journal DOI: 10.36713/epra2013 || SJIF Impact Factor 2025: 8.691 || ISI Value: 1.188

Level of Attitude Towards Science of Students in Terms of Usefulness

Table 3 shows students' perception of science usefulness. The highest-rated item was "I find learning science necessary" (M = 4.26, very high), while the lowest was "I will choose a profession related to science" (M = 3.28, moderate). The category mean (3.85, high) indicates a strong perception of science's usefulness, with minimal variability (SD = 0.992).

Level of Attitude Towards Science of Students in Terms of Interest

Table 4 shows students' interest in science. The highest-rated item was interest in science-related field trips (M = 4.34, very high), while the lowest was general interest in science subjects (M = 4.05, high). The category mean (4.20, very high) indicates strong interest, with minimal variability (SD = 0.898).

Summary of the Level of Attitude Towards Science of Students

Table 5 summarizes students' overall attitude toward science. Among the four indicators, interest had the highest mean (4.20, very high), followed by usefulness (3.85, high). Confidence received the lowest mean (3.53, high). The overall mean of 3.84 (high) suggests a generally positive attitude toward science, with an SD of 0.956 indicating consistent responses.

Extent of Engagement of Students in Terms of Engagement on Science Lessons Tasks

Table 6 shows students' engagement in science lessons and tasks. The highest-rated item was the relevance of science lessons (M = 4.48, very high), while the lowest was daily preparedness for class (M = 3.86, high). The category mean (4.20, very high) indicates strong engagement, though moderate variability (SD = 1.042) suggests differences in motivation.

Extent of Engagement of Students in Terms of Science Learning Involvement

Table 7 shows students' engagement in science learning involvement. Appreciation of the scientific method had the highest mean (M = 4.34, very high), while seeking help had the lowest (M = 3.67, high). The category mean (3.98, high) and SD (0.886) indicate generally consistent engagement with some variability.

Extent of Engagement of Students in Terms of Science Effort and Preparation

Table 8 shows student engagement in science effort and preparation. Following instructions had the highest mean (M = 4.32, very high), while class participation had the lowest (M = 3.75, high). The category mean (4.02, high) and SD (0.927) indicate generally consistent engagement with some variation.

Summary of the Extent of Engagement of Students

Table 9 summarizes students' overall engagement in science. Engagement in science lessons and tasks has the highest mean (4.20, very high), followed by science effort and preparation (4.02, high), while science learning involvement has the lowest mean (3.98, high). The overall mean is 4.07 (high), indicating that student engagement is generally strong. The SD of 0.952 suggests moderate variability in engagement levels.

The Level of Science Achievement of Students

Table 10 presents students' science achievement, with a mean score of 30.27, a mean rating of 60.53% (high), and an SD of 17.803. The considerable dispersion in scores indicates varying proficiency levels, suggesting that while many students perform well, others may need additional support.

Significance of the Relationship Between the Variables

Table 11 shows the correlation between attitude toward science, student engagement, and science achievement. A statistically significant but weak positive correlation ($r = 0.154$, $p = 0.028$) was found between attitude toward science and science achievement, indicating that improved attitudes slightly enhance performance. However, the weak correlation suggests that other factors also influence science achievement.

Mediation Analysis

Mediation analysis was not conducted as student engagement did not significantly predict science achievement when controlling for attitude. The direct effect of attitude on achievement was significant ($\beta = 5.092$, $p = 0.028$), while engagement showed a positive but non-significant effect ($\beta = 4.848$, $p = 0.057$), preventing mediation. Attitude significantly influenced engagement ($\beta = 0.579$, $p = 0.000$), but engagement remained weak and non-significant ($\beta = 0.061$) when both were analyzed together. The total R^2 of 0.026 indicated that other factors played a greater role in science achievement.

RECOMMENDATIONS

Students should maintain a positive attitude toward science and actively engage in lessons to enhance learning. Teachers should use real-world applications and interactive methods to strengthen students' attitudes. School administrators should provide resources and programs to sustain interest, while DepEd should integrate application-based learning and monitor science education initiatives. Future research should explore additional mediators, conduct longitudinal studies, and examine diverse populations to expand educational insights.

CONCLUSION

Students demonstrated a highly positive attitude toward science and strong engagement, with outstanding science achievement. While attitude significantly correlated with both engagement and achievement, engagement was not significantly linked to achievement and did not mediate the attitude-achievement relationship.

ISSN (Online): 2455-3662
EPRA International Journal of Multidisciplinary Research (IJMR) - Peer Reviewed Journal
Volume: 11| Issue: 3| March 2025|| Journal DOI: 10.36713/epra2013 || SJIF Impact Factor 2025: 8.691 || ISI Value: 1.188

FIGURES AND TABLES

Figure 1. *Local Map of Davao Del Norte and Davao de Oro*

Table 1. *Level of Attitude Towards Science of Students in Terms of Enjoyment*

Items	SD	Mean	Description
1. I find the science class more enjoyable than other classes.	0.929	3.82	**High**
2. I feel good in science class.	0.922	4.01	**High**
3. I enjoy studying science.	1.020	3.88	**High**
4. Science class is among the classes I like.	1.053	3.84	**High**
5. I look forward to the science class.	0.978	3.77	**High**
6. I get excited while listening to the science class.	0.999	3.72	**High**
7. I feel entertained in science class.	0.880	4.04	**High**
8. Studying science makes me happy.	0.972	3.71	**High**
9. I feel good about myself in science class.	0.966	3.62	**High**
10. School becomes bearable on days when there is science class.	0.940	3.56	**High**
11. Doing research on science subjects is perfect for me.	1.063	3.22	**Moderate**
12. I enjoy learning new information about science.	0.787	4.30	**Very High**
13. I look forward to going to school on days when there is a science class.	0.960	3.63	**High**
Category Mean	**0.959**	**3.78**	**High**

Table 2. *Level of Attitude Towards Science of Students in Terms of Confidence*

Items	SD	Mean	Description
1. Science questions do not scare me.	1.058	3.28	**Moderate**
2. I find it difficult to learn science topics.	1.022	3.23	**Moderate**
3. I do not worry about creating projects related to science class.	1.006	3.42	**High**
4. I am not anxious while working on science.	0.984	3.41	**High**
5. I am working on finding connections between science class and other classes.	0.943	3.63	**High**
6. I am working on improving my ability to answer questions about science.	0.827	4.23	**Very High**
7. I struggle to answer questions about science.	0.983	3.22	**Moderate**
8. I am confident in preparing science projects.	0.936	3.61	**High**
9. I am learning to manage stress effectively during science class.	0.971	3.66	**High**
10. I am learning techniques to ease my anxiety during science class.	0.933	3.63	**High**
11. I am good at solving science problems.	0.996	3.19	**Moderate**
12. I do not hesitate to chat with my friends about science topics.	1.040	3.82	**High**
Category Mean	**0.975**	**3.53**	**High**

ISSN (Online): 2455-3662
EPRA International Journal of Multidisciplinary Research (IJMR) - Peer Reviewed Journal
Volume: 11| Issue: 3| March 2025|| Journal DOI: 10.36713/epra2013 || SJIF Impact Factor 2025: 8.691 || ISI Value: 1.188

Table 3. ***Level of Attitude Towards Science of Students in Terms of Usefulness***

Items	SD	Mean	Description
1. I find learning science necessary.	0.883	4.26	**Very High**
2. I feel comfortable while studying science.	0.881	3.86	**High**
3. Research related to science is important.	0.943	4.13	**High**
4. I will choose a profession related to science.	1.355	3.28	**Moderate**
5. Science makes my daily life easier.	0.989	3.50	**High**
6. Science class contributes to solving problems I encounter in daily life.	0.942	3.70	**High**
7. Science plays a vital role in addressing the world's challenges.	0.956	4.23	**Very High**
Category Mean	**0.992**	**3.85**	**High**

Table 4. ***Level of Attitude Towards Science of Students in Terms of Interest***

Items	SD	Mean	Description
1. The experiments we do in science classes attract my attention.	0.998	4.14	**High**
2. I am interested in field trips organized within the scope of science class.	0.790	4.34	**Very High**
3. Science education is valuable and worthwhile.	0.827	4.25	**Very High**
4. I am interested in science subjects.	0.978	4.05	**High**
Category Mean	**0.898**	**4.20**	**Very High**

Table 5. ***Summary of the Level of Attitude Towards Science of Students***

Indicators	SD	Mean	Description
1. Enjoyment	0.959	3.78	**High**
2. Confidence	0.975	3.53	**High**
3. Usefulness	0.992	3.85	**High**
4. Interest	0.898	4.20	**Very High**
Overall Mean	**0.956**	**3.84**	**High**

Table 6. ***Extent of Engagement of Students in Terms of Engagement on Science Lessons and Tasks***

Items	SD	Mean	Description
1. My Science lessons and performance tasks are important and relevant to my life.	2.081	4.48	**Very High**
2. My Science lessons and performance tasks are interesting and meaningful.	0.834	4.29	**Very High**
3. My Science lessons and performance tasks are realistic and contextualized.	0.898	4.15	**High**
4. I am inspired to learn new things in Science class.	0.826	4.34	**Very High**
5. My Science lessons and performance tasks stimulate my curiosity.	0.823	4.15	**High**
6. I feel encouraged and interested to work on something in Science class.	0.931	4.11	**High**
7. I am inspired and prepared to come to Science class every day.	0.900	3.86	**High**
Category Mean	**1.042**	**4.20**	**Very High**

ISSN (Online): 2455-3662
EPRA International Journal of Multidisciplinary Research (IJMR) - Peer Reviewed Journal
Volume: 11| Issue: 3| March 2025|| Journal DOI: 10.36713/epra2013 || SJIF Impact Factor 2025: 8.691 || ISI Value: 1.188

Table 7. ***Extent of Engagement of Students in Terms of Science Learning Involvement***

Items	SD	Mean	Description
1. I am having fun during collaborative learning activities in Science.	0.795	4.22	**Very High**
2. I want to ask my Science teacher or classmates personally or through social media if I have trouble understanding a lesson.	1.062	3.67	**High**
3. I want to investigate and understand the societal and environmental impacts and implications from science and technology.	0.882	3.89	**High**
4. I participate and interact during small-group discussions in Science.	0.871	4.09	**High**
5. I appreciate the nature of the scientific method or process.	0.716	4.34	**Very High**
6. I consult and share my views and knowledge with my classmates and Science teacher.	0.942	3.70	**High**
7. I use my creativity and inventiveness in doing my Science work.	0.936	3.94	**High**
Category Mean	**0.886**	**3.98**	**High**

Table 8. ***Extent of Engagement of Students in Terms of Science Effort and Preparation***

Items	SD	Mean	Description
1. I do and finish my Science tasks on time.	0.981	4.05	**High**
2. I raise my hand to participate in Science class discussions.	0.993	3.75	**High**
3. I read and review my class notes, handouts, and textbook between classes to make sure that I learn from these Science learning materials.	0.905	3.97	**High**
4. I prepare thoroughly before the summative test or exam in Science.	0.929	3.94	**High**
5. I give maximum effort to my Science class.	0.922	3.92	**High**
6. I always pay attention to my teacher and classmates who communicate during Science class.	0.938	4.20	**Very High**
7. I feel supported by my classmates and Science teacher.	0.910	4.04	**High**
8. I follow the instructions closely in doing my Science work.	0.841	4.32	**Very High**
Category Mean	**0.927**	**4.02**	**High**

Table 9. ***Summary of the Extent of Engagement of Students***

Indicators	SD	Mean	Description
1. Engagement on Science Lessons and Tasks	1.042	4.20	**Very High**
2. Science Learning Involvement	0.886	3.98	**High**
3. Science Effort and Preparation	0.927	4.02	**High**
Overall Mean	**0.952**	**4.07**	**High**

Table 10. ***The Level of Science Achievement of Students***

Science Achievement of Students	**Standard Deviation**	**Mean Score**	**Mean Rating**	**Descriptive Equivalent**
	17.803	**30.27**	**60.53%**	**High**

ISSN (Online): 2455-3662
EPRA International Journal of Multidisciplinary Research (IJMR) - Peer Reviewed Journal
Volume: 11| Issue: 3| March 2025|| Journal DOI: 10.36713/epra2013 || SJIF Impact Factor 2025: 8.691 || ISI Value: 1.188

Table 11. ***Significance of the Relationship Between the Variables***

Variables Correlated	R	p-value	Decision on H_o	Decision on Relationship
Attitude Towards Science and Science Achievement of Students	0.154	0.028	Reject	Significant
Student Engagement and Science Achievement of Students	0.134	0.057	Accept	Not Significant
Attitude Toward Science and Student Engagement	0.633	0.000	Reject	Significant

Table 12. ***Steps in Mediation Analysis***

Independent Variable (IV)	Attitude Towards Science	
Dependent Variable (DV)	Science Achievement of Students	Student Engagement
Mediating Variable (MV)		
Step 1. Path C (IV and DV)	5.092	
Unstandardized Beta (β)	2.305	
Standard Error (e)	0.028	
p-value		
Step 2. Path B (MV and DV)	4.848	
Unstandardized Beta (β)	2.530	
Standard Error (e)	0.057	
p-value		
Step 3. Path A (IV and MV)	0.579	
Unstandardized Beta (β)	0.050	
Standard Error (e)	0.000	
p-value		
Step 4. Combined Influence of IV and MV on DV		
Attitude Towards Science		
Unstandardized Beta (β)	3.817	
Standard Error (e)	2.983	
Standardized Beta	0.116	
Part Correlation	0.090	
Student Engagement		
Standardized Beta	0.061	
Part Correlation	0.047	
Total R-square	0.026	

REFERENCES

1. *Baraquia, L. (2019). Students' Science Engagement Scale (SSES): Developing the constructs to measure science engagement. ResearchGate. Retrieved from https://www.researchgate.net/publication/339139596_Students'_Science_Engagement_Scale_SSES_Developing_the_Constructs_to_Measure_Science_Engagement*
2. *Hong, J., Kim, H., & Hong, H.-G. (2022). Analysis of predictors of Korean students' proficiency in science in PISA 2015 using a random forests hyper-ensemble approach. Asian Journal of Education, 23(2), 311–331. https://doi.org/10.15753/aje.2022.6.23.2.311*
3. *Mao, P., Cai, Z., He, J., Chen, X., & Fan, X. (2021). The relationship between attitude toward science and academic achievement in science: A three-level meta-analysis. Frontiers in Psychology, 12. https://doi.org/10.3389/fpsyg.2021.784068*
4. *Martin, A. J., Ginns, P., Burns, E., Kennett, R., & Pearson, J. (2021). Load reduction instruction in science and students' science engagement and science achievement. Journal of Educational Psychology, 113(6), 1126–1142. https://doi.org/10.1037/edu0000552*
5. *Mullis, I. V., Martin, M. O., Foy, P., Kelly, D. L., & Fishbein, B. (2020, December). TIMSS 2019 international results in mathematics and science.*
6. *OECD. (2023). PISA 2022 results (Volume I): The state of learning and equity in education. OECD Publishing. https://www.oecd-ilibrary.org/sites/53f23881-en*
7. *Ozcan, H., & Koca, E. (2020). Development of the attitude towards science scale: A validity and reliability study. Eurasian Journal of Educational Research, 85, 109-134. https://doi.org/10.14689/ejer.2020.85.6*