Mediating Effect of Self-Efficacy on the Relationship Between Classroom Learning Environment and Junior High School Student Engagement in Science

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Abstract — Junior high students worldwide show poor engagement in science. This study employed diagnostic research design in examining the mediating effect of self-efficacy on the relationship between classroom learning environment and student engagement in science. Applying survey technique to 341 samples selected through proportionate random sampling, and analyzing the data through mediation analysis, the findings revealed that self-efficacy partially mediates (30.8%) the correlation. The Social Cognitive Theory was partially affirmed. Future work may explore additional variables, use qualitative methods to identify mediators, and apply strategies that strengthen student self-efficacy for better engagement.

Keywords: Mediating effect of self-efficacy, relationship between classroom learning environment, junior high school, student engagement, science

I. INTRODUCTION

Junior high school students globally continue to experience poor engagement in science subjects, making it a persistent educational concern (Sadera et al., 2020). Studies have shown that many students demonstrate limited interest, participation, and motivation in science-related

activities, which negatively affects their academic involvement and learning outcomes (Salmela-Aro et al., 2021).

International studies further highlight this issue. In Australia, many students report feeling disengaged in both in-person and online classes (Bond et al., 2020). Similarly, junior high school students in China exhibit varying levels of engagement in science learning, indicating the need to better understand the factors influencing academic involvement (Shao et al., 2024). In Canada, poor student engagement has also been found to negatively affect learners' connection to the curriculum (Hollister et al., 2022).

In the Philippines, student engagement remains a significant challenge, with many learners showing limited participation and enthusiasm in academic activities (Wonder, 2021). This issue is particularly evident in the Davao Region, where students frequently demonstrate low attention and poor engagement in both online and face-to-face learning environments (Rosello et al., 2023). In Mati City, junior high school students likewise exhibit low engagement in science, as reflected in their limited participation and declining academic performance (Gabiazon, 2024).

Low engagement in science education not only decreases students' interest in STEM-related fields but also hinders progress toward Sustainable Development Goal 4, which promotes equitable and quality education. Moreover, declining engagement may weaken the future pool of scientists and professionals needed to address global challenges such as climate change and public health concerns (Wang & Eccles, 2021). Despite the seriousness of this issue, limited studies have explored student engagement in local educational contexts. Hence, this study seeks to address this gap and contribute to the development of strategies that may improve student engagement in science.

This study is significant as it contributes to the achievement of United Nations Sustainable Development Goal 4, which promotes inclusive and equitable quality education and lifelong learning opportunities for all. In particular, by examining the factors that influence junior high school students' engagement in science, the study supports the goals of the Department of Education (Philippines) to provide quality, relevant, and effective education for Filipino learners. Furthermore, the findings align with the vision, mission, and goals of Holy Cross of Davao College by contributing to the development of effective teaching practices and supportive learning

environments that foster academic excellence, critical thinking, and holistic student formation. Ultimately, the results of this study may help educators and school leaders design strategies that improve student engagement in science and strengthen the overall quality of education.

The main objective of this study is to determine the mediating effect of self-efficacy on the relationship between the classroom learning environment and the engagement of junior high school students in science. Specifically, it aimed to determine the level of self-efficacy in terms of belief in personal ability and belief that ability grows with effort; the level of classroom learning environment in terms of classroom positive, diversity values, personal negative, and personal positive; and the level of JHS student engagement in science in terms of cognitive engagement, behavioral engagement (effort and persistence), affective engagement (liking for learning), and behavioral engagement (extracurricular activities). Moreover, the study sought to determine the significance of the correlation between self-efficacy, classroom learning environment, and JHS students' engagement in science. In addition, it aimed to determine the significance of the indirect effect of classroom learning environment on JHS student engagement in science while controlling for self-efficacy. Likewise, the study examined the significance of the direct effect of classroom learning environment on JHS student engagement in science through self-efficacy, as well as the significance of the total effect of classroom learning environment on JHS student engagement in science.

II. METHODOLOGY

This study adopted a diagnostic research design. A diagnostic research design is used to identify the causes of a problem by examining the relationships among different factors. It involves careful planning of methods, minimization of bias, and comparison of findings with established standards to ensure accuracy and reliability. Through this design, researchers are able to generate evidence-based findings that support effective decision-making and appropriate solutions to the issue being studied (Momeni, Pincus, & Libien, 2017).

This study was conducted in a national high school within the Mati City Division, located in Davao Oriental. Mati City is a coastal component city and the capital of Davao Oriental, situated

on the southeastern tip of Mindanao. It was officially established as a city on June 16, 2007. In the field of education, Mati City is recognized as the educational hub of Davao Oriental because it hosts Davao Oriental State University, regional science high schools, and several colleges and basic education institutions that offer diverse academic programs and STEM initiatives fostering student engagement and active learning across the province.

The study included all students from Grades 7 to 10 who were officially enrolled in School Year 2025–2026. Using the Raosoft (2004) sample size calculator with a 95% confidence level and a 5% margin of error, a sample size of 341 respondents was determined from the total population of 2,958 students.

This study utilized proportionate stratified random sampling to ensure fair representation across grade levels. The total student population was stratified according to grade level, and respondents were randomly selected from each group. Specifically, the sample consisted of 101 Grade 7 students, 90 Grade 8 students, 68 Grade 9 students, and 82 Grade 10 students, reflecting each grade level's proportional share of the total population. This sampling method preserved the natural distribution of learners, minimized sampling bias, and improved the generalizability of the findings regarding classroom learning environment, self-efficacy, and student engagement in science.

This study utilized the survey questionnaire technique to collect quantitative data from the respondents. Survey questionnaires are structured self-report instruments commonly used to gather data on participants' perceptions, attitudes, and experiences. Yang and Du (2024), for example, employed a cross-sectional survey questionnaire to assess teachers' online teaching competence, self-efficacy, emotion regulation, and digital burnout.

Three adopted and modified questionnaires were used in this study: the Classroom Learning Environment (CLE) Questionnaire, the Self-Efficacy Formative Questionnaire, and the Student Engagement in Schools Questionnaire. The Classroom Learning Environment Questionnaire, developed by McGhee, Lowell, and Lemire (2007), consisted of nine declarative statements that measured students' perceptions of their classroom environment. The Self-Efficacy Formative Questionnaire, developed by Gaumer Erickson and Noonan (2018), contained seven items designed to assess students' perceived proficiency in the essential components of self-

efficacy. Lastly, the Student Engagement in Schools Questionnaire, adapted from Lam and Jimerson (2008), included 14 items that measured various dimensions of student engagement in science.

All questionnaires used a Likert-type scale to measure the respondents' perceptions and experiences based on the indicators provided in each instrument. To ensure reliability, the modified questionnaires underwent reliability testing and obtained Cronbach's alpha coefficients of 0.858 for the Classroom Learning Environment Questionnaire, 0.860 for the Self-Efficacy Formative Questionnaire, and 0.858 for the Student Engagement in Schools Questionnaire, indicating that all three instruments were reliable for data collection.

The study employed descriptive analysis, correlation analysis, and mediation analysis as statistical tools for data interpretation. A summary matrix was prepared to present the statistical technique corresponding to each statement of the problem and to explain the purpose of each statistical tool used in the study.

In addition, a scale matrix was utilized to present the mean ranges, descriptive levels, and corresponding interpretations assigned to each variable examined in the study.

Range of Means	**Descriptive Level**	**Interpretation for Classroom Learning Environment**	**Interpretation for Self-Efficacy**	**Interpretation for Student Engagement**
3.26 – 4.00	Very High	Very Good	Very Good	Very good
2.50 – 3.25	High	Good	Good	Good
1.75 – 2.49	Low	Poor	Poor	Poor
1.00 – 1.74	Very Low	Very poor	Very Poor	Very poor

In this study, the significance of the correlation is tested at 0.05 confidence level.

This study adhered to the guidelines set forth and obtained the approval of the Society of Moral Integrity and Legal Ethics (SMILE). The potential risks was minimized by way of coordinating with the science teachers who helped explaining the purpose of the study, securing informed consent from parents or guardians, and acquiring assent from the student respondents. The questionnaires were validated and subjected to reliability testing as mentioned in the data gathering technique. The Department of Education approved the study to be conducted at the public schools it administers. The entire conduct of the research obtained the approval of the research panel.

III. RESULTS AND DISCUSSIONS

Table 1 is the descriptive table. It contains the variables of classroom learning environment, self-efficacy, and JHS students' engagement in science. Also contains in the table are the indicators, the standard deviation, the mean, and the descriptive level of each variable.

TABLE 1
DESCRIPTIVE TABLE (N=341)

Predictor Variables	Standard Deviation	Mean	Descriptive Level
Classroom Learning Environment	**0.377**	**3.24**	**High**
Classroom Positive	0.481	3.22	High
Diversity Values	0.459	3.11	High
Personal Positive	0.377	3.40	Very High
Self-Efficacy	**0.359**	**3.26**	**Very High**
Belief in Personal Ability	0.373	3.13	High
Belief that Ability Grows with Effort	0.435	3.31	Very High
JHS Students' Engagement in Science	**0.384**	**3.84**	**Very High**
Cognitive	0.402	3.13	High
Behavioral (Effort and Persistence)	0.488	3.09	High
Affective (Liking for Learning)	0.606	3.31	Very High
Behavioral (Extra Curricular Activities)	0.505	3.17	High

3.26-4.00 Very High, 2.50-3.25 High, 1.75-2.49 Low, 1.00-1.74 Very Low

Specifically, the table shows that students rate the Classroom Learning Environment an average mean of 3.24 (SD = 0.377), described as high. It indicates that the classroom learning environment as rated by the respondents is good. The standard deviation obtained indicates that the responses are highly consistent. One of its indicators is described as very high and 2 as high.

The findings also indicates that students demonstrated very high levels of self-efficacy, as reflected in the mean score of 3.26 (SD = 0.359). It indicates that self-efficacy as rated by the respondents is very good. Moreover, the standard deviation obtained indicates that the variability of responses are highly consistent. One of its indicators is described as very high and the other is high. Additionally, the findings also show that the students demonstrated a very high mean of 3.84 (SD = 0.384) indicating a very good engagement in science. Furthermore, the standard deviation obtained indicates that the responses are highly consistent. One of its indicators is described as very high and its 3 indicators are high.

The findings show that the classroom learning environment was rated high, indicating a good learning setting for students. In comparison, self-efficacy and student engagement in science were both rated very high, suggesting that students demonstrate very strong confidence in their abilities and a very high level of participation in science learning.

Correlation Results

The Table 3 is the correlation table. It contains the variables, self-efficacy, classroom learning environment and JHS student engagement in science. Also contained in the table are the r-value, p-value, the decision of the hypothesis and the corresponding interpretation.

TABLE 2
TEST OF RELATIONSHIPS (N=341)

Pair of Variables	Students Engagement in Science			
	r-value	p-value	Decision on Ho	Interpretation
Self-Efficacy and JHS Student Engagement in science	0.579	0.000	Rejected	Significant
Classroom Learning Environment and JHS Student Engagement in Science	0.626	0.000	Rejected	Significant

Table 2 shows the correlation between self-efficacy and JHS student engagement in science obtained a p-value of 0.000 which is less than 0.05 degree of confidence. Hence the null hypothesis was rejected. It indicated that the correlation is significant. The r-value (r=0.579) indicates a moderately high correlation. In addition, the correlation between classroom learning environment and JHS student engagement in science obtained a p-value of 0.000 which is less than 0.05 degree of confidence. Hence the null hypothesis was rejected. It indicated that the correlation is significant. The r-value (r=0.626) denotes a moderately high correlation.

The results show that both self-efficacy and the classroom learning environment have significant relationships with students' engagement in science, as both correlations yielded p-values below the confidence level. However, when comparing the strength of the two relationships, the classroom learning environment demonstrated a stronger correlation with student engagement, having a moderately high coefficient that is higher than that of self-efficacy. This indicates that while both variables are important, the classroom learning environment has a greater influence on students' engagement in science.

Mediation Table

Table 3 is a mediation table showing the direct, indirect and total effect of the determinant variable. It also shows the estimate beta, standard error, Z-value, p-value, decision on null hypothesis and corresponding interpretation.

TABLE 3
MEDIATION TABLE (N=341)

Label	Path/Effect	Estimate β	S.E	Z-value	p-value	Decision on Ho	Interpretation
a	Classroom Environment →Self-Efficacy	0.590	0.055	10.64	0.000	Rejected	Significant
b	Self-Efficacy → Engagement	0.332	0.056	5.92	0.000	Rejected	Significant
c’	Learning Environment →Engagement in Science	0.440	0.062	7.10	0.000	Rejected	Significant
a x b	Indirect Effect	0.196	0.039	4.98	0.000	Rejected	Significant
c	Direct Effect	0.440	0.062	7.10	0.000	Rejected	Significant
c’ (TE)	Total Effect	0.636	0.048	13.34	0.000	Rejected	Significant

Level of Significance: 0.05
Decision Rule: Reject H_0 if $p < 0.05$
Proportion Mediated: Indirect effect/ Total effect = 0.308 or 30.8%
$p < 0.001$, based on the p-value of the indirect effect

The table 3 specifically shows the mediating effect of self-efficacy on the relationship between classroom learning environment and JHS student engagement in science. As found, the indirect effect of classroom learning environment on JHS student engagement in science, while controlling self-efficacy, obtained a p-value of 0.000 which is less than 0.05 degree of confidence. Hence, the null hypothesis was rejected. It indicates that the indirect effect is significant. Moreover, the direct effect of classroom learning environment on JHS student engagement in science, through self-efficacy, obtained a p-value of 0.000 which is less than 0.05 degree of confidence. Hence, the null hypothesis was rejected. It indicates that the direct effect is significant. The total effect (c’=0.636) of classroom learning environment and self-efficacy on JHS student engagement in science obtained a p=0.000 which is less than 0.05 degree of confidence. Hence, the null hypothesis was rejected. It indicates that the total effect is significant.

The proportional value obtained (30.8%) indicates that self-efficacy has moderate strength to mediate the correlation between classroom learning environment and JHS student engagement

in science. Though moderate, but significant as indicated by p=0.001 which is less than 0.05 degree of confidence.

Summary of Findings

Self-efficacy and student engagement in science is significantly correlated.

The link of Self-efficacy and student Engagement in Science affirms the study of Lobres (2024), stating the significant positive correlation between academic self-efficacy and engagement in science learning among junior high school students. Moreover, this current finding corroborates with the findings of Torres, Chen, and Peixoto (2024). Such finding indicates that among 323 high school students, academic self-efficacy exhibited a significant positive correlation with school engagement, suggesting that students who possess confidence in their abilities are more inclined to be engaged in their educational pursuits.

In contrary, this current finding contradicts Taş's (2016) study, asserting that self-efficacy is not a significant predictor of engagement when accounting for other variables. While Taş's study conducted many years ago had only 315 respondents, the current study employed 341 respondents.

Classroom learning environments and student engagement in science is significantly correlated

The connection of Classroom environment with science engagement confirms the study of Mindo and Paglinawan (2024), stating that Grade 9 science learners found a significant positive correlation between students' perceptions of a positive classroom environment (physical, pedagogical, and psychosocial aspects) and their motivation and engagement in science learning, indicating that supportive classroom conditions are associated with higher learner engagement in science. Furthermore, this current study corresponds with the research finding of Paña & Garcia (2025) indicating that among Grades 7–12 students in science classes, researchers reported a significant positive relationship between classroom environment and students' attitudes toward

science (an affective correlate of engagement), with positive classroom conditions linked to more favorable perceptions and engagement in science.

On the contrary, the current study refutes the findings of Arocha (2025), which indicated that both the educational environment and learner engagement are not statistically correlated. The respondents of the study of Arocha were much fewer (235) than the sample involved in the current study.

Indirect effect of classroom learning environment on student engagement in science, controlling self-efficacy, is significant

Classroom environment indirectly affects science engagement is significant. This current finding affirms to the study of Wang, Zhang, & Wei (2024) stating that there is a significant indirect effect of classroom environment on engagement through self-efficacy among foreign language learners. Similarly, the current study affirms Lomotos and Tagadiad (2024), stating that online learning self-efficacy significantly mediated the relationship between social presence (an environmental/learning context factor) and student engagement, demonstrating an indirect effect of the contextual learning environment on engagement through self-efficacy.

Conversely, the present finding contradicts the research finding of Jiang (2021), stating that although the classroom environment had a significant direct effect on academic performance, self-efficacy did not significantly mediate this relationship, showing it was not a viable indirect pathway. Such assertion is denied by the current finding which showed that classroom environment significantly influences science engagement both directly and indirectly through self-efficacy, providing stronger evidence across junior high students.

Direct effect of classroom learning environment on student engagement in science, through self-efficacy, is significant

The finding that Classroom environment directly influences science engagement through self-efficacy corroborates the outcomes of Khuhro's (2024) quantitative investigation. Khuhro demonstrated that the classroom climate, a crucial element of the learning environment, significantly influences both student engagement and self-efficacy. Moreover, the current finding is consistent with the finding of the research of Shao et al. (2025), asserting that teacher support is a vital component of the classroom learning environment, was directly and positively correlated with learning engagement.

However, the current finding highlighting that classroom environment significantly predicts student engagement, both directly and indirectly through self-efficacy, using a larger sample and strong mediation analysis, contradicts Achwani, Rahman, and Rusyati (2025) who found that self-efficacy cannot act as a mediator when student engagement does not change significantly with other academic indicators.

Total effect of classroom learning environment and self-efficacy on student engagement in science is significant

The recent finding that Classroom environment and self-efficacy significantly influence science engagement aligns with the work of Yavuz Sökmen (2019), who examined multiple dimensions of the classroom learning environment—such as shared control, teacher feedback, and mutual respect—and their relationships with self-efficacy and various forms of engagement (behavioral, emotional, cognitive, and agentic) among middle school science students. Similarly, the current study supports the Mohamad (2024) who found that aspects of the science classroom learning environment—particularly enjoyment of lessons and investigation activities—significantly predicted academic engagement in science among junior high school students.

Nonetheless, the present study, used a larger sample and a mediation model, which provides stronger evidence that classroom environment and self-efficacy significantly influence

science engagement. This current finding disputes the results of Abellar and Villocino (2025), who reported no significant relationship between teacher self-efficacy, classroom management, and student engagement.

IV. CONCLUSION

Based on the findings of the study, it is concluded that Self-Efficacy has 30.8% partial significant mediation effect on the correlation between classroom learning environment as predictive variable and student engagement in science as criterion variable. This conclusion partially affirms the assertion of Social Cognitive Theory stating that human behavior is shaped by reciprocal interaction between personal, environmental and behavioral factors.

V. RECOMMENDATIONS

Future research may be conducted using other variables not covered in the study to determine the other 69.2% variance in the strength of self-efficacy to mediate relationship between classroom learning environment and student engagement in science. Qualitative research may be explored to generate themes that may serve as potential mediating variables between correlation of determinant and criterion variables. Initiate educational activities that boost student self-efficacy to reinforce confidence and sustain student engagement.

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