Classroom Management, Classroom Environment, Students' School Motivation, and Learning Behavior: A Structural Equation Model on Student Engagement of Public Senior High Schools

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Abstract: **Effective learning relies heavily on student engagement. It reflects how involved and motivated students are in their studies, which directly - influences their learning outcomes and personal development. This quantitative study determined the best-fitting structural model of the endogenous variable – student engagement – as influenced by four exogenous variables: classroom management, classroom environment, students' school motivation, and learning behavior among public senior high school learners in Region XI. A non-experimental, descriptive-correlational design with structural equation modeling (SEM) was employed, involving 400 senior high school learners from 11 school divisions selected through systematic stratified sampling. Descriptive analysis revealed high levels across all exogenous variables, while student engagement—measured in affective, behavioral, and cognitive domains—was found to be very high. Correlation analyses indicated significant relationships between student engagement and the four exogenous variables. Further, the findings identified Model 3 as the best-fitting model, signifying direct causal relationships between the four exogenous variables and student engagement. After model modifications, classroom management was best described by effective factors and teachers' strategies. Classroom environment was represented by its two indicators: proper ventilation of classroom and seats and sitting arrangement. Likewise, students' school motivation was measured by its two indicators: self- determination and career motivation. Additionally, learning behavior was described by its two remaining indicators: responsibility and motivation. Student engagement was most measured by its indicators- affective; liking for school and behavior; effort and persist. These findings have meaningful implications for educators and policymakers in designing targeted interventions that enhance learner participation, motivation, and achievement in senior high schools.**

Keywords: **student engagement, classroom management, learning environment, student motivation, learning behavior, SEM, Region XI.**

1. INTRODUCTION

In the education context, it is commonly acknowledged that student engagement is a key factor in determining learning effectiveness, perseverance, and academic achievement (Li and Xue, 2023). Amid numerous distractions, educators and researchers worldwide constantly struggle to capture students' attention and engagement in meaningful, sustained learning

*(*Dörnyei, 2020). Moreover, even with its acknowledged significance, educators globally still strive to achieve and maintain high levels of student engagement, which are influenced by a variety of factors, including classroom dynamics, teaching strategies, and individual student characteristics. Kahu (2021), further explained that the use of digital technologies in the classroom has created both new opportunities and difficulties for promoting engagement in traditional and remote learning settings.

Besides, the literature demonstrates that student engagement has significant effects on learners, extending beyond improved academic outcomes to making teaching more enjoyable, interesting, and rewarding. Students are more likely to succeed academically, feel more connected to school, and have better social-emotional well-being when they exhibit high levels of behavioral, emotional, and student engagement (Sutton, 2021). Conversely, low student participation has been linked to several unfavorable consequences, including drug usage, aggression, delinquency, and school dropout. While these concerning results usually manifest in adolescence, low involvement in senior high school can put adolescents on a downward spiral. Promoting student participation at all grade levels is, therefore, essential.

Furthermore, O'Connor (2021) and Greene (2020), emphasize the role of motivation and learning behaviors in sustaining engagement and academic success. Additionally, Zafar & Nausheen (2022) found that an essential element in assisting students in confronting and overcoming academic obstacles. Research highlights the importance of involvement in problem solving and resilience, by demonstrating that they are more self-assured and capable of handling academic activities and assignments.

Figure 1-the conceptual framework of the study, which describes the interrelationship of four latent exogenous variables and their impact on the latent endogenous variable. The connection is evident in the presence of bidirectional arrow connecting four latent exogenous variables: the classroom management, with its indicators: effective factors, teacher's strategies, and teacher-student interaction. The classroom environment, which includes: facilities, painting and lighting, proper ventilation, seats and sitting arrangement, chalkboard use, teacher's behavior, student's behavior and teacher-student relationship. The students' school motivation, comprising self-determination, self-efficacy, intrinsic motivation, grade motivation and career motivation. Lastly, the learning behavior namely: goal-setting, responsibility, motivation and self-discipline.
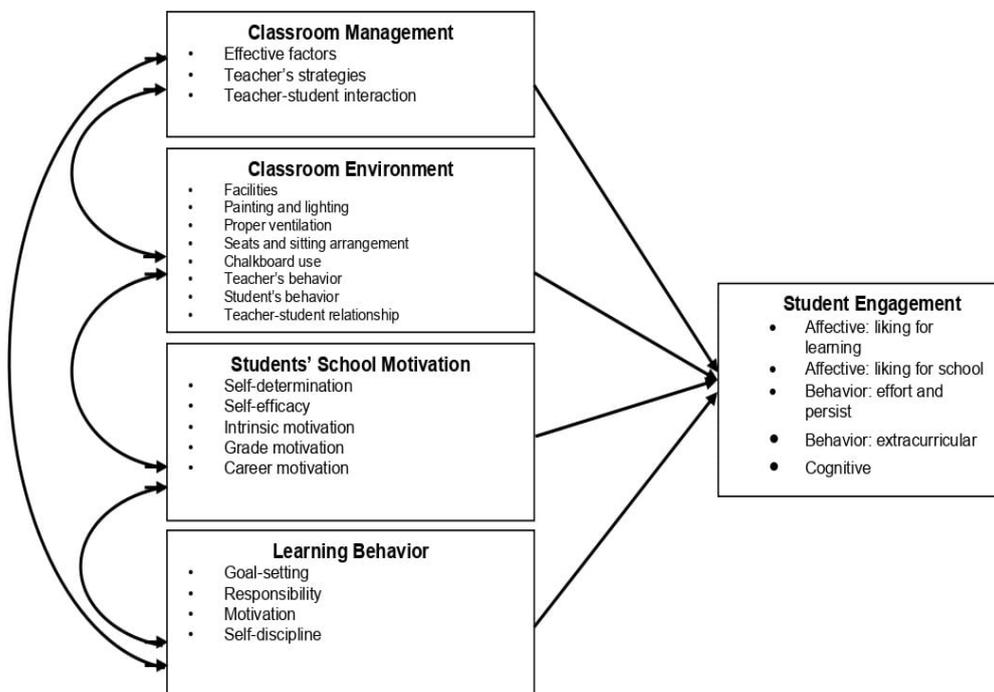
Following the latent exogenous variables that correspond to the endogenous latent variable. Moreover, the rectangular shapes represent the measured domains of the related latent external and internal variables. In school organizations, it is critical to comprehend the primary and contextual factors that affect student engagement (Khusanova, Kang, & Choi, 2021).

However, in the local setting, the researcher has not found a study that uses structural equation modelling (SEM) to explore the connection among classroom management, classroom environment, students' school motivation, and learning behavior in controlling student engagement within the group of academes in public schools. Several studies made on student engagement focus only on two variables. In this context, the researcher chose to undertake a multivariate study geared on four variables as a construct of student engagement. The result of this research will generate new concepts for education and could be used to create a strategy for augmenting student engagement among learners and teachers in public schools in the country, which could lead to better teaching performance and student achievement.

The study's primary purpose was to determine the best-fit structural model of student engagement in public senior high schools. More precisely, to determine the level of classroom management in terms of effective factors, teacher's strategies and teacher-student interaction; to describe the level of classroom environment in terms of facilities, painting and lighting, proper ventilation, seats and sitting arrangement, chalkboard use, teacher's behavior, student's behavior and teacher-student relationship; to ascertain the level of students' school motivation in terms of self-determination, self-efficacy, intrinsic motivation, grade motivation and career motivation; to measure the level of learning behavior in terms of goal-setting, responsibility, motivation and self-discipline; to determine the level of student engagement in terms of affective: liking for learning, affective: liking for school, behavior: effort and persist, behavior: extracurricular and cognitive; to determine whether there are significant correlations between exogenous variables and endogenous variable. Finally, to choose the best-fit model of student engagement of public senior high schools of the Davao Region based on classroom management, classroom environment, students' school motivation, and learning behavior.

Simultaneously, the null hypotheses listed below were examined at the 0.05 significance level. First, there was no significant correlation between classroom management and student engagement, classroom environment and student engagement, students' school motivation and student engagement, and learning behavior and student engagement. Consequently, no model best fits student engagement in public senior high schools.

This research holds importance for education across multiple nations, as it functions as the basis for developing and implementing the system. This promotes improved awareness of how the environment affects the learners' involvement and inherent individual elements in developing improved notions in this area. The study contributes to the pursuit of Sustainable Development Goal No. 3, Good Health and Wellbeing for our learners, and No.4, focusing on ensuring inclusive and equitable Quality Education and promoting lifelong learning opportunities for all. Therefore, it might educate people about or perhaps address the widespread problem of student disengagement that lowers performance in classrooms, which is essential to comprehending basic education teachers' dynamics at work.

The results of the study could provide a crucial foundation for initiatives targeted at educating instructors at universities and other educational establishments. This might additionally give the Department of Education's officials useful information for planning activities and programs that could be used to improve any specified domains in the classroom management, classroom environment, students' school motivation, and learning behavior that could impact the level of student engagement.

This research may also serve as baseline for establishing policies in the recruiting and selection of prospective teachers and brilliant potential learners in the future. Additionally, this would assist the school administration in looking, considering, and guiding our learners in engaging class and school activities. Finally, to create a higher potential improvement in teachers and guidance counselors for academic satisfaction improvement toward our learners. The findings of this study can be utilized to evaluate the effectiveness of classroom management, classroom environment, students' school motivation and learning behavior as variables in forecasting student engagement. Researchers may be able to use this analysis as a cross summary, an outline, or a reference.

2. METHOD

This section includes the research respondent, materials, and instruments design and procedure, and ethical considerations, if any, used in the study.

Research respondent

A total of 136,764 active senior high public schools in the various schools in DepEd region xi as of school year 2024-2025 (PPRD DEPED RXI, 2024). The study's respondents were selected using a scientific method, with 400 enrolled students polled to represent the whole population.

The study was conducted in the Davao region (Region XI), Philippines. The study's respondents were learners across senior high schools (SHS) in public schools of 11 divisions all with passing grades. Furthermore, respondents are male or female aged 16-19 years who enrolled in the school year and attended to the public schools in the region. In the locations mentioned above, survey questionnaires were distributed. The number of respondents per division was determined via systematic stratified random sampling. Adhering to the essential guideline for determining the suitable number of respondents for structural equation modeling, (Savalei, 2021) which is between 200 and 400, the researcher will be attempting to work backward by using an appropriate quota sampling Smith & Dawber, 2019) at the 0.5 significance level.

MATERIALS AND INSTRUMENTS

The study used five sets of questionnaires adapted from different authors and were validated by experts, and their comments were incorporated into the final instrument. The standardized questionnaires were content-valid, as they were tested and proven by the authors. The questionnaires were designed comprehensively to provide respondents with ease and comfort in answering each question and understanding the study's objective. The questionnaire on classroom management was adapted from the works of Chalak (2019).

The questionnaire on students' school motivation was adapted from the works of Conradty and Bogner (2022). The tool has five indicators, namely self-determination, self-efficacy, intrinsic motivation, grade motivation and career motivation. The questionnaire on learning behavior was adapted from the works of Bhise, Mishra, Pisulkar, Nimonkar, Srivastava, and Belkhode (2022). The tool has four indicators, namely: goal-setting, responsibility, motivation and self-discipline. Furthermore, the questionnaire on student engagement was adapted from the works of Hart, Stewart and Jimerson (2021). The tool has seven indicators, namely: affective: liking for learning, affective: liking for school, behavioral: effort and persistence, behavioral: extracurricular and cognitive.

Moreover, to determine the descriptive equivalent of the levels of mean values, range of mean, the following scale were considered: 4.20-5.00 which indicates very high with a descriptive interpretation of being always observed and/or manifested; 3.40-4.19 which indicates high with a descriptive interpretation of being often observed and/or manifested; 2.60-3.39 which indicates moderate with a descriptive interpretation of being sometimes observed and/or manifested; 1.80-2.59 which indicates low with a descriptive interpretation of being seldom observed and/or manifested; and 1.00-19 1.79 which shows very low with a descriptive interpretation of being rarely observed and/or manifested. Furthermore, according to Adeniran (2019), the internal consistency of the scale's when increases as the Cronbach's alpha coefficient approaches 1.0. Ahmad (2024), stated that reliability is crucial to guarantee that the data gathered appropriately reflects consistent measurements of the structures being studied. The tools employed must accurately measure the target constructs to produce reliable and valuable insights, regardless of the research's focus—student attitudes, course efficacy, or educational technologies.

Design and Procedure

This study used the structural equation modeling technique and a quantitative, descriptive-correlational research approach. To analyze data, quantitative studies use statistical analysis and mathematical models, yielding numerical results that are considered more objective. The causes and mechanisms behind changes in phenomena are determined by quantitative study (Aspers & Corte, 2019). Building the best-fit model for public senior high school engagement was the primary aim of this study. According to Thomas (2024), a descriptive correlational study is a research methodology that aims to describe the relationships between variables without proving causation. Descriptive measures the classroom management, classroom environment, students' school motivation, learning behavior and student engagement of public senior high schools. However, because it evaluates the relationship between the exogenous and endogenous variables, this study is correlational.

To determine the significance of the relationships between the exogenous and endogenous variables, Pearsons, r was used. Covariance analysis will identify the predictors of the dependent variable given the list of independent variables. The mean was used to determine the levels of classroom management, classroom environment, students' school motivation, and learning behavior. The study aimed to identify which exogenous variables best-fit student engagement. The first step in gathering the information used in this research was obtaining approval from the University of Mindanao Ethics Review Committee (UMERC) on November 27, 2024 to conduct the study. The ethical principles outlined by Wa-mbaleka (2019),

respondents in research must always be treated with respect. Their cultural sensitivity is a prerequisite. In order to solve the respondents' concerns, they need to be empathetic. They need a transparent audit trail so readers can judge the ethics of their research. They should act morally and professionally in all that they do.

Respondents were given the option to participate voluntarily without any cost. In accordance with the Data Privacy act of 2012, the researcher will ensure that respondents' personal information remains confidential. All sources of knowledge in this study will be properly acknowledged. The researcher will adhere to all UMERC ethical guidelines throughout the study. The UMERC certification number was mentioned in the final report, and a UMERC compliance certificate was required before actual data collection. A request letter signed by the dean was sent to the DepEd Regional Director. The approved letter is attached to the letters addressed to the eleven superintendents of the DepEd divisions in Region XI. A schedule was established for the period of questionnaire floating and retrieval, spanning March to April 2025**.** To avoid plagiarism, the study used plagiarism-detection tools, such as Turnitin, to ensure that no one would present the work of others as the researcher's own. Regarding authorship, the researcher, a graduate of master of arts in science teaching-physics (MAST-PHY) who is currently pursuing a doctorate in educational management, will undergo content revisions based on recommendations from his adviser, who will also serve as a co-author in this study.

3. RESULTS AND DISCUSSION

This part of the research evaluates and assesses the collected data from the survey regarding classroom management, classroom environment, students' school motivation, and learning behavior is evaluated and assessed, considering the investigation's purpose of this study. It offers an exhaustive analysis of the findings, emphasizing significant patterns, correlations, and insights and uses statistical analysis to fulfill the study's research objectives.

Classroom Management

The findings indicate a consistently high level of classroom management among senior high school teachers in Region XI, as reflected in an overall mean score of 4.16, which is interpreted as high. Detailed analysis of the indicators highlights particular strengths and specific areas for improvement. Notably, the contribution effect of teachers' Classroom Management (Teacher–Student) recorded the highest mean score of 4.18, or high, while teachers' strategies for Classroom Management (Physical Aspects) received a mean score of 4.14, the lowest, suggesting an area needing further attention.

Table 1: Level of Classroom Management

Indicator	SD	Mean	D.E.
Effective Factors in Classroom Management (Motivation)	0.449	4.16	High
Teacher's Strategies for Classroom Management (Physical Aspects)	0.486	4.14	High
Effect of Teacher's Classroom Management (Teacher – Student)	0.513	4.18	High
Overall	0.369	4.16	High

The result of the study shows that teachers frequently encouraged equal participation from all students and ensure to make classroom physical environment conducive for learning and encourage students to engage about topics related to issues in active discussion to foster learning in the classroom and achieve performance.

This is relevant based on the study of Sánchez (2023) which emphasized that encouraging participation and fostering an inclusive classroom culture are part of the strategies. In the same way, well-organized classrooms are essential for improving student learning outcomes, according to Paolini (2015).

Classroom Environment

The findings in Table 2 reveal that the classroom environment among senior high school teachers in Region XI is consistently rated high, with an overall mean of 4.17. Analysis of specific indicators underscores particular strengths and some areas for potential improvement. Notably, the indicator "seats and sitting arrangement" received the highest mean rating of 4.27, categorized as very high. Within this domain, the specific item "has enough seats and desks for every student" was noted, as was proper ventilation in classroom 4.11, which was an indicator requiring attention despite its high rating.

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Table 2. Level of Classroom Environment

Indicators	SD	Mean	D.E.
Facilities	0.495	4.16	High
Painting and Lighting	0.476	4.16	High
Proper Ventilation of Classroom	0.521	4.11	High
Seats and Sitting Arrangement	0.477	4.27	Very High
Chalkboard Use	0.533	4.15	High
Teacher's Behavior	0.529	4.14	High
Student's Behavior	0.566	4.12	High
Student- Teacher Relationship	0.460	4.24	Very High
Overall	0.295	4.17	High

The finding is consistent with Kirkil (2025), which found that temperature and humidity were related to students' comfort and learning performance in the classroom. Equally, Well-lit classrooms improve visual comfort, lessen eyestrain, and promote improved concentration, claim Rambe et al. (2024). Apart from that, classrooms with enough ventilation create a more effective and stimulating learning environment, added Marquez (2020).

Students' School Motivation

Table 3 presents the results on student school motivation among senior high school students in Region XI, which show a consistently high level of motivation, reflected in an overall mean of 4.17. The analysis highlights specific indicators notably Career Motivation had the highest mean rating of 4.30, indicating a very high level of motivation among students in terms of their career aspirations. However, the indicator self-efficacy a mean of 4.05, interpreted as high but signaling a potential area for improvement.

Table 3. Level of Students' School Motivation

Indicators	SD	Mean	D.E.
Self-Determination	0.598	4.08	High
Self-Efficacy	0.557	4.05	High
Intrinsic Motivation	0.573	4.20	Very High
Grade Motivation	0.544	4.22	Very High
Career Motivation	0.534	4.30	Very High
Overall	0.391	4.17	High

The overall High response rate among senior high school learners indicated that students' school motivation domains were also rated high. This shows that using strategies that help learners learn to be confident they will do well on reviews, especially when learning is fun, leads to good grades. This aligns with Dzaiy & Abdullah's (2024) statement: to increase student engagement and enhance learning outcomes, active learning strategies are being used. Roediger and Butler (2011) also discovered that retrieval practice markedly enhances long-term retention, particularly when using Kahoot! quizzes and hands-on artifact analysis to make learning feel like a game (Tucci, 2022)

Learning Behavior

Table 4 presents the results on the level of learning behavior among senior high school students in Region XI, which was measured through four key indicators: goal-setting, responsibility, motivation, and self-discipline. The results yielded an overall mean of 4.16, indicating a high level of learning behavior that is consistently evident among students. Of the four indicators, Motivation ranked highest with a mean of 4.21, or very high. In this domain, students expressed being highly motivated to achieve set goals each day. Meanwhile, "responsibility" scored the lowest among the indicators with a 4.13 mean, though still rated high.

Table 4. Level of Learning Behavior

Indicators	SD	Mean	D.E.
Goal-Setting	0.478	4.15	High
Responsibility	0.509	4.13	High
Motivation	0.508	4.21	Very High
Self-Discipline	0.588	4.14	High
Overall	0.361	4.16	High

The overall High response rate among senior high school learners indicates that the domains of learning behavior were also rated high. This suggests that learners can identify challenges and devise ways to overcome them by integrating and applying the knowledge and skills they have gained in everyday life. This mindset is motivated every day to achieve set goals, and one way to do so is to follow a daily schedule that includes activities related to work and play. This result is parallel with Dweck's (2006) study emphasizes that a growth mindset fosters perseverance and adaptive learning behaviors and can face challenges with resilience.

Student Engagement

Table 5 presents the findings on student engagement among senior high school students in Region XI, revealing consistently high levels across affective, behavioral, and cognitive dimensions. The overall mean was 4.13 with high description, indicating that students are regularly and actively engaged in their academic and school environments. Among the indicators, both affective engagement in terms of liking for learning and behavioral engagement through extracurricular involvement attained the highest mean scores of 4.15, or high.

Table 5. Level of Student Engagement

Indicators	SD	Mean	D.E.
Affective: Liking for Learning	0.489	4.15	High
Affective: Liking for School	0.525	4.11	High
Behavior: Effort and Persist	0.511	4.12	High
Behavior: Extracurricular	0.586	4.15	High
Cognitive	0.408	4.14	High
Overall	0.342	4.13	High

The overall High response rate among senior high school learners indicates that the domains of student engagement were also rated highly. This suggests that enjoying learning new things in class and taking pride in being at the school, while working as hard as they can by showing an active role in extracurricular activities. With the knowledge acquired, figure out how the information and learning might be useful in the real world. The learning is consistent with the study by Seemiller (2020), which found that what makes learning enjoyable is interest in the lesson and its relevance to real life. The same study by Miglianico (2020) argued that learners who experience positive emotions at school—such as pride, interest, and joy—tend to show higher motivation, engagement, and academic outcomes.

Significance on the Relationship between Levels of Classroom Management and Student Engagement

Table 6 presents the test results of the relationship between classroom management (CM) and student engagement (SET) among senior high school students. The overall computed r-value is 0.50 and p-value of 0.317. On the other hand, when the individual indicators of classroom management namely; effective factors in CM (motivation) was correlated with the overall indicators of student engagement the r-value is 0.10 with p-value 0.835, seeing that the p-value is more than 0.05 hence, not significant; when teacher's strategies for CM (Physical Aspects) was correlated with the overall indicators of student engagement r-value is .074 with p-value of 0.138 since the p-value is greater than 0.05 therefore, not significant; Meanwhile, when effect of teacher's CM (Teacher – Student) was correlated with the overall indicators of student engagement r-value is .028 with p-value of 0.574, given that the p-value is greater than 0.05 therefore, not significant.

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Table 6. Significance on the Relationship between Levels of Classroom Management and Student Engagement

Classroom Management	Student Engagement					
	Affective: Liking for Learning	Affective: Liking for School	Behavior: Effort and Persist	Behavior: Extracurricular	Cognitive	Overall
Effective Factors in Classroom Management (Motivation)	.048 (0.343)	.054 (0.280)	.012 (0.818)	-.070 (0.160)	.006 (0.911)	.010 (0.835)
Teacher's Strategies for Classroom Management (Physical Aspects)	.048 (0.333)	.067 (0.180)	.083 (0.093)	.052 (0.298)	-.013 (0.798)	.074 (0.138)
Effect of Teacher's Classroom Management (Teacher – Student)	.037 (0.455)	.055 (0.269)	-.028 (0.571)	-.016 (0.753)	.060 (0.232)	.028 (0.574)
Overall	.058 (0.250)	.077 (0.124)	.028 (0.571)	-.102 (0.806)	.024 (0.627)	.050 (0.317)

*Significant at 0.05 significance level

The findings on the relationship between classroom management and student engagement among senior high school students in Region XI reveal that although both constructs were rated highly, no statistically significant relationships were found between them. This suggests further that effective classroom management practices, including motivational strategies, physical arrangements, and teacher-student interactions, may not be directly influencing how students engage affectively, behaviorally, or cognitively. These results highlight the complex multifactorial nature of student engagement, aligning with Li et al. (2021), who noted that engagement is shaped not only by classroom conditions but also by students' individual traits, socio-emotional contexts, and external support systems.

Significance on the Relationship between Levels of Classroom Environment and Student Engagement

Table 7 presents the significance of the relationship between the levels of (CM) classroom environment and student engagement (SET) among senior high school students in the Davao Region. As shown in the hypothesis, the relationship was tested at .05 level of significance. The computed overall r-value of 0.118 and p-value less than .05. When individual indicator of STE, namely; affective: liking for learning, was correlated with the overall CE the r-value is .108 with p-value less than .05, hence it's significant. When indicator of STE, namely; affective: liking for school, was correlated with the overall CE the r-value is .114 with p-value less than .05, hence its significant. While, when indicator of STE, namely; behavior: extracurricular was correlated with the overall CE the r-value is .026 with p-value .602, since greater than .05, hence not significant. When indicator of STE, namely; behavior: effort and persist was correlated with the overall CE the r-value is .078 with p-value .121, since greater than .05, hence not significant.

Table 7. Significance on the Relationship between Levels of Classroom Environment and Student Engagement

Classroom Environment	Student Engagement					
	Affective: Liking for Learning	Affective: Liking for School	Behavior: Effort and Persist	Behavior: Extracurricular	Cognitive	Overall
Facilities						
Painting and Lighting	.129* (0.010)	.103* (0.040)	.060 (0.230)	.089 (0.077)	.050 (0.317)	.128* (0.011)
Proper Ventilation of Classroom	.117* (0.019)	.136* (0.007)	.088 (0.079)	.176* (0.000)	.116* (0.020)	.189* (0.000)
Seats and Sitting Arrangement	.098 (0.050)	.076 (0.130)	.101* (0.044)	.167* (0.001)	.100* (0.046)	.162* (0.001)
Chalkboard Use	.184* (0.000)	.101* (0.044)	.122* (0.014)	.075 (0.133)	.050 (0.323)	.157* (0.002)

Teacher's Behavior	.098	.031	.085	.114*	.048	.133*
	(0.050)	(0.536)	(0.090)	(0.023)	(0.339)	(0.024)
Student's Behavior	.201*	.132*	.112*	.110*	.142*	.203*
	(0.000)	(0.008)	(0.025)	(0.028)	(0.004)	(0.000)
Student- Teacher Relationship	.166*	.089	.114*	.086	.076	.156*
	(0.001)	(0.075)	(0.023)	(0.085)	(0.131)	(0.002)
Overall	.108*	.114*	.078	.026	.083	.118*
	(0.031)	(0.023)	(0.121)	(0.602)	(0.096)	(0.019)

*Significant at 0.05 significance level.

The results reveal that several aspects of the classroom environment have statistically significant positive correlations with various indicators of student engagement. These findings are consistent with recent studies that emphasize the impact of the physical and psychosocial environment on student engagement. Kahu and Nelson (2018) argue that engagement is shaped not only by instructional practices but also by the learning ecosystem, including the physical space and interpersonal relationships. Similarly, Ullah et al. (2021) found that well-managed classroom settings with adequate lighting, good air quality, and well-organized seating arrangements significantly enhance students' emotional and cognitive investment in learning. Moreover, Martin and Bolliger (2019) highlighted that teacher-student relationships and classroom interactions foster emotional safety, which enhances motivation and participation. Thus, the current findings suggest that improving both the physical setup and relational climate of the classroom can serve as an effective strategy to promote deeper student engagement across all dimensions.

Significance on the Relationship between Levels of Students' School Motivation and Student Engagement

Table 8 presents the significance of the relationship between the levels of students' school motivation (SSM) and student engagement (SET) among senior high school students in the Davao Region. As indicated in the hypothesis, the relationship was tested at .05 level of significance. The computed overall r-value of 0.260 and p-value less than .05. When the individual indicator of SSM was correlated with the overall indicator of SET, the r-value ranged from 0.128 to 0.271 with p-value less than 0.05 therefore, significant. While, when the individual indicator of SET was correlated with the overall indicator of SSM, the r-value ranged from .090 to .283 with p-value less than 0.05 therefore, significant.

The result suggests a significant relationship between students' school motivation and student engagement of public schools in the Davao Region, therefore, the null hypothesis was rejected. The correlation coefficient 0.260 further suggest that there is a moderate relationship between the two variables.

Table 8. Significance on the Relationship between Levels of Students' School Motivation and Student Engagement

Student School Motivation	Student Engagement					
	Affective: Liking for Learning	Affective: Liking for School	Behavior: Effort and Persist	Behavior: Extracurricular	Cognitive	Overall
Self-Determination	.177*	.064	.089	.110*	-.022	.129*
	(0.000)	(0.198)	(0.076)	(0.028)	(0.663)	(0.010)
Self-Efficacy	.165*	.092	.100*	.153*	.075	.176*
	(0.001)	(0.065)	(0.046)	(0.002)	(0.136)	(0.000)
Intrinsic Motivation	.257*	.172*	.192*	.174*	.113*	.271*
	(0.000)	(0.001)	(0.000)	(0.000)	(0.024)	(0.000)
Grade Motivation	.186*	.166*	.152*	.083	.100*	.202*
	(0.000)	(0.001)	(0.002)	(0.097)	(0.045)	(0.000)
Career Motivation	.200*	.085	.113*	-.007	.053	.128*
	(0.000)	(0.089)	(0.023)	(0.893)	(0.287)	(0.011)
Overall	.283*	.165*	.185*	.150*	.090	.260*
	(0.000)	(0.001)	(0.000)	(0.003)	(0.072)	(0.000)

*Significant at 0.05 significance level.

The overall findings from the analysis that all indicators of students' school motivation namely; self-determination, self-efficacy, intrinsic motivation, grade motivation and career motivation manifested significant relationships with student engagement with its domains, Affective: Liking for Learning, Affective: Liking for School, Behavior: Effort and Persist, Behavior: Extracurricular and Cognitive with r-values ranging from .128 to .271 with p-values less than 0.05, therefore, significant. The result reinforced the study of Liu et al. (2022) and Ryan & Deci (2020), emphasize that internal motivation fosters a sense of autonomy and competence, both of which are essential precursors to sustained engagement across various school activities. Students who believe in their academic abilities (self-efficacy) and feel personally invested in their learning are more likely to enjoy school, participate in extracurricular activities, and persist through challenges.

This correlation supports the Goal Theory of Locke, and Latham (1990). This theory proposes that setting specific, challenging, and achievable goals can increase motivation and engagement. Students who are intrinsically motivated often set their own learning goals. Teachers can also help students develop these goals and provide support and feedback to enhance their sense of competence and progress.

Significance on the Relationship between Levels of Learning Behavior and Student Engagement

Table 9 presents the significance of the relationship between the levels of learning behavior (LB) and student engagement (SET) among senior high school students in the Davao Region. As indicated in the hypothesis, the relationship was tested at .05 level of significance. The computed overall r-value of 0.245 and p-value less than .05. When the individual indicator of LB was correlated with the overall indicator of SET, the r-value ranged from 0.107 to 0.257 with p-value less than 0.05 therefore, significant. While, when the individual indicator of SET was correlated with the overall indicator of LB, the r-value ranged from .126 to .292 with p-value less than 0.05 therefore, significant. The result suggests a significant relationship between learning behavior and student engagement of public schools in the Davao Region, therefore, the null hypothesis was rejected. The correlation coefficient 0.245 further suggest that there is a moderate significance between the two variables.

Table 9. Significance on the Relationship between Levels of Learning Behavior and Student Engagement

Learning Behavior	Student Engagement					
	Affective: Liking for Learning	Affective: Liking for School	Behavior: Effort and Persist	Behavior: Extra curricular	Cognitive	Overall
Goal-Setting	.093	.048	.074	.071	.082	.107*
	(0.064)	(0.342)	(0.139)	(0.159)	(0.101)	(0.032)
Responsibility	.106*	.066	.057	.056	.093	.108*
	(0.035)	(0.187)	(0.258)	(0.260)	(0.063)	(0.031)
Motivation	.186*	.119*	.075	.087	.197*	.189*
	(0.000)	(0.017)	(0.137)	(0.081)	(0.000)	(0.000)
Self-Discipline	.387*	.125*	.210*	.126*	.010	.257*
	(0.000)	(0.012)	(0.000)	(0.012)	(0.844)	(0.000)
Overall	.292*	.132*	.157*	.126*	.133*	.245*
	(0.000)	(0.008)	(0.002)	(0.012)	(0.008)	(0.000)

*Significant at 0.05 significance level.

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The overall findings from the analysis showed that all indicators of learning behavior namely; Goal-Setting, Responsibility, Motivation and Self-Discipline demonstrated significant relationships with student engagement with its domains, Affective: Liking for Learning, Affective: Liking for School, Behavior: Effort and Persist, Behavior: Extracurricular and Cognitive with r-values ranging from .107 to .257 with p-values less than 0.05, therefore, significant.   This suggests that students who maintain focused, regulate their impulses, and exhibit consistent study habits are more likely to participate actively in school, express enjoyment in learning, and invest effort both in academic tasks and extracurricular activities. The presence of significant correlations across multiple dimensions of engagement further emphasizes that learning behaviors are not isolated traits but are deeply interwoven with how students experience and interact within the educational environment.

This correlation supports the findings of Panadero (2019) and Schunk and DiBenedetto (2020), who assert that self-regulatory behaviors significantly affect how students manage their learning and persist in the face of academic challenges. These scholars emphasize that developing self-regulation skills such as goal-setting, responsibility, and motivation is essential for fostering engagement. Furthermore, Zimmerman and Moylan (2019) highlight that students who actively practice self-discipline and motivational strategies are better equipped to engage both cognitively and behaviorally, enhancing their educational experience and performance. The results of this study align with these insights, indicating that strengthening learning behavior practices could be a vital strategy for educators aiming to enhance student engagement and overall academic success.

Best- fit Structural Model on Student Engagement

The original proposed model outlined in Figure 1 requires modifications to fit the data. Three generated models were displayed in the study. Chi-square degrees of freedom value should be less than two but greater than zero, with its corresponding p-value greater than 0.05. Root mean square error approximation value must be less than 0.05, and its corresponding p- close value must be greater than 0.0.5. The other indices such as the normed fit index, Tucker-Lewis index, comparative fit index, and the goodness of fit index, must all be greater than 0.95.

The Generated Structural Model 1. Figure 2 in the structural equation diagram shows a comprehensive interaction among key factors influencing student engagement. Specifically, four of the five latent constructs Classroom Management (CMT) with its indicators; effective factors in classroom management, effect of teachers in classroom management and teachers' strategies for classroom, Classroom Environment (CE) with its indicators; proper ventilation of classroom, facilities, paint and lighting, student-teacher relationship, chalkboard use, teachers' behavior, students' behavior and seats and sitting arrangement, Students' School Motivation (SSM) with its indicators; self-determination, self-efficacy, intrinsic motivation, grade motivation and career motivation, and Learning Behavior (LB) with its indicators; responsibility, goal-setting, self-discipline and motivation were identified as predictors of Student Engagement (SET) with its indicators; affective: liking for school, affective: liking for learning, cognitive, behavior: extracurricular and behavior: effort and persist . Among these, Learning Behavior and Student School Motivation emerged as the most influential factors, highlighting that student engagement is primarily driven by intrinsic behaviors such as motivation, self-discipline, and goal-setting. These behaviors contribute to affective, behavioral, and cognitive forms of engagement. Similarly, SSM indicators such as self-determination, intrinsic motivation, and grade motivation show strong associations with students' affective and cognitive involvement in learning.

The findings of the model demonstrate a clear structural linkage between the exogenous variables (CMT, CE, SSM, and LB) and the endogenous variable, Student Engagement. The model suggests that while environmental factors like classroom facilities and management practices contribute to shaping engagement indirectly, the most substantial impact stems from internal student factors. This supports the findings of Panadero (2019) and Schunk and DiBenedetto (2020), who assert that self-regulatory behaviors significantly influence how learners manage their academic responsibilities and persist through challenges. These results are corroborated by recent studies such as those by O'Connor et al. (2021) and Greene (2020), which underscore the role of motivation and learning behaviors in sustaining engagement and academic success.
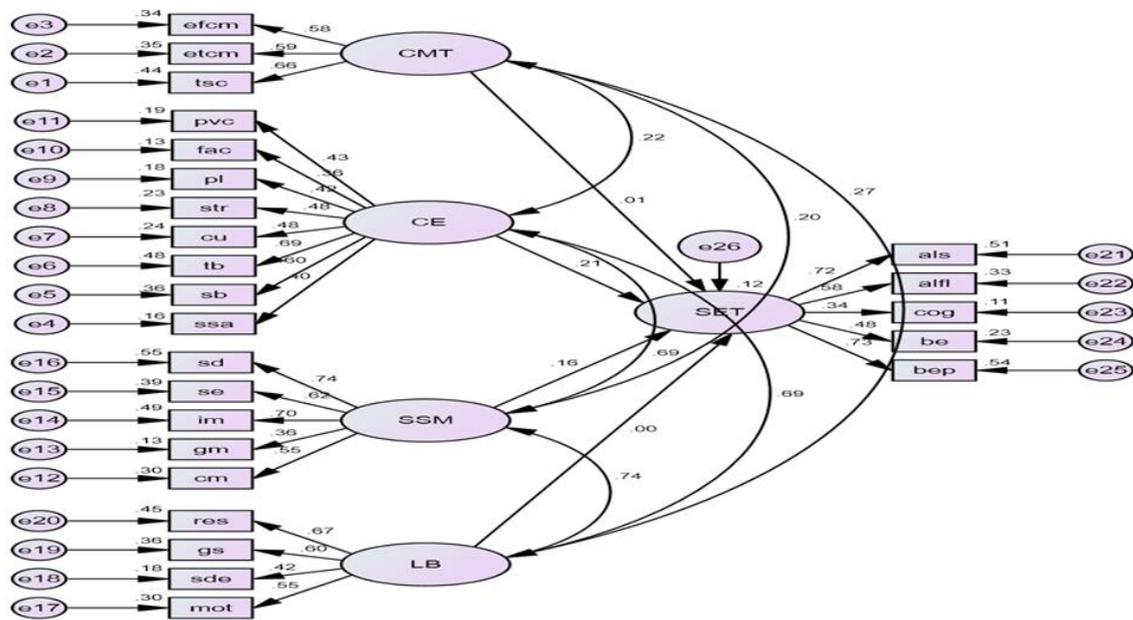
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Figure 2. Structural Equation Model 1 in Standardized Solution

Legend:

efcm – Effective Factors in Classroom Management	str – Student – Teacher Relationship	gs – Goal-Setting
tsc – Teacher's Strategies for Classroom	CE – Classroom Environment	res – Responsibility
etcm – Effect of Teacher's Classroom Management	se – Self-Efficacy	mot – Motivation
CMT – Classroom Management	im – Intrinsic Motivation	sde – Self-Discipline
fac – Facilities	gm – Grade Motivation	LB – Learning Behavior
pl – Paint and Lightning	sd – Self- determination	alfl – Affective: Liking for Learning
pvc – Proper Ventilation of Classroom	cm – Career Motivation	als – Affective: Liking for School
ssa – Seats and Sitting Arrangement	SSM – Students' School Motivation	bep – Behavior: Effort and Persist
cu – Chalkboard Use		be – Behavior: Extracurricular
tb – Teacher's Behavior		cog – Cognitive
sb – Student's Behavior		SE – Student Engagement

Table 10. Goodness of Fit Measures of Structural Equation Model 1

INDEX	CRITERION	MODEL FIT VALUE
P-Close	> 0.05	.000
CMIN/DF	0 < value < 2	2.746
P-value	> 0.05	.000
GFI	> 0.95	.870
CFI	> 0.95	.795
NFI	> 0.95	.715
TLI	> 0.95	.768
RMSEA	< 0.05	.066

Legend:

CMIN/DF -	Chi-Square/Degrees of Freedom
NFI	- Normed Fit Index
TLI	- Tucker-Lewis Index
CFI	- Comparative Fit Index
GFI	- Goodness of Fit Index
RMSEA	- Root Means Square of Error Approximation
Pclose	-P of Close Fit
P-value	- Probability Level

Table 10 presents the goodness-of-fit measures for Structural Equation Model (SEM) 1, which are essential for evaluating how well the model fits the observed data. The first measure, P-Close (P of Close Fit), has a value of 0.000, which is significantly below the ideal threshold of 0.05, suggesting that the model does not fit well. The CMIN/DF (Chi-Square/Degrees of Freedom) value is 2.746, which exceeds the recommended range of 0 to 2, implying that the model may be too complex or poorly specified. Additionally, the P-value of 0.000 indicates a significant discrepancy between the model and the data, which is contrary to the expectation of a P-value greater than 0.05 for an ideal fit.

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The Generated Structural Model 2. Figure 3 reflects the goodness-of-fit indices for Structural Equation Model 2. It displays the interrelationships among the exogenous variables, with some indicators with low values removed.   In classroom management, there were two out of three original indicators, namely, the effect of teachers in classroom management and teachers' strategy in the classroom, that demonstrated a positive influence. Similarly, the environment's positive influence was evident in its retained indicators, which consisted of two out of eight indicators: proper ventilation of the classroom and classroom seats and sitting arrangement. Students' school motivation, as indicated in the model, positively influences self-determination and career motivation, two of the five indicators retained.
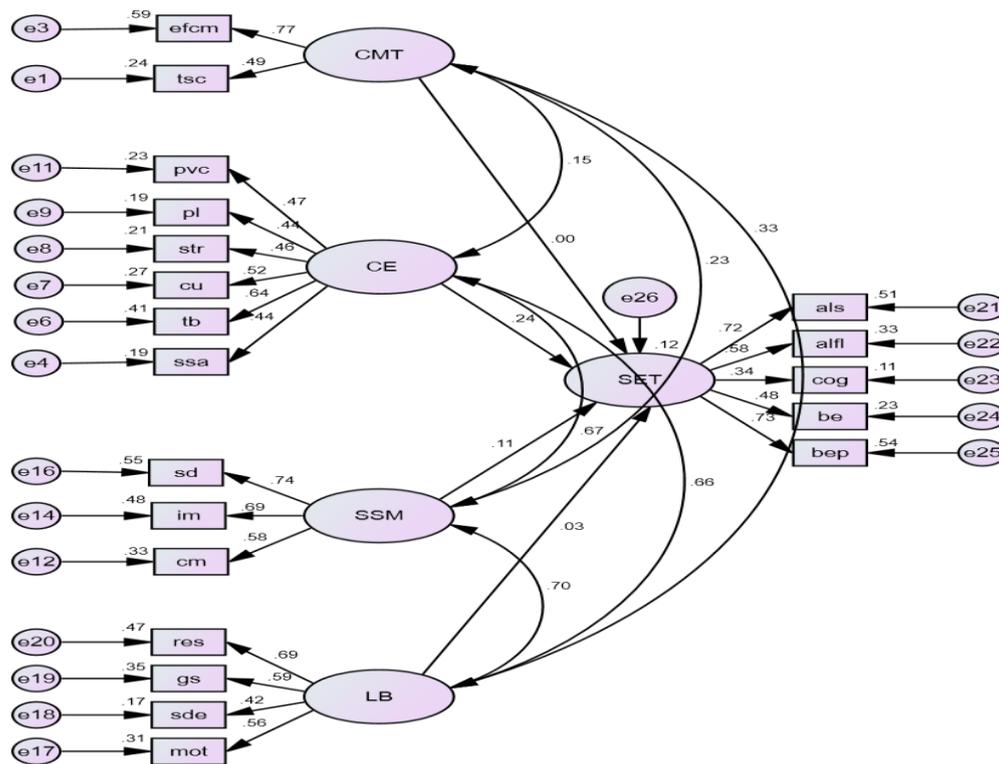
Figure 3. Structural Equation Model 2 in Standardized Solution

Legend:

efcm – Effective Factors in Classroom Management	str – Student – Teacher Relationship	gs – Goal-Setting
tsc – Teacher's Strategies for Classroom	CE – Classroom Environment	res – Responsibility
etcm – Effect of Teacher's Classroom Management	se – Self-Efficacy	mot – Motivation
CMT – Classroom Management	im – Intrinsic Motivation	sde – Self-Discipline
fac – Facilities	gm – Grade Motivation	LB – Learning Behavior
pl – Paint and Lightning	sd – Self- determination	alfl – Affective: Liking for Learning
pvc – Proper Ventilation of Classroom	cm – Career Motivation	als – Affective: Liking for School
ssa – Seats and Sitting Arrangement	SSM – Students' School Motivation	bep – Behavior: Effort and Persist
cu – Chalkboard Use		be – Behavior: Extracurricular
tb – Teacher's Behavior		cog – Cognitive
sb – Student's Behavior		SE – Student Engagement

These findings are consistent with observations by Kline (2021) and Schumacker and Lomax (2020), who argue that fit indices below the .90 threshold (especially for CFI and TLI) suggest a need for respecification of the model's structure. Their research underscores that fit indices are particularly sensitive when models include multiple latent constructs with weak or non-significant paths—exactly the pattern seen in this SEM. As such, Table 11 confirms the need for a more parsimonious and better-fitting model, which was eventually realized in Model 3 (Table 12). This iterative process aligns with the best practices in SEM development, where theory-driven adjustments and empirical validation work hand in hand to refine model accuracy and explanatory power.

Table 11. Goodness of Fit Measures of Structural Equation Model 2

INDEX	CRITERION	MODEL FIT VALUE
P-Close	> 0.05	.019
CMIN/DF	0 < value < 2	2.417
P-value	> 0.05	.000
GFI	> 0.95	.914
CFI	> 0.95	.855
NFI	> 0.95	.779
TLI	> 0.95	.828
RMSEA	< 0.05	.060

Legend:

CMIN/DF	-	Chi-Square/Degrees of Freedom
NFI	-	Normed Fit Index
TLI	-	Tucker-Lewis Index
CFI	-	Comparative Fit Index
GFI	-	Goodness of Fit Index
RMSEA	-	Root Means Square of Error Approximation
Pclose	-	P of Close Fit
P-value	-	Probability Level

The Generated Structural Model 3. Figure 4 highlights the significant impact of classroom management, classroom environment, students' school motivation and behavioral learning on student engagement. This result underscores the pivotal role of fostering a collaborative and physical environment to enhance the effectiveness of student engagement. Notably, within the constructs of four exogenous variables all were emerged as critical components exhibiting high factor loadings. These components emphasize the value of teamwork and collegial relationships in strengthening student engagement and promoting an environment conducive to shared learning and individual growth.
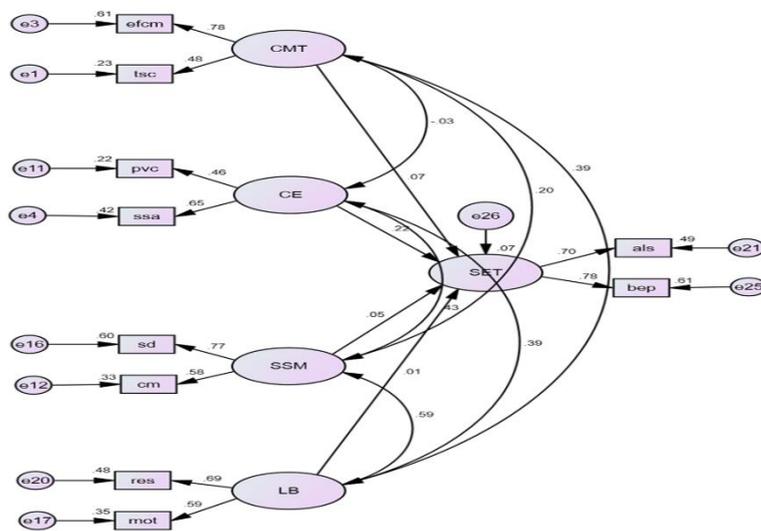

Figure 4. Structural Equation Model 3 in Standardized Solution

Legend:

efcm – Effective Factors in Classroom Management	str – Student – Teacher Relationship	gs – Goal-Setting
tsc – Teacher's Strategies for Classroom	CE – Classroom Environment	res – Responsibility
etcm – Effect of Teacher's Classroom Management	se – Self-Efficacy	mot – Motivation
CMT – Classroom Management	im – Intrinsic Motivation	sde – Self-Discipline
fac – Facilities	gm – Grade Motivation	LB – Learning Behavior
pl – Paint and Lightning	sd – Self- determination	alfl – Affective: Liking for Learning
pvc – Proper Ventilation of Classroom	cm – Career Motivation	als – Affective: Liking for School
ssa – Seats and Sitting Arrangement	SSM – Students' School Motivation	bep – Behavior: Effort and Persist
cu – Chalkboard Use		be – Behavior: Extracurricular
tb – Teacher's Behavior		cog – Cognitive
sb – Student's Behavior		SE – Student Engagement

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Table 12 displays the goodness-of-fit measures for Path Analysis Model 3, which represents the final refined structural equation model. Unlike the previous models, this version demonstrates excellent model fit across all indices. The P-Close (from .019 to .996) and P-value (from .000 to .579) are well above the accepted threshold of .05, indicating the model is not significantly different from the observed data—an ideal scenario in SEM. Moreover, the Chi-square to degrees of freedom ratio (CMIN/DF from 2.417 to 0.919) is below the standard cut-off of 2.0, reinforcing the model's parsimony and accuracy. Fit indices such as GFI (from .914 to .989), CFI (from .855 to 1.000), NFI (from .779 to .959), and TLI (from .828 to 1.007) all surpass the conventional .95 threshold, while the RMSEA (previously .060 to 0.000) confirms virtually no approximation error in the model.

Table 12. Goodness of Fit Measures of Path Analysis Model 3

INDEX	CRITERION	MODEL FIT VALUE
P-Close	> 0.05	.996
CMIN/DF	0 < value < 2	.919
P-value	> 0.05	.579
GFI	> 0.95	.989
CFI	> 0.95	1.000
NFI	> 0.95	.959
TLI	> 0.95	1.007
RMSEA	< 0.05	.000

Legend:

CMIN/DF	-	Chi-Square/Degrees of Freedom
NFI	-	Normed Fit Index
TLI	-	Tucker-Lewis Index
CFI	-	Comparative Fit Index
GFI	-	Goodness of Fit Index
RMSEA	-	Root Means Square of Error Approximation
Pclose	-	P of Close Fit
P-value	-	Probability Level

These results support the assertion by Hair (2019) that achieving strong fit indices across multiple criteria is indicative of a theoretically sound and statistically robust model. Additionally, Byrne (2020) emphasizes that models with CFI and TLI values at or above 1.0 and RMSEA values near zero are considered near-perfect representations of the observed covariance structure. Furthermore, the GFI, or Goodness-of-Fit index, evaluates the proportion of the observed covariances and variances that the model explains. It is comparable to the R^2. In analysis of regression, GFI > 0.95 is the suggested value for a good match represents a perfect fit as opined by In'nami & Koizumi, (2013).

Table 13. Estimates of Variable Regression Weights in Structural Equation Model 3

			B	S.E.	C.R.	BETA	P
SET	<---	CMT	.109	.145	.751	.070	.453
SET	<---	CE	.259	.151	1.716	.219	.086
SET	<---	SSM	.057	.134	.422	.047	.673
SET	<---	LB	.012	.160	.077	.010	.939
tsc	<---	CMT	1.000			.483	
efcm	<---	CMT	1.495	.452	3.306	.782	***
ssa	<---	CE	1.000			.651	
pvc	<---	CE	.780	.197	3.961	.465	***
cm	<---	SSM	1.000			.578	
sd	<---	SSM	1.497	.241	6.216	.773	***
mot	<---	LB	1.000			.593	
res	<---	LB	1.173	.175	6.688	.694	***
als	<---	SET	1.000			.700	
bep	<---	SET	1.083	.343	3.160	.778	.002

Chi-square = 22.972

Degrees of freedom =25

Probability level = .579

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Table 13 reflects a final, simplified model (Model 3), aiming for a cleaner structure with improved fit. This time, the model shows excellent goodness-of-fit statistics (e.g., RMSEA = 0.000, CFI = 1.000, P-close = .996), suggesting that this version best represents the data. Despite this, none of the latent constructs still significantly predicted Student Engagement directly (all p-values > .05), with CE again showing a marginal influence (p = .086).

However, the internal structural relationships were notably stronger. Classroom Management's effect on Effective Classroom Management (efcm, β = .782, p < .001) continued to improve, suggesting refinement in defining the latent variable. The Classroom Environment's influence on elements like Proper Ventilation (pvc, β = .465, p < .001) and Seating Arrangement (ssa, β = .651) became more pronounced, reflecting that the physical and interpersonal climate of classrooms contributes meaningfully to the learning context. Among the engagement indicators, behavioral persistence (bep, β = .778, p = .002) and liking for school (als, β = .700) emerged as critical facets of engagement. This reinforces the notion that while the broader constructs may lack direct statistical impact on engagement, their underlying elements strongly influence how students participate, commit, and relate to school activities. These findings recommend prioritizing micro-level interventions in classroom design, teacher behavior, and student motivation.

Table 13 shows that the entire model fits the data remarkably well in spite of these weak structural relations. With a non-significant chi-square (p=.579), all fit indices—RMSEA=.000, CMIN/DF=.919, CFI=.000, TLI=.007, GFI=.989, NFI=.959, and P-close=.996—exceeded international SEM criteria. These metrics verify that the model is stable, well-defined, and statistically sound. Although the proposed prediction does not significantly explain engagement, the model as a whole accurately depicts the data structure and the latent variables are well assessed, according to the congruence between Figures 3 and 4 and the goodness-of-fit statistics.

The outcomes of this study, especially the non-significant direct effects of CM, CE, SSM, and LB on SET, are consistent with a number of earlier studies showing that relational and emotional variables more strongly predict engagement than structural or contextual classroom factors (Fredricks 2004). In a similar vein, Quin (2017) discovered that relationships between teachers and students, rather than classroom management techniques, were the most reliable predictor of student engagement in a variety of contexts. This suggests that management primarily promotes order rather than genuine engagement. Kahu (2023) further contended that classroom structures and environmental factors only offer "background support," whereas engagement emerges internal psychological states shaped autonomy, relatedness, and relevance in the learning process.

Furthermore, although classroom management, classroom environment, students' school motivation, and learning behavior are crucial elements of the educational process, they do not directly predict student engagement in the context under investigation, according to the study's findings. None of the four variables significantly affected engagement, even though the model showed great measurement validity and excellent statistical fit, showing that the constructs were accurately and consistently measured. Student involvement is largely influenced by internal affective and behavioral characteristics rather than external structural or motivational settings, as seen by the little variance explained in student engagement (R1=6.7%).

Finally, Fredricks, Wang, and Schallert (2021) found that while overall school structures and climate matter, they only affect student engagement significantly when translated into actionable, observable components such as well-ventilated spaces, organized seating, and emotionally supportive teacher conduct. This agrees with the findings in Table 13, where indicators such as Seating Arrangement (β = .651) and Proper Ventilation (β = .465) had strong statistical influence even though the full CE variable did not directly predict SET. Their study underscores that fostering student engagement requires attention to environmental micro-features and consistent motivational cues, confirming the direction and relevance of your refined SEM.

Senior high school students in region XI demonstrated a strong dedication and interest to their learning, suggesting potential for further improvement. Additionally, providing attention and utmost support can boost their likelihood of staying with the school. Hence, Sustainable Development Goal (SDG) 3, focuses on ensuring healthy lives and promoting well-being for all at all ages. This goal addresses a wide range of health priorities, including reducing mortality rates, combating diseases, ensuring access to healthcare, and promoting mental health. Sustainable Development Goals (SDG) 4, emphasizes quality education, which focuses on ensuring inclusive and equitable quality education and promoting lifelong learning opportunities for all.

4. CONCLUSION AND RECOMMENDATION

The findings revealed that public senior high schools in Davao Region perceive classroom management, classroom environment, students' school motivation, learning behavior, and student engagement as high. When correlated, it showed a significant positive relationship among classroom management, classroom environment, students' school motivation, learning behavior, and student engagement in public senior high schools in the Davao Region. This finding indicates that the four exogenous variables are significant predictors of the effectiveness of the student engagements. Additionally, classroom management, classroom environment, students' school motivation, and learning behavior significantly influence student engagement in public senior high schools of Davao Region. Among these factors, classroom environment and students' school motivation had the most significant influence, followed by classroom management and learning behavior.

The findings accept Self-Determination Theory (Ryan and Deci, 2000). This theory proposes three key psychological needs that influence motivation: autonomy, competence and relatedness. Effective classroom management creates structure and clear expectations, but also allows for student choice and voice. This fosters autonomy. A well-designed classroom environment that provides appropriate challenges and opportunities for success builds competence. Positive relationships with teachers and peers cultivate relatedness. When these needs are met, students are more likely to be intrinsically motivated and engaged in learning. Lastly, the findings accept Self-Efficacy Theory by Albert Bandura (1978) emphasizes the importance of students' belief in their capabilities to learn and succeed. Effective learning behaviors such as active participation, asking questions, and seeking help from peers or teachers demonstrate a growth mindset and a willingness to grapple with challenges. These behaviors lead to accomplishments that boost students' self-efficacy, which in turn motivates them to persist with challenging tasks and become more engaged in learning.

Grounded in the body's findings and conclusions, the following recommendations are offered for educators, Department of Education's school administrators, and future researchers:

For School Administrators. Provide professional development centered on engagement-focused pedagogy- Training should target student-centered instruction, autonomy support, and fostering positive classroom relationships; Adopt institutional policies that promote belongingness- schools should develop initiatives that enhance inclusion, student voice, affirming feedback, and supportive behavioral expectations; Reassess engagement programs to focus on compliance and more on motivation emotional connection.

For Future Research. Incorporate emotional, relational, and instructional variables in future SEM models- Variable such as teacher- student rapport, per climate, sense of belonging, perceived teacher support, and instructional relevance may mere strongly predict engagement; Examine possible mediating and moderating effects – Motivation or classroom climate may influence engagement indirectly through self- regulation, emotions, or perceptions of competence; Use longitudinal designs to track changes in engagement over time- engagement is a dynamic process; cross-sectional data may not fully capture its complexity; and Replicate the study in different school types or cultural contexts- this will determine whether the weak structural relationships found here hold across diverse learner populations.

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