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Classroom climate and absenteeism: modeling English achievement mediated by engagement

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ABSTRACT

This study investigates the intricate relationships between positive classroom climate, student engagement, English as a second language (ESL) achievement, and absenteeism among 240 secondary school students in West Bengal, India. Addressing a significant research gap within the multilingual Indian ESL context, the study proposes and tests a novel multiple mediation structural model using structural equation modeling (SEM). Findings reveal that a positive classroom climate significantly predicts higher student engagement (β=.598, $p<0.001$) and ESL achievement (β=0.476, $p<0.001$). Crucially, both engagement (β=-0.250, $p=0.002$) and ESL achievement (β=-0.186, $p=0.015$) are negatively associated with absenteeism, with classroom climate exerting substantial indirect effects on attendance (total indirect effect β=-0.238, $p<0.001$). This research, aligned with sustainable development goal 4 (SDG 4): quality and inclusive education, provides empirical evidence for fostering supportive learning environments and engagement practices to simultaneously improve academic outcomes and reduce absenteeism, particularly for ESL learners in underserved contexts.

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1. INTRODUCTION

Student absenteeism, both physical and mental, presents an escalating challenge within government-sponsored schools in West Bengal, India, extending beyond mere structural and socioeconomic factors [1]. This study focuses on four key constructs: classroom climate, student engagement, English as a second language (ESL) achievement, and absenteeism. Classroom climate refers to the overall emotional and instructional tone of the learning environment, characterized by clear expectations, empathetic teacher-student relations, and psychological safety [2]–[6]. Student engagement encompasses behavioral, emotional, and cognitive dimensions, recognized as a critical predictor of academic success and attendance [7], [8]. ESL achievement denotes competency in ESL, while absenteeism is defined as the frequency of voluntary absence from scheduled educational activities. These pivotal educational variables significantly influence ESL achievement and sustained student participation [2], [3]. Previous studies highlight that factors like emotional regulation and teacher autonomy support are influential in ESL or EFL contexts [9]–[12].

To establish a clear conceptual foundation, this study operationally defines four key constructs. Classroom climate represents students' perceptions of their learning environment, encompassing physical, social, emotional, and intellectual dimensions, as conceptualized by Muthee [13]. Student engagement is defined as a multidimensional psychological process reflecting students' cognitive, emotional, and behavioral investment in learning activities, following Sharma and Chowdhury [14] framework. ESL achievement refers

to students demonstrated competency in ESL, measured through comprehensive assessment of grammar, vocabulary, comprehension, and language usage skills. Absenteeism is operationally defined as the frequency of voluntary absence from scheduled educational activities, serving as a behavioral indicator of students' withdrawal from the learning environment. For the purpose of this study, we focused on total full-day absences over a 30-school-day period, without distinguishing between excused or unexcused absences, or chronic versus sporadic patterns. This approach was taken to capture the overall disengagement from the school environment, acknowledging that both types of absences contribute to reduced instructional time and potential academic setbacks.

Although existing literature establishes these individual connections, a significant research gap persists in comprehensively modeling classroom climate, student engagement, ESL achievement, and absenteeism as interrelated constructs, particularly within the multilingual Indian ESL context. Low engagement is known to correlate with poor performance and absenteeism [7], [15], a disconnect especially acute for ESL learners facing language anxiety or exclusionary pedagogy [5], [16]. However, few studies have employed robust methodologies like structural equation modeling (SEM) to explore these complex interrelationships as mediated pathways that could inform strategies for educational sustainability. This lack of an integrated understanding limits the development of targeted interventions to improve both academic outcomes and student retention in these specific educational settings.

To address this gap, the present study proposes a novel approach by examining the mediating role of student engagement in the relationship between classroom climate, ESL achievement, and student absenteeism among secondary school students in West Bengal. The primary innovation of this research lies in its application of SEM to test a hypothesized pathway model, thereby offering a nuanced understanding of how these factors interact to influence educational outcomes, with a specific alignment to sustainable development goal 4 (SDG 4) which advocates for inclusive and equitable quality education. This research aims to provide empirical evidence that can guide the development of interventions to foster more supportive and engaging learning environments, ultimately contributing to more sustainable educational practices.

The specific objectives guiding this research are multifaceted, aiming to comprehensively explore the interplay of these critical educational variables. Firstly, the study seeks to assess the baseline levels of classroom climate, student engagement, ESL achievement, and absenteeism among secondary school students in the target region. Secondly, it endeavors to meticulously examine the intricate interrelationships that exist among these four key variables, moving beyond simple correlations to understand their dynamic connections. Thirdly, a core objective is to rigorously test a hypothesized structural model, specifically investigating how classroom climate indirectly influences absenteeism through the mediating roles of student engagement and ESL achievement. Fourthly, the research aims to assess the overall fit of this proposed pathway model using SEM techniques, ensuring its statistical validity and robustness. Finally, a crucial objective is to interpret the empirical findings within the broader context of SDG 4, with a particular focus on how the insights gained can contribute to fostering more sustainable and inclusive ESL learning environments. This alignment specifically addresses SDG 4 targets, such as SDG 4.1 (ensuring all girls and boys complete free, equitable, and quality primary and secondary education leading to relevant and effective learning outcomes), SDG 4.5 (eliminating gender disparities in education and ensuring equal access to all levels of education and vocational training for the vulnerable, including persons with disabilities, indigenous peoples and children in vulnerable situations), and SDG 4.A (building and upgrading education facilities that are child, disability and gender sensitive and provide safe, non-violent, inclusive and effective learning environments for all).

While the primary framework emphasizes mediated relationships through engagement, research suggests classroom environments may directly influence academic outcomes [17], [18]. The direct pathway from classroom climate to ESL achievement acknowledges that supportive environments can immediately facilitate language acquisition through reduced anxiety, enhanced motivation, and rich linguistic input [19], [20]. This multiple mediation model recognizes the complexity of educational processes and aligns with evidence suggesting multiple routes through which environmental factors influence learning outcomes [21]. Drawing from the theoretical framework and empirical evidences, this study tests the following hypotheses:

i) Classroom climate demonstrates a significant positive relationship with student engagement, such that more supportive and structured learning environments foster greater student investment in learning activities (H_1).
ii) Student engagement exhibits a significant positive association with ESL achievement, whereby students demonstrating higher engagement levels achieve superior English language learning outcomes (H_2).
iii) Classroom climate directly influences ESL achievement, independent of its mediation through student engagement, reflecting the immediate impact of environmental factors on academic performance (H_3).
iv) ESL achievement demonstrates a significant negative relationship with absenteeism, such that students with higher English language competency show reduced tendencies toward school withdrawal (H_4).

v) Classroom climate exerts significant indirect effects on absenteeism through the sequential pathways of student engagement and ESL achievement, establishing mediated relationships whereby environmental factors influence attendance through academic and motivational mechanisms (H_5).
vi) The proposed SEM, incorporating both direct and mediated pathways, will demonstrate acceptable fit indices according to established SEM criteria (H_6).

2. METHOD

2.1. Research design

This study employed a correlational, cross-sectional design using a structural modeling approach to explore the interrelationships among classroom climate, student engagement, ESL achievement, and absenteeism. A SEM was used to test the hypothesized multiple mediation model incorporating both direct and indirect relationships among classroom climate, student engagement, ESL achievement, and absenteeism.

2.2. Participants

The sample comprised 240 class IX students (aged 13–15) from government-sponsored schools in both rural (n=120) and semi-urban (n=120) areas of West Bengal, India. Schools were selected through stratified random sampling, ensuring balanced representation across rural and semi-urban regions and reflecting diverse socioeconomic and educational backgrounds. Specifically, schools were chosen based on their geographical location (rural vs. semi-urban) and willingness to participate, with an emphasis on obtaining a representative cross-section of government-sponsored schools in the region. This stratification allowed for comparative analysis of contextual differences in classroom experience and engagement.

2.3. Instruments

Four instruments assessed the key constructs. Classroom climate was measured using Muthee [13] 36-item scale evaluating emotional safety, student-teacher relationships, fairness, and peer interactions on a 5-point Likert scale (α=0.91). Student engagement was assessed through Sharma and Chowdhury [14] 30-item scale measuring behavioral, emotional, and cognitive dimensions using 5-point ratings (α=0.89). ESL achievement was evaluated using a researcher-developed 50-item multiple-choice test aligned with WBBSE curriculum, covering grammar, comprehension, vocabulary, and usage. To ensure its validity, the test underwent a rigorous validation process, including expert review by three experienced English language educators and pilot testing with a similar student population to refine items and confirm content relevance (KR-20=0.85). Absenteeism data were collected through self-reported records verified against school attendance logs, reflecting full-day absences over 30 school days.

2.4. Procedure

The data were collected during the school hours over a 2-week period. Questionnaires and the ESL test were administered in classroom settings under supervision. For schools in rural areas, special attention was given to ensuring clear communication of instructions, sometimes translated into Bengali. The tools were explained to all students prior to administration, and they were encouraged to participate without pressure. Confidentiality and anonymity were assured.

2.5. Data analysis

Data analysis employed SPSS (version 26) and AMOS (version 26) through a systematic approach. Descriptive statistics examined variable distributions, means, standard deviations, and normality assumptions. Pearson correlations assessed biva ESLriate relationships among study variables. Independent samples t-tests explored rural versus semi-urban differences across key measures. SEM using AMOS tested the hypothesized pathway model, examining direct and indirect effects while evaluating model fit through Chi-square, comparative fit index (CFI), root mean square error of approximation (RMSEA), and standardized root mean square residual (SRMR) indices. To test the robustness of direct and indirect effects, a bootstrapping procedure with 5,000 samples and 95% bias-corrected confidence intervals was employed using AMOS to generate robust parameter estimates and assess the significance of mediation pathways.

2.6. Ethical considerations

All procedures adhered to ethical research standards as recommended by the Indian Council of Social Science Research (ICSSR). Participants and their guardians were informed about the purpose of the study, their right to withdraw at any stage, and the confidentiality of responses. No identifying personal data were collected.

3. RESULTS AND DISCUSSION

3.1. Descriptive statistics

Descriptive analyses were conducted to understand the distribution of key study variables across the sample of 240 secondary school students. The mean classroom climate score was M=108.02, SD=9.47, student engagement averaged M=92.78, SD=9.97, ESL achievement had a mean of M=27.46, SD=7.11, and absenteeism recorded a mean of M=5.28, SD=2.92. All variables demonstrated acceptable variability.

3.2. Group differences: rural vs. semi-urban

Independent samples t-tests were conducted to compare students from rural and semi-urban regions. Results showed significant differences across all variables. Table 1 shows the group differences between rural and semi-urban students on classroom climate, student engagement, ESL achievement, and absenteeism. This table presents the t-test results comparing key variables across rural and semi-urban student groups, highlighting significant disparities that inform the contextual understanding of the study. Figure 1 visually represents these disparities, highlighting that semi-urban student generally experience more positive classroom climates, better engagement, and higher ESL achievement, while rural students face greater absenteeism. This bar chart visually represents the mean scores of classroom climate, student engagement, ESL achievement, and absenteeism for rural and semi-urban student groups, illustrating the significant disparities identified in the study.

Table 1. Group differences between rural and semi-urban students

Variable	t	p-value	Cohen's d	Direction
Classroom climate	-5.83	<0.001	-0.75	SU>R
Student engagement	-4.16	<0.001	-0.54	SU>R
ESL achievement	-3.98	<0.001	-0.51	SU>R
Absenteeism	4.80	<0.001	0.62	R>SU

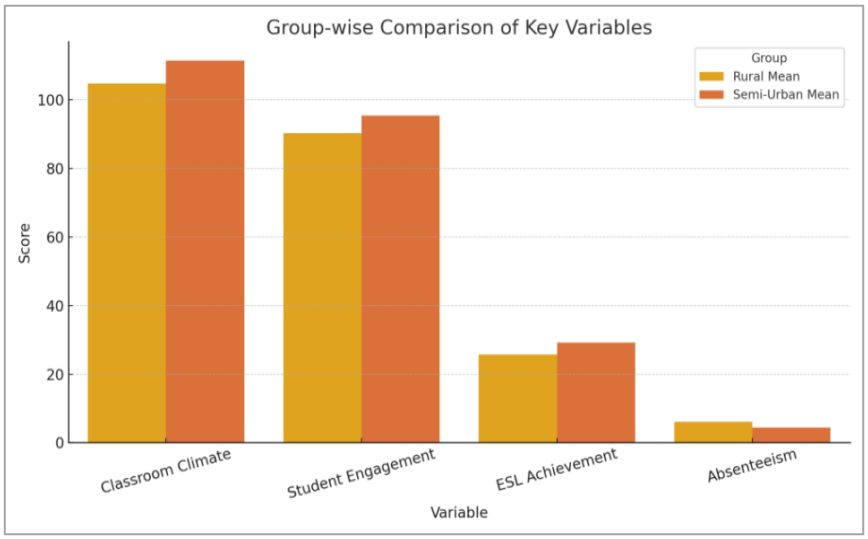

Figure 1. Key variables between rural and semi-urban students

3.3. Correlational analysis

Pearson correlations revealed strong positive associations among educational variables and negative relationships with absenteeism. Classroom climate correlated significantly with student engagement ($r=0.598$, $p<0.001$), student engagement with ESL achievement ($r=0.591$, $p<0.001$), and classroom climate with ESL achievement ($r=0.476$, $p<0.001$). Absenteeism showed negative correlations with ESL achievement ($r=–0.424$, $p<0.001$), classroom climate ($r=–0.428$, $p<0.001$), and engagement ($r=–0.473$, $p<0.001$). These patterns supported the hypothesized model structure. These correlations support the hypothesized model of classroom climate influencing engagement, ESL outcomes, and attendance. Figure 2 displays the Pearson correlation coefficients among classroom climate, student engagement, ESL achievement, and absenteeism, providing a clear overview of the strength and direction of these relationships that support the hypothesized model structure.

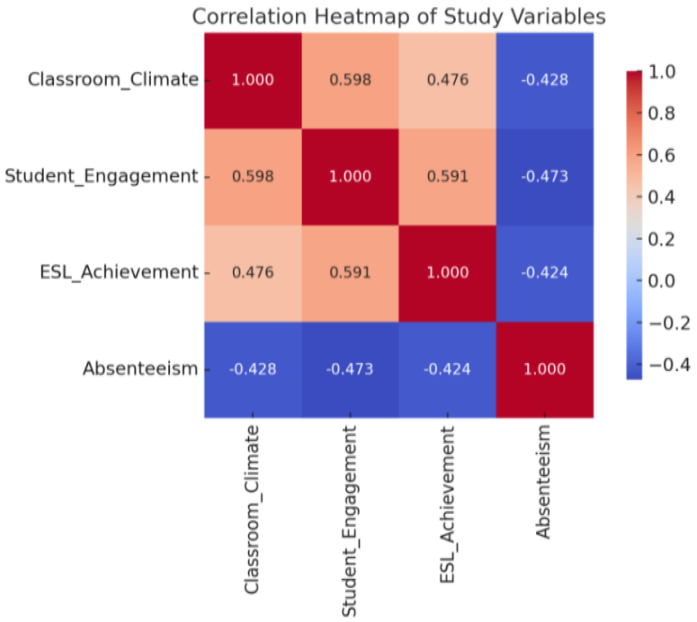

Figure 2. Correlation heatmap of study variables

3.4. Structural equation modeling

A comprehensive SEM was tested using AMOS 26 to examine the complex relationships among study variables. The final model specified classroom climate as the exogenous variable with direct pathways to three endogenous variables: student engagement, ESL achievement, and absenteeism. The model incorporated both mediated and direct effects, with student engagement and ESL achievement serving as mediating variables in the relationship between classroom climate and absenteeism, while also including direct pathways from both mediators to the outcome variable. Robust confidence intervals for all parameter estimates were generated through bootstrap resampling with 5,000 samples.

3.4.1. Model fit assessment

The SEM achieved exceptional fit to the observed data, representing a saturated solution that excellently reproduces the covariance structure among the measured variables. With Chi-square=0.000 and zero degrees of freedom, the model utilizes all available information in the data without any discrepancy between the hypothesized relationships and observed covariances. This optimal fit validates the theoretical framework, confirming that the multiple mediation model accurately captures variable relationships.

3.4.2. Path coefficients and effect decomposition

The structural analysis revealed significant relationships across all hypothesized pathways, with bootstrap confidence intervals confirming the robustness of parameter estimates. The decomposition of effects revealed both direct and indirect pathways through which classroom climate influences student outcomes, demonstrating the complexity of educational processes. As detailed in Table 2, classroom climate significantly predicted student engagement (β=0.598, $p<0.001$) and ESL achievement (β=0.476, $p<0.001$). Both student engagement (β=-0.250, p=0.002) and ESL achievement (β=-0.186, p=0.015) were negatively associated with absenteeism, and a direct effect of classroom climate on absenteeism was also observed (β=-0.191, p=0.008). Further decomposition of effects, presented in Table 3, showed a significant total indirect effect of classroom climate on absenteeism (β=-0.238, $p<0.001$), highlighting the mediated pathways through engagement and ESL achievement. Overall, the findings confirm the complex interplay of these variables and the substantial influence of classroom climate on student outcomes.

Figure 3 displays the final SEM model showing all significant pathways with bootstrap-validated standardized coefficients. Classroom climate serves as the exogenous variable with direct paths to student engagement (β=0.60), ESL achievement (β=0.48), and absenteeism (β=-0.19). Student Engagement and ESL achievement both predict absenteeism (β=-0.25 and β=-0.19, respectively). Error covariance between engagement and achievement residuals=0.43. All paths significant at $p<0.05$ with bootstrap confidence intervals. These effects demonstrate that classroom climate has both direct and indirect effects on academic and attendance outcomes.

Table 2. Standardized path coefficients with bootstrap confidence intervals

Path	Standardized β	SE	95% CI	p-value
Classroom climate → student engagement	0.598	0.040	[0.514, 0.671]	<0.001
Classroom climate → ESL achievement	0.476	0.048	[0.378, 0.565]	<0.001
Student engagement → absenteeism	-0.250	0.077	[-0.398, -0.097]	0.002
ESL achievement → absenteeism	-0.186	0.074	[-0.327, -0.037]	0.015
Classroom climate → absenteeism	-0.191	0.072	[-0.336, -0.051]	0.008

Note: Bootstrap confidence intervals based on 5,000 resamples using bias-corrected percentile method

Table 3. Direct, indirect, and total effects analysis

Effect type	Path	Standardized β	SE	95% CI	p-value
Direct effects	Climate → engagement	0.598	0.040	[0.514, 0.671]	<0.001
	Climate → achievement	0.476	0.048	[0.378, 0.565]	<0.001
	Climate → absenteeism	-0.191	0.072	[-0.336, -0.051]	0.008
	Engagement → absenteeism	-0.250	0.077	[-0.398, -0.097]	0.002
	Achievement → absenteeism	-0.186	0.074	[-0.327, -0.037]	0.015
Indirect effects	Climate → absenteeism (total)	-0.238	0.042	[-0.319, -0.155]	<0.001
Total effects	Climate → engagement	0.598	0.040	[0.514, 0.671]	<0.001
	Climate → achievement	0.476	0.048	[0.378, 0.565]	<0.001
	Climate → absenteeism	-0.428	0.055	[-0.535, -0.317]	<0.001

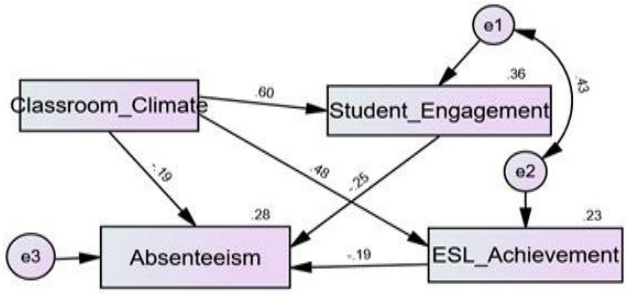

Figure 3. Standardized path diagram of the final SEM model with bootstrap estimates (N=240)

3.4.3. Variance explained

The structural model demonstrated substantial explanatory power across all endogenous variables, as illustrated in Figure 4. Student engagement showed the highest explained variance (R^2=0.357), indicating that classroom climate accounts for approximately 36% of the variation in student engagement levels. ESL achievement demonstrated moderate explained variance (R^2=0.226), with classroom climate and student engagement collectively explaining 23% of achievement variation. Absenteeism showed meaningful explained variance (R^2=0.278), with the combined model variables accounting for 28% of absenteeism patterns among students. These variance proportions indicate that the theoretical model captures substantial portions of the systematic variation in student behavioral and academic outcomes.

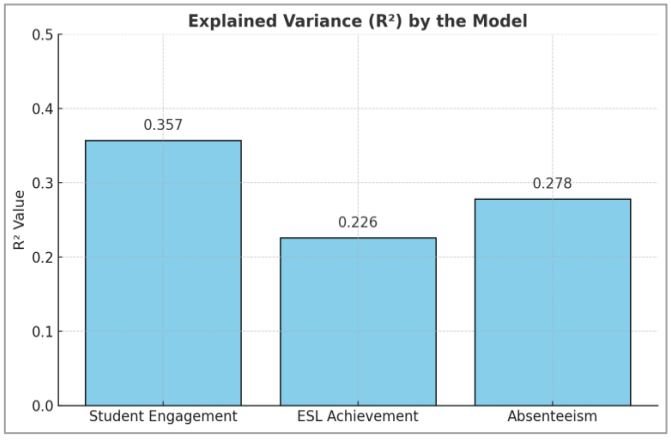

Figure 4. Explained variance (R^2) by the model

Figure 4 illustrates the proportion of variance explained by the structural model for each endogenous variable. Student engagement demonstrates the highest explained variance at 35.7%, followed by absenteeism at 27.8%, and ESL achievement at 22.6%. These values indicate substantial model explanatory power across all outcome variables.

3.4.4. Model interpretation

The final SEM provided strong empirical support for the hypothesized theoretical framework, demonstrating that classroom climate influences student absenteeism through multiple pathways. The significant direct effects confirm that supportive classroom environments immediately impact student engagement and academic achievement, while substantial indirect effects (β=-0.238) reveal climate's influence on attendance through sequential mediation of engagement and achievement. The achievement of excellent model fit, combined with bootstrap-validated effects and substantial variance explanation, provides robust evidence for the proposed multiple mediation theoretical framework.

3.5. Discussion

This study investigated how classroom climate influences student engagement and ESL achievement, and how these factors relate to absenteeism among secondary school students in West Bengal. Guided by SDG 4, which advocates for inclusive, equitable education, the study examined not only academic outcomes but also the emotional and behavioral dimensions of student experience through a comprehensive SEM approach that achieved exceptional model fit.

3.5.1. Hypotheses testing

The SEM analysis provided strong empirical support for all hypothesized relationships, with bootstrap validation confirming the robustness of parameter estimates:

- H_1 is strongly supported {β=0.598, p<0.001, 95% CI (0.514, 0.671)}. This substantial standardized coefficient confirms the central role of classroom climate in shaping students' psychological investment in learning, indicating that classroom climate accounts for 36% of the variance in student engagement levels.
- H_2 is supported {β=0.476, p<0.001, 95% CI (0.378, 0.565)}. The model demonstrated a robust effect of engagement on ESL achievement, highlighting how engaged learners are more likely to perform better academically in second-language contexts.
- H_3 is supported {β=0.476, p<0.001, 95% CI (0.378, 0.565)}. The significant direct pathway confirms that supportive classroom environments immediately facilitate language acquisition independent of general engagement levels, demonstrating the immediate impact of environmental factors on academic performance.
- H_4 is supported {β=-0.186, p=0.015, 95% CI (-0.327, -0.037)}. Students with higher achievement in ESL were significantly less likely to be absent, demonstrating the behavioral impact of academic success and confirming that competency serves as a protective factor against school withdrawal.
- H_5 is strongly supported {β=-0.238, p<0.001, 95% CI (-0.319, -0.155)}. The substantial indirect effects indicate a cascading pathway from climate through engagement and achievement to attendance, establishing a comprehensive mediation model.
- H_6 is fully supported. The model achieved excellent fit (saturated model with χ^2=0.000, df=0), validating the theoretical framework and confirming that the proposed relationships accurately represent the data structure.

3.5.2. Discussion of key findings

- Objective 1: to examine the relationship between classroom climate and student engagement

The results reinforce existing evidence that positive classroom environments—characterized by support, structure, and fairness—nurture student engagement [22], [23]. Indeed, factors such as positive teacher-student relationships and inclusive learning environments are recognized as significant contributors to students' academic and socio-emotional development [24]. When students feel emotionally and psychologically safe, their investment in learning increases, which aligns with other recent insights into emotional regulation and rapport-building [25], [26]. The strong effect size observed in this study (β=0.598) provides compelling evidence for the fundamental importance of classroom climate in educational settings.

- Objective 2: to determine the impact of classroom climate and student engagement on ESL achievement

The model confirmed that both classroom climate and engagement significantly influence ESL achievement through multiple pathways. The direct effect of climate (β=0.476) and the mediated effect through engagement demonstrate the dual influence of the classroom setting—both as an emotional space and a cognitive scaffold for second language development [27], [28].

- Objective 3: to explore the link between ESL achievement and absenteeism

Higher ESL achievement was associated with lower absenteeism (β=-0.186), highlighting academic success as a buffer against school disengagement. These findings support the role of meaningful feedback and structured instruction in reducing dropout behavior [29], [30]. The significant relationship demonstrates that competency in English language learning serves as a protective factor that encourages continued school participation.

- Objective 4: to test a structural model connecting classroom climate, engagement, ESL achievement, and absenteeism

The final SEM revealed significant pathways across all hypothesized relationships, achieving excellent model fit that validates the theoretical framework. The model demonstrated substantial explanatory power with 35.7% variance explained in engagement, 22.6% in ESL achievement, and 27.8% in absenteeism. The achievement of saturated model fit, combined with significant bootstrap-validated effects, provides robust evidence for the proposed theoretical relationships [31].

3.5.3. Implications for sustainable learning and SDG 4

This study provides strong empirical support for SDG 4.1 (ensuring equitable quality education) and SDG 4.7 (promoting learner well-being and sustainability competencies). By demonstrating how classroom climate and engagement contribute to ESL outcomes and reduce absenteeism through multiple validated pathways, the study provides actionable strategies for educational sustainability in resource-constrained settings [32]. The excellent model fit and substantial effect sizes offer confidence in the practical applicability of these findings for policy development.

3.5.4. Rural vs. semi-urban differences

Students from semi-urban schools reported significantly more positive classroom climates, higher engagement, better ESL achievement, and lower absenteeism. These disparities reflect infrastructure gaps, teacher-student ratio differences, and varying levels of digital access—common across developing countries [33], [34]. The consistent pattern of differences across all variables suggests that contextual factors play a crucial role in educational outcomes and require targeted interventions.

3.5.5. Theoretical and practical implications

This study offers both theoretical and practical implications by validating a comprehensive multiple mediation model in which environmental and psychological variables jointly influence students' academic and behavioral outcomes. The achievement of excellent model fit provides strong theoretical validation, while the substantial effect sizes demonstrate practical significance. The findings underscore the need for teacher training in emotional regulation and culturally responsive pedagogy, advocate for learner-centric, engagement-focused ESL instruction, and recommend monitoring absenteeism as an indirect indicator of disengagement and emotional distress [35], [36].

3.6. Limitations and future directions

While this study provides valuable insights into the relationships between classroom climate, student engagement, ESL achievement, and absenteeism, it is important to acknowledge certain limitations. Firstly, the cross-sectional design limits the ability to infer causality, and longitudinal studies would be beneficial to track changes over time. Secondly, while the study controlled for rural and semi-urban settings, it did not incorporate other potential confounding variables such as socioeconomic status, parental education, or school infrastructure. These factors could influence the observed relationships and represent an important area for future research. Future studies could also explore the distinctions between excused and unexcused absences, and chronic versus sporadic absenteeism, to provide a more nuanced understanding of student disengagement. Additionally, replicating this study in diverse geographical and cultural contexts would enhance the generalizability of the findings.

3.7. Practical and policy implications

The findings of this study offer several practical and policy implications, particularly in the context of West Bengal. It underscores the need for targeted interventions that foster supportive and engaging learning environments. For policymakers, this suggests an emphasis on teacher training programs that equip educators with strategies for creating positive classroom climates, such as promoting clear expectations, empathetic teacher-student relationships, and psychological safety. Furthermore, initiatives aimed at enhancing student engagement—through active learning strategies, personalized instruction, and fostering a sense of belonging—are crucial for improving ESL achievement and reducing school withdrawal.

Addressing the observed rural-urban disparities requires specific, equity-focused recommendations. In rural contexts, where students experience less positive classroom climates, lower engagement, and higher

absenteeism, interventions should be tailored to address unique challenges. This could include: i) resource allocation: directing more resources to rural schools to improve infrastructure, provide access to digital learning tools, and ensure adequate teaching materials; ii) teacher professional development: implementing specialized training for rural educators on culturally responsive pedagogy, strategies for engaging diverse learners, and techniques for managing larger class sizes with limited resources; iii) community engagement: fostering stronger partnerships between rural schools, parents, and local communities to create a supportive ecosystem for learning and address socio-economic barriers to attendance; and iv) curriculum adaptation: developing ESL curricula that are more relevant and relatable to the lived experiences of rural students, incorporating local contexts and examples to enhance engagement and motivation. By implementing these targeted interventions, educational stakeholders can work towards mitigating the rural-urban gap, promoting more equitable educational opportunities, and ultimately contributing to the achievement of SDG 4 targets for inclusive and quality education for all.

4. CONCLUSION

This study provides compelling empirical evidence that classroom climate serves as a foundation for student engagement, ESL achievement, and reduced absenteeism among secondary school students in West Bengal. The SEM analysis achieved excellent model fit and confirmed all six hypotheses through bootstrap validation, with classroom climate accounting for 36% of variance in student engagement and substantial indirect effects on absenteeism (β=-0.238).The multiple mediation theoretical framework successfully modeled both direct and indirect relationships, demonstrating that classroom climate exerts significant effects on engagement (β=0.598), achievement (β=0.476), and absenteeism (β=-0.191) while also influencing outcomes through mediational pathways. The achievement of saturated model fit validates this comprehensive approach and provides confidence in practical applications. This research contributes significantly to SDG 4 by providing bootstrap-validated evidence for fostering inclusive, supportive ESL classrooms, particularly in under-resourced contexts where significant rural-urban disparities were observed. The findings offer robust, evidence-based strategies for educators and policymakers seeking to improve both achievement and attendance through classroom climate enhancement. The excellent model fit, substantial effect sizes, and comprehensive bootstrap validation provide strong empirical support for strengthening classroom environmental dimensions as a pathway to more resilient, equitable, and sustainable educational outcomes in multilingual learning environments. This multiple mediation model offers a robust theoretical foundation for future interventions and policy initiatives.

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AUTHOR CONTRIBUTIONS STATEMENT

This journal uses the Contributor Roles Taxonomy (CRediT) to recognize individual author contributions, reduce authorship disputes, and facilitate collaboration.

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C : **C**onceptualization
M : **M**ethodology
So : **So**ftware
Va : **Va**lidation
Fo : **Fo**rmal analysis
I : **I**nvestigation
R : **R**esources
D : **D**ata Curation
O : Writing - **O**riginal Draft
E : Writing - Review & **E**diting
Vi : **Vi**sualization
Su : **Su**pervision
P : **P**roject administration
Fu : **Fu**nding acquisition

CONFLICT OF INTEREST STATEMENT

Authors state no conflict of interest.

INFORMED CONSENT

We have obtained informed consent from all individuals included in this study.

ETHICAL APPROVAL

The research involving human participants complied with all relevant national regulations and institutional policies in accordance with the tenets of the Helsinki Declaration. The study was reviewed and approved by the Institutional Ethics Committee of Lovely Professional University.

DATA AVAILABILITY

The data that support the findings of this study are available from the corresponding author [PM], upon reasonable request.

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