

# Impact of Classroom Climate on Students' Self-Efficacy and Mathematics Achievement in Secondary School Mathematics

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## ABSTRACT

This study examined the effect of classroom climate on students' self-efficacy and achievement in senior secondary school mathematics in Odeda Local Government Area, Ogun State, Nigeria. Guided by Bandura's Social Cognitive Theory, the research employed a descriptive survey design involving 120 students selected through stratified and simple random sampling from eight schools. Data were collected using the Students' Perception of Classroom Environment Questionnaire (SPCEQ), the Mathematics Self-Efficacy and Achievement Scale (MSEAS), and a Mathematics Achievement Test (MAT). Data were analysed using Pearson Product-Moment Correlation and descriptive statistics. The findings revealed that most classrooms were physically conducive, adequately ventilated, well-seated, and orderly, but lacked sufficient instructional materials and visual aids. The Pearson correlation results showed no statistically significant relationship between classroom climate and either students' self-efficacy or their achievement in mathematics. These results suggest that while classroom comfort contributes to learning satisfaction, it is not a sufficient condition for improving academic outcomes. Students' confidence and performance in mathematics are more strongly influenced by effective teaching practices, feedback, and motivational support than by environmental factors alone.

## INTRODUCTION

Mathematics education in Nigeria continues to face persistent challenges of low achievement and limited student motivation despite ongoing curriculum reforms. Mathematics plays a fundamental role in scientific development, technological advancement, and economic growth because it serves as the foundation for science, engineering, technology, and problem-solving in everyday life. Consequently, mathematics is regarded as a compulsory subject at both junior and senior secondary school levels in Nigeria. Despite its importance, students' performance in mathematics has remained persistently low over the years. Reports from examination bodies such as the West African Examinations Council (WAEC) and the National Examinations Council (NECO) continue to reveal unsatisfactory achievement levels among secondary school students. Many learners experience difficulties in mathematical reasoning, abstract thinking, and problem-solving, which often result in low confidence and limited participation during mathematics lessons.

One important factor influencing students' engagement and academic outcomes is classroom climate, which refers to the social, emotional, and instructional atmosphere of the learning environment (Çelik, Demir, & Özbek, 2024). A positive classroom climate characterized by mutual respect, cooperation, clear expectations, emotional safety, and supportive interaction can significantly influence students' attitudes, behaviours, and persistence in learning mathematics (Akindipe, 2025; Asanre & Chinaka, 2024). Research in educational psychology suggests that students' learning experiences are

shaped not only by intellectual ability but also by the emotional and interpersonal conditions within the classroom. Supportive learning environments encourage participation, collaboration, and meaningful engagement, whereas classrooms characterized by fear, rigid instruction, poor interaction, and lack of emotional support may discourage active involvement in mathematics learning activities.

The concept of classroom climate extends beyond physical classroom conditions such as seating arrangement and ventilation. It also includes psychological and interpersonal dimensions such as teacher support, peer relationships, classroom management, communication patterns, and students' sense of belonging. Constructivist and socio-cultural learning perspectives emphasize that meaningful learning occurs when students interact actively with teachers, peers, and instructional materials within a supportive environment. In mathematics classrooms, positive teacher–student relationships and collaborative learning experiences can help reduce anxiety and strengthen students' confidence in solving mathematical problems.

Within mathematics learning, affective variables such as motivation, self-confidence, anxiety, and self-efficacy strongly influence students' academic achievement. Bandura (1977) defined self-efficacy as individuals' beliefs in their capabilities to organize and execute actions required to accomplish specific tasks. Later, Bandura (1986) elaborated this concept within the broader Social Cognitive Theory, emphasizing the reciprocal interaction between personal factors, behaviour, and environmental influences. Students with high self-efficacy are more likely to approach mathematical challenges with persistence and confidence, whereas students with low self-efficacy often demonstrate avoidance behaviours, anxiety, and reduced engagement (Usher & Pajares, 2008; Schunk, Pintrich, & Meece, 2008). In mathematics classrooms, supportive teacher–student interaction, constructive feedback, and peer collaboration provide opportunities for mastery experiences and social persuasion that can strengthen students' self-efficacy and engagement.

Previous studies provide evidence that classroom climate may influence students' motivation and academic achievement. Pietersen (2022) found that democratic classroom structures improved students' motivation and learning outcomes, while Fajemidagba, Salman, and Ayinla (2012) reported that teacher warmth and constructive feedback helped reduce students' anxiety toward mathematics. Similarly, cooperative learning environments have been shown to foster social integration and cognitive development in mathematics education (Schunk et al., 2008). However, many Nigerian secondary schools still operate within teacher-centered and examination-oriented systems that provide limited opportunities for interaction, collaboration, and emotional support (Federal Republic of Nigeria, 2013). Such instructional practices may reduce students' participation and negatively affect their confidence in learning mathematics.

Recent international assessments such as TIMSS and PISA demonstrate that countries investing in socio-emotional classroom support, including Finland, Singapore, and South Korea, tend to achieve stronger mathematics performance (OECD, 2024). These educational systems emphasize not only physical classroom conditions but also psychological safety, learner autonomy, formative assessment, and supportive teacher–student relationships. This international evidence suggests that classroom climate may play an important role in shaping students' mathematics learning experiences and academic outcomes.

Despite growing international interest in classroom climate research, findings remain inconsistent across different educational and cultural contexts. While studies conducted in Turkey and Pakistan reported significant positive relationships between classroom climate and students' achievement or self-efficacy (Çelik et al., 2024; Khuhro, 2024), studies from some sub-Saharan African contexts have found weak or nonsignificant relationships (Bizimana, 2025; Fajemidagba et al., 2012). Such inconsistencies indicate that the relationship between classroom climate and students' learning outcomes may depend on contextual, cultural, and instructional factors.

Furthermore, limited studies within the Nigerian context have simultaneously examined classroom climate, students' self-efficacy, and mathematics achievement among senior secondary school students. Existing studies often focus primarily on academic performance without adequately considering psychosocial classroom factors that influence students' confidence and engagement. Therefore, this study seeks to fill this contextual and empirical gap by investigating the relationship between classroom climate, students' self-efficacy, and mathematics achievement among senior secondary school students in Odeda Local Government Area, Ogun State, Nigeria. The study was guided by the following null hypotheses:

$H_{01}$ : There is no significant relationship between classroom climate and students' self-efficacy in mathematics.

$H_{02}$ : There is no significant relationship between classroom climate and students' mathematics achievement.

## METHODOLOGY

This study adopted a descriptive survey design to investigate the relationship between classroom climate, students' self-efficacy, and achievement in senior secondary school mathematics in Odeda Local Government Area (LGA) of Ogun State, Nigeria. The design was considered suitable because it enabled the researcher to describe existing conditions and determine the nature of relationships among variables without manipulation.

### Population and Sample

The population comprised all senior secondary school students in Odeda LGA. A total of 120 students were selected from eight secondary schools using stratified and simple random sampling techniques to ensure equal representation of male and female students across different school types. Fifteen students were drawn from each school, yielding a total sample of 120 participants.

### Instruments

Three instruments were used: the Students' Perception of Classroom Environment Questionnaire (SPCEQ), the Mathematics Self-Efficacy and Achievement Scale (MSEAS), and the Mathematics Achievement Test (MAT). The SPCEQ (Section B) contained statements measuring perceptions of classroom climate focusing on teacher support, peer interaction, rule clarity, and organization, rated on a four-point Likert scale (Strongly Agree = 4 to Strongly Disagree = 1). The MSEAS measured students' confidence, persistence, motivation, and perceived competence in mathematics, also on a four-point Likert scale. The MAT was a 10-item objective test developed from the Senior Secondary School Mathematics Curriculum, assessing algebra, geometry, and statistics using a table of specification to ensure balanced cognitive coverage.

### Validity and Reliability

All instruments were subjected to content validation by experts in mathematics education and measurement and evaluation. Reliability was assessed through the test-retest method administered to a pilot group outside the main sample, with a two-week interval. The correlation coefficients obtained were: SPCEQ ( $r = 0.82$ ), MSEAS ( $r = 0.79$ ), and MAT (KR-20 = 0.74), all meeting the minimum reliability threshold of  $r \geq 0.70$ , thereby demonstrating satisfactory consistency and stability.

### Data Collection Procedure

Permission to conduct the study was obtained from school authorities. The researcher personally administered the instruments with the assistance of mathematics teachers during regular school hours. Completed instruments were retrieved immediately to ensure high response rates.

### Data Analysis

Data were analyzed using descriptive and inferential statistics. Frequency counts and percentages were used to describe demographic information. Mean scores and standard deviations were computed to answer the research questions. Pearson Product-Moment Correlation was used to test the hypotheses at the 0.05 level of significance. Although the study involved 120 students, the correlation analysis was conducted using school-level mean scores from the eight participating schools ( $N = 8$ ). Therefore, the findings should be interpreted cautiously because the small number of school-level units may limit statistical power.

### Ethical Considerations

Ethical approval was secured from relevant authorities before commencement. Participation was voluntary, and respondents were assured of confidentiality.

## RESULT AND DISCUSSION

### Result

#### Demographic Data

A total of 120 students from eight secondary schools participated. [Table 1](#) shows that 53.3% of respondents were male ( $n = 64$ ) and 46.7% female ( $n = 56$ ), indicating a slightly higher proportion of male students. As shown in [Table 2](#), most participants (51.7%) were aged 11–15 years, 45.8% were aged 16–20 years, and 2.5% were aged 21–25 years old, reflecting the typical composition of senior secondary school students in Nigeria.

**Tabel 1.** Gender Distribution of Participants

GENDER	FREQUENCY	PERCENTAGE (%)
Male	64	63.3

GENDER	FREQUENCY	PERCENTAGE (%)
Female	56	46.7
Total	120	100

**Tabel 2.** Age Distribution of Participants

AGE	FREQUENCY	PERCENTAGE (%)
11 years – 13 years	62	51.7
16 years – 20 years	55	45.8
21 years – 25 years	3	2.5
TOTAL	120	100

*Students' Perception of Classroom Climate*

Table 3 presents students' mean responses to items on the *Students' Perception of Classroom Environment Questionnaire (SPCEQ)*. Most students agreed that their classrooms were adequately ventilated ( $M = 3.14$ ), had enough seats ( $M = 3.22$ ), and were well arranged ( $M = 3.33$ ). They also agreed that the classrooms were spacious ( $M = 3.03$ ) and free from distractions ( $M = 2.66$ ). Conversely, they disagreed that teachers frequently used instructional materials ( $M = 2.11$ ) or displayed learning charts ( $M = 1.92$ ).

**Tabel 3.** Students' Perception of Classroom Climate (N = 120)

No	Item	Mean	SD	Remark
1	There is enough ventilation in the mathematics classroom.	3.14	0.24	Agreed
2	The classroom has enough seats and desks for every student.	3.22	0.24	Agreed
3	Good seating arrangement makes mathematics learning interesting.	3.33	0.25	Agreed
4	The classroom has enough space for students to display their talents.	3.03	0.23	Agreed
5	One can clearly see the board from the back seat.	2.98	0.22	Agreed
6	Teachers come to class with instructional materials.	2.11	0.22	Disagreed
7	There are charts hung on the wall to enhance learning.	1.92	0.23	Disagreed
8	The mathematics class is free from distractions.	2.66	0.23	Agreed

Source: Field Survey (2025)

These results show that although the physical setting of most classrooms was conducive, the limited use of teaching aids and visual materials may reduce instructional richness consistent with Çelik et al. (2024), who observed that environmental comfort alone seldom enhances learning engagement.

*Hypothesis One*

$H_{01}$ : There is no significant relationship between classroom climate and students' self-efficacy in mathematics.

The Pearson correlation results in Table 4 showed that the calculated correlation coefficient ( $r = -0.37$ ) was lower than the critical value ( $r\text{-table} = 0.707$ ,  $df = 6$ ) at the 0.05 level of significance. Therefore, the null hypothesis was retained, indicating that there was no statistically significant relationship between classroom climate and students' self-efficacy in mathematics ( $p > 0.05$ ).

**Tabel 4.** Pearson Correlation Between Classroom Climate and Students' Self-Efficacy in Mathematics

Variable	N	Mean	SD	r-cal	r-table
Classroom Environment Perception	8	80.00	25.6	-0.37	0.707
Self-Efficacy	8	41.25	25.9		

Source: Field Survey (2025)

The finding implies that students' perceptions of a favorable classroom environment did not necessarily correspond to higher mathematics self-efficacy. As Bandura (1986) noted, self-efficacy develops primarily through mastery experiences and reinforcement rather than environmental comfort alone.

*Hypothesis Two*

$H_{02}$ : There is no significant relationship between classroom climate and students' achievement in mathematics.

As shown in Table 5, the calculated correlation coefficient ( $r = -0.21$ ) is lower than the critical value ( $r\text{-table} = 0.707$ ,  $df = 6$ ) at the 0.05 level of significance. Therefore, the null hypothesis is retained. This indicates that classroom climate has no statistically significant relationship with students' mathematics achievement ( $r = -0.21$ ,  $p > 0.05$ ).

**Table 5. Pearson Correlation Between Classroom Climate and Students' Achievement in Mathematics**

Variable	N	Mean	SD	r-cal	r-table
Classroom Environment Perception	8	62.00	3.3	-0.21	0.707
Achievement Test	8	58.00	3.5		

Source: Field Survey (2025)

Although mean differences were small, students who perceived their classroom climate more positively tended to perform slightly better, suggesting an indirect emotional or motivational influence that did not reach statistical significance.

## Discussion

Overall, results indicate that while mathematics classrooms were physically conducive adequately ventilated, well-seated, and orderly there was no statistically significant relationship between classroom climate and either self-efficacy or achievement. Environmental adequacy contributed to learning satisfaction but was insufficient to enhance cognitive or affective outcomes.

This contrasts with findings by Çelik et al. (2024) and Riaz & Asad (2018), who reported that classroom climate significantly predicted achievement when teacher support and socio-emotional interaction were strong. In the current context, the homogeneity of school facilities and teacher-centered pedagogy likely reduced variance in learning experiences, as also observed by Özgen and Bindak (2011).

According to Bandura's Social Cognitive Theory (1986), self-efficacy derives from mastery experiences, vicarious learning, social persuasion, and physiological states. Students in this study may not have received sufficient mastery experiences or reinforcement to translate environmental comfort into self-belief. Similarly, the absence of instructional materials and interactive pedagogy (as indicated by low mean scores for items 6 and 7) may have restricted engagement.

From a broader perspective, these results underscore the importance of teacher quality and instructional design in mediating the effects of classroom climate. Research emphasizes that affective atmosphere alone is not enough; effective teachers transform physical spaces into active learning contexts through dialogue, feedback, and collaboration (Fajemidagba et al., 2012). In line with Bronfenbrenner's (1979) Ecological Systems Theory, the school environment interacts with family and community contexts to shape students' achievement trajectories.

Thus, interventions should focus on enhancing pedagogical practices rather than solely improving infrastructure. Teachers should arrange seating for group tasks, use visual aids, and provide constructive feedback to strengthen students' self-efficacy. Policymakers should pair facility upgrades with teacher professional development to build classrooms that are not only comfortable but also motivational and interactive. Future studies could extend this research through mixed methods designs to capture the qualitative dimensions of classroom interaction and student engagement.

## Limitations

This study has several limitations that should be considered when interpreting its findings. First, the sample was drawn from a single LGA (Odeda, Ogun State), which restricts the generalizability of findings to other Nigerian contexts. Second, the unit of analysis for the correlation (school-level means,  $N = 8$  or  $10$ ) results in low statistical power and an elevated risk of Type II error. Third, both the SPCEQ and MSEAS are self-report instruments, which may be susceptible to social desirability bias. Fourth, potential confounding variables such as teacher experience, years of teaching, and students' socioeconomic status were not controlled for, which may have attenuated the observed relationships.

## CONCLUSION

This study investigated the impact of classroom climate on students' self-efficacy and achievement in senior secondary school mathematics in Odeda Local Government Area, Ogun State, Nigeria. The findings revealed that although most classrooms were physically conducive adequately ventilated, well arranged, and spacious there was no statistically significant relationship between classroom climate and either self-efficacy or achievement. This suggests that classroom comfort alone may enhance students'

satisfaction but does not necessarily translate into improved mathematics performance. In accordance with Bandura's Social Cognitive Theory, students' self-efficacy and achievement depend more on mastery experiences, feedback, and teaching quality than on environmental factors alone. A positive classroom climate provides a supportive foundation, but must be complemented by interactive teaching, motivational reinforcement, and consistent academic feedback to yield meaningful learning gains.

Based on these findings, it is recommended that: (1) teachers adopt learner-centered and motivational strategies that foster collaboration, engagement, and constructive feedback; (2) administrators provide adequate instructional resources such as teaching aids and visual materials; (3) professional development programs equip teachers with skills to integrate emotional, physical, and instructional dimensions of classroom climate into their practice; and (4) policymakers balance infrastructural development with capacity-building initiatives. Future research should employ mixed-methods or longitudinal designs to explore the qualitative dimensions of classroom climate including teacher–student rapport, emotional safety, and peer support and may examine moderators such as gender, socioeconomic background, and prior mathematics experience.

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