Classroom Environment and Academic Achievement: A Comparative Study of Secondary Schools in Urban Sindh, Pakistan

Dr. Nazia Dharejo
naziadharejo@gmail.com
Lecturer Dept. of Commerce, University of Mirpurkhas, Mirpurkhas–Pakistan

Dr. Dahshilla Junejo
dahshilla@usindh.edu.pk
Assistant Professor Dept. of Commerce, University of Mirpurkhas, Mirpurkhas-Pakistan

Zakir Hussain Malkani
Lecturer, Dept. of Business Administration, FG Degree College for (M) Peshawar Cantt

Dr. Hakim Ali Mahesar
Professor, Institute of Commerce & Managment, University of Sindh, Jamshoro, Sindh, Pakistan
Corresponding Author: *Dr. Nazia Dharejo naziadharejo@gmail.com

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ABSTRACT

This study investigates the influence of classroom environments on the academic achievement of secondary school students in four major urban centers of Sindh, Pakistan: Karachi, Hyderabad, Sukkur, and Mirpurkhas. Utilizing a quantitative, descriptive-correlational design, data were collected from 400 students through a structured questionnaire adapted from the Classroom Environment Scale (CES). The analysis revealed significant positive correlations between academic performance and three key dimensions of classroom environment physical infrastructure, psychological climate, and instructional resources. Among these, psychological factors such as teacher-student relationships and peer interaction exhibited the strongest influence. ANOVA results further indicated significant inter-city differences, with students in Karachi and Hyderabad reporting more favorable environments than those in Sukkur and Mirpurkhas. The findings highlight the role of localized classroom conditions in influencing educational outcomes and advocate for targeted interventions and policy reforms tailored to the diverse educational landscapes of Sindh.

Keywords: *Classroom Environment; Academic Achievement; Secondary Education; Urban Sindh; Educational Psychology; Learning Resources; School Infrastructure; Student Performance; Pakistan Education; Comparative Study*

INTRODUCTION

The classroom environment significantly impacts students' academic performance, cognitive development, and overall learning experience. This study explores how factors like classroom structure, teacher behavior, learning resources, and psychological climate affect secondary students in Sindh. As academic achievement is a crucial indicator of educational success, understanding its relationship with environmental variables is vital for policy reform and educational enhancement. At every educational level, the classroom atmosphere has a significant impact on how students experience and perform academically. It encompasses a wide array of physical, psychological, and instructional elements that collectively influence student learning, engagement, motivation, and achievement (Fraser, 1998; Earthman, 2004). An effective classroom environment fosters positive interactions, supports cognitive

development, and provides the necessary resources and infrastructure to facilitate learning. Conversely, poorly structured environments can hinder student performance, reduce motivation, and exacerbate educational disparities.

Globally, extensive research has demonstrated a strong relationship between classroom environment and academic achievement. For example, studies in both developed and developing countries have shown that factors such as classroom layout, lighting, ventilation, teacher-student relationships, and access to learning materials significantly affect students' academic success (Barrett et al., 2015; Cohen et al., 2009). However, these findings are often context-specific and may not fully capture the socio-cultural and institutional complexities present in different regions. In Pakistan, and particularly in the province of Sindh, the educational landscape is marked by vast disparities in infrastructure, teacher training, and resource allocation between urban and rural areas, and even among urban centers themselves (Shah & Soomro, 2020). Despite the availability of global literature on the subject, there remains a notable gap in localized empirical research examining how classroom environments affect academic outcomes within Sindh's urban context. This gap is particularly pronounced in major cities such as Karachi, Hyderabad, Sukkur, and Mirpurkhas, where educational settings differ significantly in terms of student demographics, institutional governance, and resource availability (Ali & Rizvi, 2021; Baloch & Qureshi, 2022).

Karachi, as the largest metropolis in Pakistan, hosts a diverse mix of public and private secondary schools with varying levels of infrastructural quality and academic performance. Hyderabad, an important educational hub, similarly features a wide spectrum of schooling environments but lacks systematic empirical studies on their effectiveness. Sukkur and Mirpurkhas, though smaller, are experiencing rapid urban growth and increased educational demand, yet there is little published research on their secondary education systems (Ahmed, 2019). Given the socio-economic, cultural, and infrastructural variations across these cities, there is a pressing need for a comparative investigation that assesses how classroom environments influence academic performance in secondary schools. By filling this research gap, the present study aims to generate evidence-based insights that can inform educational policy, school management practices, and targeted interventions across urban Sindh.

LITERATURE REVIEW

Previous studies have confirmed that a supportive and resourceful classroom environment positively correlates with academic success (Fraser, 2015). Researchers such as Barry and King (1998) emphasized that a physically safe and emotionally supportive classroom enhances student motivation. In Pakistan, limited studies like those by Khan and Iqbal (2017) addressed environmental factors, highlighting lack of infrastructure and overcrowded classrooms as barriers to learning. The literature consistently reflects that well-managed classrooms with adequate teaching aids, disciplined routines, and cooperative learning environments foster improved academic outcomes.

Understanding the Classroom Environment

The classroom environment refers to the physical, psychological, and instructional conditions in which students learn. It encompasses factors such as classroom layout, lighting, teacher behavior, peer relationships, teaching materials, and overall school infrastructure (Fraser, 1998). These environmental factors significantly influence students' cognitive, emotional, and behavioral engagement (Moos, 1979). Based on the study of Bronfenbrenner's ecological systems theory, the microsystem—where classroom interactions occur—is a primary determinant of academic and social development (Bronfenbrenner, 1979).

Physical Environment and Student Achievement

The physical aspects of the classroom, including lighting, ventilation, classroom size, seating arrangement, and noise levels, have a profound impact on student learning. Earthman (2004) emphasized that inadequate physical environments can lead to increased stress, decreased concentration, and ultimately lower academic performance. In a large-scale study, Barrett et al. (2015) found that well-designed physical learning environments accounted for 16% of variation in student achievement. In the context of Pakistan, deteriorating school infrastructure, particularly in urban public schools, is a critical issue. A study by Shah and Soomro (2020) in Hyderabad found that many schools lacked proper furniture, ventilation, and sanitation, adversely affecting students' academic outcomes.

Psychological and Social Climate in Classrooms

The psychological classroom climate includes interpersonal relationships, emotional safety, and the overall sense of belonging students feel within the classroom. Fraser and Walberg (2005) observed that a positive psychological environment enhances student motivation and academic performance. A supportive teacher-student relationship is particularly important in influencing student involvement, especially in adolescence (Wang & Holcombe, 2010). In Pakistani urban schools, classroom culture often reflects rigid hierarchies and limited interaction, which can suppress student voice and creativity (Ali & Rizvi, 2021). Creating emotionally safe, inclusive, and communicative classroom spaces is therefore essential.

Instructional Environment and Pedagogical Support

The instructional environment refers to the quality and type of teaching methods, availability of resources, and the curriculum used. Fraser (2015) highlighted that students in resource-rich classrooms with diverse learning aids perform significantly better. The use of active learning strategies, timely feedback, and access to updated textbooks and digital tools supports deeper learning (Cohen et al., 2009). However, many schools in Sindh, particularly public schools, rely on rote-based learning, outdated materials, and minimal use of ICT, leading to disengagement and poor learning outcomes (Ahmed, 2019). Moreover, the lack of teacher professional development contributes to ineffective instructional delivery.

Empirical Insights from International and National Studies

International research across different education systems consistently validates the bond between classroom environment and student outcomes. For instance, in South Korea, Lim and Lee (2013) demonstrated that students in interactive, emotionally safe environments showed higher performance in STEM subjects. In contrast, students in poorly managed classrooms in Kenya faced significantly lower academic gains (Oketch & Rolleston, 2007).

In Pakistan, empirical evidence is slowly growing. A study by Baloch and Qureshi (2022) in Mirpurkhas found that the absence of teacher training, inadequate classrooms, and weak administrative structures contributed to poor academic performance in secondary schools. Similarly, Ali and Rizvi (2021) reported that even in high-performing schools in Karachi, disparities in the physical and instructional environment were evident between private and public institutions.

Literature Gap in the Urban Sindh Context

Despite the growing evidence, there is a clear shortage of localized, comparative research on the classroom environment in urban centers of Sindh. Karachi, Hyderabad, Sukkur, and Mirpurkhas represent distinct urban identities with varying socio-economic, cultural, and educational characteristics, yet there has been no comprehensive study comparing these cities in terms of classroom environment and its influence on student achievement. Existing studies tend to focus on either infrastructure (Shah & Soomro, 2020) or curriculum-related challenges (Ahmed, 2019) but do not offer a multidimensional or comparative analysis. This gap warrants an in-depth investigation that considers all key components of the classroom environment across these diverse urban settings.

Research Gap

While extensive body of global literature exists on the relationship between classroom environments and academic performance (Fraser, 2015), there remains a significant dearth of localized research in Sindh. Major cities such as **Karachi** the largest and most diverse educational hub in Pakistan host a wide range of public and private schools, yet very few empirical studies explore how classroom environments impact student outcomes in this context (Ali & Rizvi, 2021). Similarly, **Hyderabad**, known for its concentration of secondary and tertiary educational institutions, lacks robust investigations into classroom conditions and their effects on learning (Shah & Soomro, 2020). **Sukkur**, despite being home to several notable institutions, suffers from limited research concerning environmental factors in secondary education settings (Ahmed, 2019). In **Mirpurkhas**, educational infrastructure is gradually expanding, yet scholarly work analyzing classroom dynamics remains scarce (Baloch & Qureshi, 2022). The unique socio-political and economic landscape of Sindh necessitates region-specific inquiry to inform effective educational strategies. Currently, no comprehensive empirical study addresses these dynamics at the secondary school level in Karachi, Hyderabad, Sukkur, or Mirpurkhas.

Research Objectives

1. **To examine the current classroom environmental conditions** (physical, psychological, and instructional) in secondary schools across key urban centers of Sindh, including Karachi, Hyderabad, Sukkur, and Mirpurkhas.

2. **To evaluate the impact of various classroom environmental factors** such as infrastructure, teacher-student interaction, and availability of learning resources on the academic performance of students studying at secondary level in these cities.

3. **To identify regional disparities** in classroom environments among the selected cities and how these differences influence student outcomes.

4. **To provide evidence-based recommendations** for improving classroom environments in Sindh's secondary schools to enhance educational quality and student achievement.

Research Hypotheses

Based on the research objectives and identified gaps in localized educational research in Sindh, the following hypotheses have been formulated:

- **H_1:** There is a statistically significant relationship between classroom environmental conditions and the academic performance of secondary school students in Karachi, Hyderabad, Sukkur, and Mirpurkhas.

- **H_2:** Physical infrastructure factors within the classroom environment (e.g., lighting, ventilation, and seating arrangement) significantly influence students' academic achievement across the selected urban centers.

- **H_3:** Psychological aspects of the classroom environment such as teacher-student interaction and peer relationships have a positive and significant effect on student academic performance.

- **H_4:** The presence and effective use of instructional resources (e.g., textbooks, multimedia, teaching aids) are significantly correlated with higher academic achievement among secondary school students in Sindh.

- **H_5:** There are notable inter-city differences in the quality of classroom environments and their corresponding effects on academic performance among students in Karachi, Hyderabad, Sukkur, and Mirpurkhas.

RESEARCH METHODOLOGY

This study adopts a **quantitative, descriptive-correlational research design** aimed at examining the relationship between classroom environmental factors and academic achievement among secondary school students. The design allows for the analysis of patterns, relationships, and statistical associations without manipulating variables. The target population comprises **secondary school students (grades 9 and 10)** from both public and private schools in **four major cities of Sindh: Karachi, Hyderabad, Sukkur, and Mirpurkhas**. A **stratified random sampling technique** was used to ensure representation from each city and school type. A total of **400 students** were selected (100 from each city), balancing gender and institutional diversity.

Research Instrument

A structured questionnaire based on Fraser's (1998) modified Classroom Environment Scale (CES) was used to gather data. A 5-point Likert scale, with 1 denoting strongly disagree and 5 denoting strongly agree, was employed in the survey. There were three main parts to the questionnaire:

1. **Physical Environment**: Seating, lighting, ventilation, space utilization.

2. **Psychological Environment**: Teacher behavior, peer interaction, student motivation.

3. **Instructional Environment**: Availability and use of teaching aids, learning resources, assessment strategies.

Validity and Reliability

Content validity was established through expert review by education researchers and practitioners. A pilot study was conducted with 40 students (10 from each city), yielding a **Cronbach's alpha of 0.86**, indicating high internal consistency.

Data Collection Procedure

Permission was obtained from the respective school administrations and ethical consent was secured from students and their guardians. Questionnaires were administered in person under supervision to ensure clarity and honest responses.

DATA ANALYSIS

Statistical Package for the Social Sciences (SPSS) Version 26 was used to analyze the data. Responses were compiled using descriptive statistics (mean, standard deviation). To test hypotheses and ascertain the degree and importance of correlations between variables, inferential statistics such as the **Pearson correlation coefficient, t-tests,** and **ANOVA** were utilized. The results of the data analysis of the structured questionnaire that was given to 400 secondary school students in Karachi, Hyderabad, Sukkur, and Mirpurkhas are shown in this part. SPSS version 26 was used for the analysis.

Descriptive Statistics

Descriptive statistics were used to summarize responses for the three key dimensions of the classroom environment:

Variable	Mean	Standard Deviation
Physical Environment	3.72	0.64
Psychological Environment	3.88	0.58
Instructional Environment	3.65	0.61
Academic Performance (Self-reported GPA)	3.45	0.68

The results indicate that students generally perceive their classroom environments as moderately positive, particularly in terms of psychological aspects such as teacher support and peer collaboration.

Inferential Statistics (Correlation Analysis)

Pearson correlation was used to test the relationship between classroom environment components and academic performance:

Variable	Correlation with Academic Performance (r)	Significance (p)
Physical Environment	0.42	< 0.01
Psychological Environment	0.51	< 0.01
Instructional Environment	0.47	< 0.01

The results show a **moderate to strong positive correlation** between all classroom environment factors and academic performance. The psychological environment has the highest correlation, suggesting its particularly strong influence.

ANOVA Analysis

ANOVA was conducted to examine whether there were significant differences among cities regarding the perceived quality of classroom environments:

Variable	F-Value	p-Value
Classroom Environment	4.89	0.003

The ANOVA results confirm a **statistically significant difference ($p < 0.05$)** in classroom environment quality among Karachi, Hyderabad, Sukkur, and Mirpurkhas. Post-hoc analysis revealed that Karachi and Hyderabad scored higher than Sukkur and Mirpurkhas in all three dimensions. These findings support all five research hypotheses and provide strong evidence of the impact of classroom environments on academic achievement across different urban centers in Sindh.

CONCLUSION

This study focused at how classroom environment affected secondary school students' academic achievement in Karachi, Hyderabad, Sukkur, and Mirpurkhas, four cities of Sindh province. The results showed a statistically significant positive correlation between students' academic performance and the instructional, psychological, and physical elements of classroom environments. Among these, the psychological environment characterized by teacher support, positive peer relationships, and student motivation emerged as the most influential factor.

Additionally, the study highlighted regional disparities in classroom conditions, with students from Karachi and Hyderabad reporting more favorable environments compared to those in Sukkur and Mirpurkhas. These results underscore the importance of context-specific interventions aimed at enhancing educational environments across Sindh.

RECOMMENDATIONS

Based on the findings, the following recommendations are proposed:

1. **Invest in Classroom Infrastructure**: Provincial education authorities and school management should prioritize improvements in physical facilities such as lighting, seating, and ventilation, particularly in under-resourced schools in Sukkur and Mirpurkhas.

2. **Enhance Teacher-Student Interaction**: Professional development programs should be organized to train teachers in fostering supportive, inclusive, and motivational classroom climates.

3. **Ensure Equitable Distribution of Learning Resources**: Government and private stakeholders must ensure all schools are adequately equipped with up-to-date instructional materials, including digital tools, textbooks, and teaching aids.

4. **Develop City-Specific Education Strategies**: Policies should be tailored to address the unique needs and limitations of each city, recognizing the disparities in classroom conditions and access to resources.

5. **Promote Student-Centered Learning Environments**: Schools should adopt pedagogical practices that actively engage students, promote collaboration, and encourage critical thinking.

Ethical Considerations

This study was conducted with a strong commitment to ethical research practices. The official clearance obtained from administrations of the schools, before any data was collected. All participants gave their informed consent, as the case of minors guardians' permission obtained. Participants received guarantees that their **participation was entirely voluntary**, that their answers would be kept **private**, and that they could **leave at any moment** without incurring any **penalty**. All data collected were anonymized and used solely for academic purposes.

Limitations of the Study

Despite its contributions, this study acknowledges several limitations:

1. **Geographical Scope**: The study focused on four urban centers in Sindh, which may limit generalizability to rural or remote areas.

2. **Self-Reported Academic Performance**: Data on academic achievement were based on students' self-reported GPAs, which may introduce reporting bias.

3. **Cross-Sectional Design**: The study used a cross-sectional design, which identifies associations but not causality between variables.

4. **Single Stakeholder Perspective**: The perspectives of teachers, school administrators, and parents were not included in this phase of the study.

Suggestions for Future Research

To build upon the findings of this study, the following future research directions are recommended:

1. **Expand to Rural Contexts**: Future studies should investigate classroom environments in rural districts of Sindh to understand broader provincial trends.

2. **Include Multiple Stakeholders**: Incorporating teachers' and parents' perspectives would offer a more holistic view of the classroom environment.

3. **Use of Longitudinal Designs**: A longitudinal approach could better capture changes over time and identify causal relationships.

4. **Intervention-Based Studies**: Future research could implement and evaluate specific strategies to improve classroom environments and monitor their impact on academic outcomes.

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