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A Framework for Healthy and Sustainable Learning Spaces: Linking Materiality, Indoor Environmental Quality (Ieq), And Student Well-Being in Caleb University, Lagos State, Nigeria

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Abstract- ***The quality of the physical learning environment has a significant influence on students' comfort, health, and academic performance. This study investigated the relationship between building material quality, Indoor Environmental Quality (IEQ), and student well-being at Caleb University, Imota, Lagos State, Nigeria. A cross-sectional survey design was adopted, and data were collected using a structured questionnaire that assessed students' perceptions of thermal comfort, acoustic conditions, lighting quality, and the quality of building materials within their learning spaces. The data were analysed using descriptive statistics, Pearson Product-Moment Correlation, and multiple regression analysis. The findings revealed that a substantial proportion of students experienced environmental challenges within their classrooms. Specifically, 46.0% reported thermal discomfort, while 46.7% indicated that noise and poor acoustic conditions negatively affected their learning experience. The correlation analysis showed a strong positive relationship between indoor environmental quality and students' well-being ($r = .712$, $p < .001$), suggesting that improved indoor conditions enhance concentration and overall well-being. Multiple regression analysis further identified building material quality as the strongest predictor of student well-being ($\beta = .663$, $t = 16.677$, $p < .001$), indicating that the quality of construction materials plays a critical role in creating supportive learning environments. The study concludes that improving both building material quality and indoor environmental conditions can significantly enhance students' well-being and learning experiences. These findings provide useful evidence for architects, educational administrators, and policymakers involved in the planning, design, and management of sustainable educational facilities, particularly in tropical regions.***

Keywords: Healthy Learning Spaces, Sustainable Learning Environments; Building Materials, Indoor Environmental Quality (IEQ), Student Well-Being, Caleb University.

I. INTRODUCTION

1.1 Background of Study

Learning environments are more than physical spaces for academic instruction; they function as complex environmental systems that influence students' health, comfort, cognitive performance, and academic outcomes.

In higher education institutions, students spend a significant portion of their daily lives within lecture halls, studios, and other indoor learning spaces. This makes the quality of these environments a critical factor in educational success.

Recent research has increasingly emphasized the importance of Indoor Environmental Quality (IEQ) as a determinant of learning performance. IEQ encompasses thermal comfort, indoor air quality, lighting conditions, and acoustic performance, all of which interact to shape students' comfort and ability to concentrate (Al Horr et al., 2023; Wargocki & Wyon, 2023; Mendell & Heath, 2023).

The responses reveal that poor indoor conditions reduce cognitive performance, increase fatigue, and negatively affect student satisfaction (Li & Mak, 2023; Park & Yoon, 2023).

In addition to environmental conditions, building materiality plays an important role in shaping indoor

experiences. Materials influence thermal regulation, air quality, lighting reflection, and acoustic absorption, thereby directly affecting how learning spaces perform environmentally (Sarbu & Sebarchievici, 2023; Ruparathna et al., 2023).

Sustainable educational buildings in Nigeria continue to face challenges related to cost-driven design decisions and limited environmental optimization (Olukolajo & Oloyede, 2024).

In many developing countries, including Nigeria, educational buildings are often designed with emphasis on cost reduction rather than long-term environmental performance. This frequently results in learning environments that do not fully support optimal comfort conditions (Oluwatayo & Amole, 2024; Oguntona, 2024).

Students are therefore exposed to thermal discomfort, poor air circulation, inadequate lighting, and noise disturbances, all of which reduce learning effectiveness (Asaju et al., 2024; Nja et al., 2023).

1.2 Statement of the Problem

Despite increasing awareness of sustainability in architecture, many university learning spaces in Nigeria still exhibit poor Indoor Environmental Quality.

Common issues include inadequate ventilation, excessive heat, poor lighting, and high noise levels, all of which negatively affect student comfort and academic performance (Asaju et al., 2024; Nja et al., 2023; Choi & Guerin, 2023).

Furthermore, building material selection in many educational facilities is still largely driven by cost rather than environmental performance, resulting in spaces that are not fully supportive of learning (Sarbu & Sebarchievici, 2023; Ruparathna et al., 2023).

Sustainable school environments have been shown to provide long-term benefits in productivity, health, and operational efficiency (Kats, 2023).

Although several studies have explored IEQ and student performance separately, fewer studies have examined how materiality and IEQ interact to influence student well-being as a combined system. This creates a gap in knowledge that limits the development of integrated design strategies for healthier learning environments.

1.3 Aim of Study

The aim of this study is to examine the relationship between building materiality, Indoor Environmental Quality (IEQ), and student well-being in Caleb University, Lagos State, with a view to developing a framework for healthy and sustainable learning environments.

1.4 Objectives of the Study

The following are the objectives of this research study:

1. Assess the condition of building materiality and Indoor Environmental Quality in selected learning spaces at Caleb University.
2. Examine the influence of building materials on students' comfort, health, and well-being.
3. Evaluate the effects of IEQ components (thermal comfort, ventilation, lighting, and acoustics) on student well-being and concentration.
4. Determine the relationship between building materiality, Indoor Environmental Quality, and student well-being.
5. Develop a framework for improving healthy and sustainable learning environments in higher education institutions.

1.5 Research Questions

The research questions that will govern this study include:

1. What is the current condition of building materiality and Indoor Environmental Quality in Caleb University learning spaces?
2. How does building materiality influence students' comfort, health, and well-being?
3. How do Indoor Environmental Quality parameters affect students' concentration and academic performance?
4. What relationship exists between materiality, IEQ, and student well-being?
5. What framework can be developed to improve healthy and sustainable learning environments?

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1.6 Scope of the Study

This study focuses on selected learning spaces within Caleb University, Imota, Lagos State, Nigeria. It examines students' perceptions of building material quality and key Indoor Environmental Quality parameters, including thermal comfort, ventilation, lighting, and acoustics.

The study is limited to undergraduate students and relies on questionnaire-based data. It does not include direct physical measurements such as temperature or air quality.

1.7 Significance of the Study

This study contributes to sustainable learning environments by integrating IEQ and materiality in university design.

It provides insights for architects, policymakers, and educational administrators on how learning environments influence student well-being and performance (Al Horr et al., 2023; Wargocki & Wyon, 2023; Li & Mak, 2023).

The economic implications of sustainable building design highlight the long-term benefits of investing in environmental quality in infrastructure (Stern, 2023).

1.8 Study Area

The study was conducted at Caleb University, Imota, Lagos State, Nigeria. The university operates within a tropical climate characterized by high temperatures, humidity, and strong solar radiation.

These conditions make thermal comfort and ventilation critical aspects of building performance. Caleb University provides a suitable case study due to its diverse academic buildings with varying architectural and environmental characteristics.

Figure 1.10.1; Showing the Location Map of Caleb University, Imota Lagos Nigeria

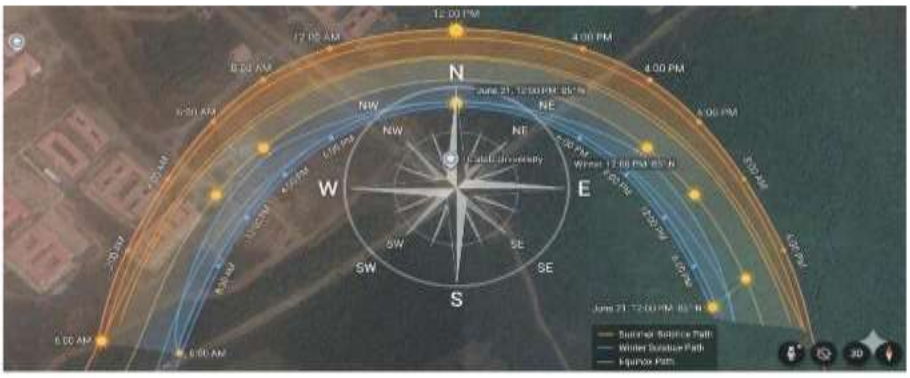

Figure 1.10.2: Sun Path Diagram

II. LITERATURE REVIEW

2.1 Conceptual Review

2.1.1 Indoor Environmental Quality (IEQ)

Indoor Environmental Quality (IEQ) refers to the combined effects of thermal comfort, indoor air quality, lighting, and acoustics within a built environment. These environmental factors collectively determine the level of comfort, health, and productivity experienced by building occupants. According to Tham (2024), maintaining good indoor environmental quality is essential for protecting occupants' physical and psychological well-being. Similarly, Klepeis and Nazaroff (2023) noted that healthy indoor environments contribute significantly to improved health outcomes and overall building performance.

Within educational settings, indoor environmental quality is particularly important because students spend long hours in classrooms and other learning spaces. A conducive indoor environment enhances concentration, supports cognitive functioning, and improves learning outcomes. Wargocki and Wyon (2023) observed that favourable thermal conditions, effective ventilation, and good indoor air quality enhance students' ability to concentrate during academic activities. Likewise, Mendell and Heath (2023) reported that classrooms with better indoor environmental conditions promote higher levels of cognitive performance and learning effectiveness. In the Nigerian context, Akande et al. (2026) emphasized that improving ventilation and maintaining acceptable indoor environmental conditions are necessary for creating healthier university learning environments.

Indoor environmental quality is widely recognised as a multidimensional concept. De Giuli et al. (2023) and Al Jumaili and Sabbagh (2024) explained that it comprises thermal comfort, indoor air quality, visual comfort, and acoustic conditions, all of which interact to influence occupants' health, comfort, and learning experience. Rather than acting independently, these environmental factors work together to determine the overall quality of the indoor environment.

Several studies have also linked indoor environmental quality to occupants' productivity and psychological well-being. Owolabi, Ajayi, and Daramola (2025) found that improved indoor environmental conditions enhance productivity in educational and innovation spaces. Similarly, Owolabi et al. (2025) reported that good indoor environmental quality contributes to better mental well-being and helps reduce stress among building occupants.

Poor indoor environmental conditions have been associated with fatigue, reduced attention span, discomfort, and lower academic performance. According to Sarbu and Sebarchievici (2023), sustainable buildings should integrate indoor environmental quality principles from the design stage to ensure occupants' comfort and satisfaction. Supporting this view, Nazaroff (2023) emphasized that maintaining good indoor air quality is essential for protecting occupants' health and improving cognitive performance in educational buildings.

Lighting also plays an important role in creating effective learning environments. Heschong (2023) reported that adequate daylighting improves students' visual comfort and academic performance by providing better illumination for learning activities. In addition, advances in building technology have made it possible to improve indoor environmental quality through intelligent building management systems. Sinopoli (2023) explained that smart building systems can automatically regulate lighting, ventilation, and temperature to maintain comfortable indoor conditions and improve occupants' overall experience.

2.1.2 Building Materiality in Learning Environments

Building materiality refers to the physical characteristics and qualities of the materials used in the construction and finishing of buildings, including walls, floors, ceilings, roofs, windows, and other internal and external surfaces. The choice of these materials influences not only the structural performance and appearance of a building but also the quality of the indoor environment experienced by its occupants.

The selection of appropriate building materials plays an important role in determining thermal comfort, lighting performance, acoustic quality, and indoor air quality within educational buildings. Materials with

poor thermal properties may contribute to excessive heat gain, while inappropriate surface finishes can increase glare, reduce acoustic comfort, or negatively affect indoor air quality. Consequently, poor material selection can lead to overheating, noise-related distractions, discomfort, and reduced learning efficiency (Oluwatayo & Amole, 2024; Okunlola & Ibitoye, 2026).

In recent years, sustainable building materials have received considerable attention because of their contribution to healthier and more environmentally responsible buildings. Kats (2023) also noted that the use of sustainable building materials contributes to healthier educational environments while reducing long-term operational costs. According to Ruparathna et al. (2023), the use of sustainable materials improves environmental performance, enhances energy efficiency, and reduces the environmental impact of buildings throughout their life cycle. Such materials also support the creation of healthier indoor environments by improving thermal performance and reducing the emission of harmful pollutants.

In educational facilities, the quality and durability of building materials directly influence students' comfort and overall learning experience. Well-selected materials contribute to a more comfortable indoor environment by maintaining stable temperatures, reducing unwanted noise, and improving the overall quality of learning spaces. For this reason, building material selection should be considered an essential aspect of designing healthy and sustainable educational environments.

2.1.3 Student Well-being in Learning Spaces

Learning environments are increasingly recognized as complex systems that influence academic performance, health, and spatial experience (Gislason, 2023). Student well-being refers to physical, emotional, and psychological comfort within learning environments. It includes stress levels, satisfaction, and health conditions.

Based on the findings that poor IEQ negatively affects student well-being, leading to discomfort and reduced academic engagement (Li & Mak, 2023; Nja et al., 2023).

Thermal comfort in learning environments is better understood through adaptive comfort models which consider occupant behavior and environmental adaptation (Humphreys, Nicol, & Roaf, 2023).

Adaptive thermal comfort models suggest that occupants' thermal perception is influenced by environmental adaptation rather than fixed temperature standards (Kim & de Dear, 2023).

2.2 Theoretical Framework

2.2.1 Environmental Stress Theory

Environmental Stress Theory explains how poor environmental conditions create psychological and physical strain that reduces performance. In learning environments, heat, noise, and poor lighting contribute to cognitive overload and reduced concentration.

2.2.2 Human Comfort Theory

Human Comfort Theory emphasizes that learning performance improves when thermal, visual, and acoustic conditions are balanced.

Thermal comfort standards in indoor environments are commonly guided by ISO 7730, which defines ergonomic principles for acceptable thermal conditions in occupied spaces (ISO, 2023). Comfortable environments enhance productivity and learning satisfaction (Wargocki & Wyon, 2023).

2.3 Empirical Review

Previous studies have consistently reported that indoor environmental quality has a significant influence on students' learning experiences. Al Horr et al. (2023) and Borrelli and Schiavon (2024) both observed that improvements in thermal comfort, lighting, acoustics, and ventilation contribute positively to students' academic performance. Similar findings were reported by Asaju et al. (2024) within the Nigerian context, where poor classroom environmental conditions were found to negatively affect students' learning experiences. Emmanuel-Obot et al. (2026) reached a similar conclusion, emphasizing that maintaining acceptable indoor environmental conditions is essential for healthy university learning environments.

2.4 Relationship Between Building Materiality, IEQ, and Student Well-being

The relationship between building materiality, indoor environmental quality (IEQ), and students' well-being is closely interconnected. Building materials influence several aspects of the indoor environment, including thermal comfort, indoor air quality, acoustics, and lighting performance. Consequently, the quality and characteristics of building materials have a direct effect on the comfort, health, and learning experience of building occupants. According to Sarbu and Sebarchievici (2023), the selection of appropriate building materials is essential for creating sustainable buildings that provide comfortable and healthy indoor environments. Similarly, Ruparathna et al. (2023) argued that sustainable material selection improves environmental performance while enhancing energy efficiency and occupants' overall comfort.

Indoor environmental quality serves as the link between building materiality and students' well-being. Materials with good thermal and acoustic properties help maintain comfortable indoor conditions, whereas poor-quality materials may contribute to excessive heat, poor ventilation, noise disturbances, and reduced indoor air quality. These conditions can negatively affect students' concentration, learning performance, and overall well-being.

Furthermore, comfort within learning environments is determined by the combined influence of several environmental factors rather than by a single condition. Frontczak and Wargocki (2023) explained that thermal comfort, lighting quality, acoustics, and indoor air quality interact to shape occupants' perceptions of comfort and satisfaction. Therefore, improving building material quality alongside indoor environmental conditions is essential for creating healthy, sustainable, and student-centred learning environments.

2.5 Summary of Literature Review

The literature reviewed shows that building material quality and indoor environmental quality both influence students' comfort, health, and academic performance. Although many previous studies have examined these factors separately, only a few have explored how they interact within the context of Nigerian universities. This study therefore seeks to bridge that gap by examining the relationship between building materiality, indoor environmental quality, and students' well-being at Caleb University.

III. RESEARCH METHODOLOGY

3.1 Research Design

A cross-sectional survey design was adopted. This allows data collection at a single point in time to assess relationships between variables.

3.2 Population of the Study

The population for this study comprised undergraduate students of Caleb University. These students were considered suitable because they make regular use of the university's learning spaces and are therefore in a good position to assess the quality of the indoor environment and its effect on their learning experience.

3.3 Sample Size Determination

The sample size for this study was determined using the Yamane (1967) formula, which is widely used for calculating sample sizes from a finite population.

The formula is:

$$n = \frac{\{N\}}{\{1+N(e)^2\}}$$

Where:
n = Sample size
N = Total population size
e = Level of precision (sampling error), usually 0.05 (5%)

The study targeted undergraduate students within the selected faculties at Caleb University, where the total enrollment stood at 500 at the time of the study

Calculation

$$n = \frac{\{500\}}{\{1+500(0.05)^2\}}$$

$$n = \frac{\{500\}}{\{1+500(0.0025)\}}$$

n= {500}
{2.25}
n=222

Therefore, the sample size is 222 respondents.

3.4 Sampling Technique
A stratified random sampling technique was used to ensure representation across faculties and academic levels.

3.5 Data Collection Instrument
Data were collected using a structured questionnaire designed in line with the study objectives. The questionnaire was divided into four sections:

- Section A: Demographic information
- Section B: Building material quality and Indoor Environmental Quality (thermal comfort, ventilation, lighting, acoustics)
- Section C: Student well-being and academic experience
- Section D: Perceptions of the relationship between IEQ, materiality, and learning outcomes

A five-point Likert scale was used to measure responses, ranging from Strongly Agree (5) to Strongly Disagree (1).

3.6 Method of Data Analysis
Data were analyzed using SPSS. Descriptive statistics (mean, frequency, percentage) and inferential statistics (correlation and regression) were used.

3.7 Ethical Considerations
Ethical approval and considerations were observed throughout the study. Participation was voluntary, and respondents were informed of the purpose of the research. Confidentiality and anonymity were maintained, and data collected were used strictly for academic purposes.

IV. RESULTS AND DISCUSIONS

4.1 Response Rate Analysis

Table 4.1: Response Rate Analysis

Questionnaire Status	Frequency	Percentage
Distributed	222	100
Returned	161	72.5
Valid	152	68.5
Invalid	9	4.1

A total of 222 questionnaires were distributed, out of which 161 were returned, giving a response rate of 72.5%. After screening, 152 were found valid for analysis, representing 68.5% of the total distribution. The remaining responses were excluded due to incompleteness or inconsistency.

4.2 Demographic Characteristics of Respondents
This section presents the demographic characteristics of the respondents based on gender, age, and academic level.

4.2.1 Gender Distribution

Table 4.2.1: Gender Distribution

Gender					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Female	55	36.2	36.2	36.2
	Male	97	63.8	63.8	100
	Total	152	100.0	100.0	100

Discussion
Table 4.2.1 shows the gender distribution of the respondents. Out of the 152 valid responses, 97 (63.8%) were male, while 55 (36.2%) were female. This indicates that the majority of the respondents who participated in the study were male.

4.2.2 Age Distribution

Table 4.2.2: Age Distribution

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Age Range					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	15-20 years	35	23.0	23.0	23.0
	21-25 years	68	44.7	44.7	67.7
	Above 25 years	49	32.2	32.2	100.0
	Total	152	100.0	100.0	100.0

Discussion

Table 4.2.2 presents the age distribution of the respondents. The majority of the respondents, 68 (44.7%), were between 21 and 25 years of age. This was followed by 49 respondents (32.2%) who were above 25 years, while 35 respondents (23.0%) were within the 15–20 years age group. The results suggest that most participants were young adults.

4.2.3 Academic Level Distribution

Table 4.2.3: Academic Level Distribution

Academic Level					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	100 Level	16	10.5	10.5	10.5
	200 Level	23	15.1	15.1	25.7
	300 Level	11	7.2	7.2	32.9
	400 Level	56	36.8	36.8	69.7
	500 Level	46	30.3	30.3	100.0
	Total	152	100.0	100.0	

Discussion

Table 4.2.3 shows the academic level distribution of the respondents. The highest proportion of respondents were in 400 Level (56; 36.8%), followed by 500 Level (46; 30.3%). Respondents in 200 Level, 100 Level, and 300 Level accounted for 23 (15.1%), 16 (10.5%), and 11 (7.2%), respectively. Overall, 67.1% of the respondents were in the senior undergraduate levels (400 and 500 Level), indicating that most participants had substantial experience of the university's learning environment, making their responses valuable to the study.

4.3 Assessment of Materiality in Learning Spaces

This section assesses respondents' perceptions of the quality of building materials used in their learning spaces, including wall finishes, floor finishes, ceilings, glazing, and other interior elements.

Table 4.3: Assessment of Materiality in Learning Spaces.

Assessment of Materials in Learning Spaces					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very Poor	15	9.9	9.9	9.9
	Poor	57	37.5	37.5	47.4
	Fair	30	19.7	19.7	67.1
	Good	20	13.2	13.2	80.3
	Excellent	30	19.7	19.7	100.0
	Total	152	100.0	100.0	

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Discussion

Table 4.3 shows respondents' assessment of the quality of building materials used in their learning spaces. Nearly half of the respondents (47.4%) rated the materials as Poor or Very Poor, indicating general dissatisfaction with the physical condition of the learning environment. In contrast, 32.9% rated the materials as Good or Excellent, while 19.7% considered them Fair. These findings suggest that many students perceive the quality of building materials in their learning spaces as inadequate.

4.3.1 Assessment of Indoor Environmental Quality (IEQ)

This section evaluates respondents' perceptions of the thermal comfort of their learning spaces.

Table 4.3.1: Assessment of Indoor Environmental Quality (Thermal Comfort)

Assessment of Indoor Environmental Quality					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very Uncomfortable	28	18.4	18.4	18.4
	Uncomfortable	42	27.6	27.6	46.0
	Neutral	60	39.5	39.5	85.5
	Comfortable	12	7.9	7.9	93.4
	Very Comfortable	10	6.6	6.6	100.0
	Total	152	100.0	100.0	

Discussion

Table 4.3.1 presents respondents' assessment of the thermal comfort of their learning spaces. A total of 46.0% of respondents described the classrooms as Uncomfortable or Very Uncomfortable, while 39.5% gave a Neutral response. Only 14.5% rated the learning spaces as Comfortable or Very Comfortable. These findings indicate that many students experience thermal discomfort in their classrooms, suggesting the need for improved ventilation and thermal control within the learning environment.

4.3.2 Indoor Air Quality

This section assesses respondents' perceptions of the air quality and ventilation in their learning spaces.

Table 4.3.2: Assessment of Indoor Air Quality

How would you rate the air quality and fresh airflow (ventilation) in your learning spaces?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very Poor	46	30.3	30.3	30.3
	Poor	25	16.4	16.4	46.7
	Fair	39	25.7	25.7	72.4
	Good	29	19.1	19.1	91.5
	Excellent	13	8.6	8.6	100.0
	Total	152	100.0	100.0	

Discussion

Table 4.3.2 shows respondents' assessment of the air quality and ventilation in their learning spaces. Nearly half of the respondents (46.7%) rated the air quality as Poor or Very Poor, while 25.7% considered it Fair. Only 27.7% rated the ventilation as Good or Excellent. These findings suggest that many students perceive the indoor air quality and ventilation in their learning spaces as inadequate, which may affect their comfort and learning experience.

4.3.3 Lighting Quality

This section assesses respondents' perceptions of the lighting conditions in their learning spaces, including both natural and artificial lighting.

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Table 4.3.3: Lighting Quality

Lighting Quality					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very Adequate	36	23.7	23.7	23.7
	Adequate	24	15.8	15.8	39.5
	Neutral	36	23.7	23.7	63.2
	Inadequate	13	8.6	8.6	71.8
	Very Inadequate	43	28.3	28.3	100.0
	Total	152	100.0	100.0	

Discussion

Table 4.3.3 presents respondents' assessment of the lighting conditions in their learning spaces. A total of 39.5% rated the lighting as Very Adequate or Adequate, while 23.7% gave a Neutral response. However, 36.9% considered the lighting Inadequate or Very Inadequate, with Very Inadequate (28.3%) being the most common response. These findings indicate that although many respondents were satisfied with the lighting conditions, a considerable proportion perceived the lighting as insufficient, suggesting the need for improvements in both natural and artificial lighting within the learning environment.

4.3.4 Acoustic Comfort

This section evaluates respondents' perceptions of noise levels and auditory comfort in their learning spaces.

Table 4.3.4: Acoustic Comfort

Acoustic Comfort					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very Noisy	33	21.7	21.7	21.7
	Noisy	38	25.0	25.0	46.7
	Neutral	23	15.1	15.1	61.8
	Comfortable	38	25.0	25.0	86.8
	Very Comfortable	20	13.2	13.2	100.0
	Total	152	100.0	100.0	

Discussion

Table 4.3.4 presents respondents' assessment of acoustic comfort in their learning spaces. A total of 46.7% of respondents described the environment as Noisy or Very Noisy, while 15.1% were neutral. In contrast, 38.2% reported Comfortable or Very Comfortable acoustic conditions. These findings suggest that noise pollution from internal and external sources is a significant issue affecting learning environments, although a considerable proportion of respondents still reported acceptable acoustic conditions.

4.4 Assessment of Student Well-Being

Table 4.4: Assessment of Student Well-Being

Assessment of Student Well-Being					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very High Extent	30	19.7	19.7	19.7

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	High Extent	31	20.4	20.4	40.1
	Moderate Extent	24	15.8	15.8	55.9
	Low Extent	15	9.9	9.9	65.8
	Very Low Extent	52	34.2	34.2	100.0
	Total	152	100.0	100.0	

Discussion

Regarding students' assessment of how well their physical learning spaces support holistic wellness—including physical comfort, health, and stress reduction—the results reveal a clearly divided pattern of responses. A total of 44.1% of respondents perceived the performance of their learning environment as inadequate in supporting their overall well-being. This group comprised 34.2% (n = 52) who rated it as "Very Low Extent" and 9.9% (n = 15) who indicated "Low Extent." In contrast, 40.1% of participants reported that their learning spaces perform well in supporting holistic wellness. This category includes 19.7% (n = 30) who selected "Very High Extent" and 20.4% (n = 31) who indicated "High Extent." The remaining 15.8% (n = 24) of respondents maintained a neutral position, rating the performance as "Moderate Extent."

Overall, the findings highlight a split perception among students, with a slightly higher proportion expressing dissatisfaction than satisfaction. This suggests that while some aspects of the learning environment may be functioning adequately, significant improvements are still required to create more supportive and health-enhancing educational spaces.

4.4.2 Influence of Learning Environment on Student Concentration

The survey measured the perceived cognitive influence of indoor environmental parameters on student attention spans and daily academic focus thresholds. Frequencies are displayed in Table 4.4.2.

Table 4.4.2

Influence of Learning Environment on Student Concentration					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very Positive Influence	57	37.5	37.5	37.5
	Positive Influence	33	21.7	21.7	59.2
	Neutral	26	17.1	17.1	76.3
	Negative Influence	22	14.5	14.5	90.8
	Very Negative Influence	14	9.2	9.2	100.0
	Total	152	100.0	100.0	

Discussion

The results suggest that most students perceive the learning environment as having a positive influence on their concentration. Specifically, 59.2% of respondents reported either a very positive or positive influence, suggesting that favourable indoor environmental conditions support students' attention and academic focus. In contrast, 23.7% believed that the learning environment negatively affects their concentration, while 17.1% remained neutral. These findings suggest that Indoor Environmental Quality (IEQ) plays an important role in students' ability to concentrate during academic activities.

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4.5 Mean Score Analysis

Table 4.5: Mean Score Analysis

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Quality of Learning Space Materials	152	1	5	2.954	1.304
Classroom Temperature Conditions	152	1	5	3.320	0.945
Indoor Quality Influence on Focus	152	1	5	3.632	1.355
Physical Environment Support for Well-being	152	1	5	2.829	1.556
Valid N (listwise)	152				

Discussion

The mean score analysis indicates that Indoor Quality Influence on Focus recorded the highest mean score (M = 3.632, SD = 1.355), suggesting that students generally perceive the indoor learning environment as an important factor influencing their academic concentration. Classroom Temperature Conditions also recorded a relatively high mean score (M = 3.320, SD = 0.945), indicating that respondents considered classroom thermal conditions to be moderately satisfactory.

In contrast, Quality of Learning Space Materials (M = 2.954, SD = 1.304) and Physical Environment Support for Well-being (M = 2.829, SD = 1.556) recorded mean scores below the benchmark value of 3.00. This suggests that improvements in construction materials and the overall physical learning environment are necessary to enhance students' comfort and well-being.

4.6 Test of Research Hypotheses

Table 4.6.1: Pearson Correlation Analysis

Correlations				
		Quality of learning materials	Indoor quality impact on focus	Environment support for well-being
Quality of learning space materials	Pearson Correlation	1	.648***	.591***
	Sig. (2-tailed)		<.001	<.001
	N	152	152	152
Indoor quality impact of focus	Pearson Correlation	.648***	1	.712***
	Sig. (2-tailed)	<.001		<.001
	N	152	152	152
Environment supports for well-being	Pearson Correlation	.591***	.712***	1
	Sig. (2-tailed)	<.001	<.001	
	N	152	152	152
***. Correlation is significant at the 0.001 level (2-tailed).				

Interpretation of Findings

The Pearson Product-Moment Correlation analysis showed significant positive relationships among all the variables examined ($p < .001$). There was a

moderately strong positive relationship between Quality of Learning Space Materials and Indoor Quality Impact on Focus (r = .648), indicating that better-quality learning spaces are associated with improved student concentration.

Similarly, Quality of Learning Space Materials was positively correlated with Environment Support for Well-being (r = .591), suggesting that improvements in the physical quality of learning spaces are associated with better student well-being.

The strongest relationship was found between Indoor Quality Impact on Focus and Environment Support for Well-being (r = .712), indicating that learning environments that support students' concentration also tend to promote their overall well-being. Since all the relationships were statistically significant ($p < .001$), the variables are positively associated.

Summary

The correlation analysis shows that all the study variables are significantly and positively related. Higher-quality learning space materials are associated with better student concentration and improved well-being, while better concentration environments are also linked to higher levels of well-being. This suggests that improvements in indoor learning environments can enhance both academic focus and students' overall health.

4.6.2 Regression Analysis

The regression analysis shows that Quality of Learning Space Materials had a significant positive influence on students' perceptions of well-being support ($B = 0.730$, $\beta = 0.663$, $t = 16.677$, $p < .001$). This suggests that improvements in the quality of learning space materials are strongly associated with improved student well-being.

Similarly, Indoor Quality Impact on Focus also had a significant positive effect on students' well-being support ($B = 0.393$, $\beta = 0.338$, $t = 8.516$, $p < .001$). This indicates that students who perceive their indoor environment as supportive of concentration are more likely to report better well-being. This is consistent with research showing that indoor environmental factors such as air quality, lighting, and thermal comfort influence cognitive performance and psychological comfort in learning spaces.

The regression constant ($B = -0.406$, $t = -4.065$, $p < .001$) represents the baseline level of the dependent variable when all predictors are held constant and is of limited interpretative importance in this context.

Overall, The results suggest that both material quality and indoor environmental quality are significant predictors of students' well-being, with material quality contributing more strongly.

Model Summary

Table 4.6.2: Regression Analysis

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.725[a]	.526	.519	1.024

a. Predictors: (Constant), Indoor Quality Impact on Focus, Quality of Learning Space Materials
b. Dependent Variable: Environment Supports for Well-Being

Interpretation

The model summary shows a strong relationship between the predictor variables and students' well-being support (R = .725). This indicates that Quality of Learning Space Materials and Indoor Quality Impact on Focus are strongly associated with students' perceptions of well-being.

The coefficient of determination ($R^2 = .526$) shows that the two predictor variables explain 52.6% of the variation in students' well-being support, while the remaining 47.4% is explained by other factors not included in the model. This suggests that although

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indoor environmental conditions play a major role, other psychological, academic, and institutional factors may also contribute to students' well-being outcomes.

The adjusted R^2 value of .519 is close to the R^2 value, indicating that the model is stable and has a good explanatory fit. Overall, the findings suggest that learning space material quality and indoor environmental conditions are significant predictors of students' well-being support. This aligns with studies showing that indoor environmental quality significantly influences student comfort, health, and learning experience in educational settings.

ANOVA Results

Table 4.6.3: Regression Analysis ANOVA Results

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	196.489	2	98.245	82.680	<.001[b]
	Residual	177.064	149	1.188		
	Total	373.553	151			

a. Dependent Variable: Physical environment support for well-being

b. Predictors: (Constant), Indoor quality impact on focus, Quality of learning space materials

Interpretation

The ANOVA results show that the regression model is statistically significant ($F(2, 149) = 82.680$, $p < .001$). This indicates that Quality of Learning Space Materials and Indoor Quality Impact on Focus, when considered jointly, significantly predict students' perceptions of well-being support.

Since the significance value is less than 0.001, the null hypothesis is rejected. This means that the independent variables have a statistically significant combined effect on the dependent variable. This further confirms that indoor environmental conditions play an important role in shaping students' well-being in learning environments.

The findings suggest that environmental factors within the learning space contribute meaningfully to students' well-being outcomes. This aligns with research showing that classroom environmental quality significantly affects students' learning experience, cognitive functioning, and overall academic engagement.

Regression Coefficients

Table 4.6.4: Regression Analysis Regression Coefficients

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-0.406	.100		-4.065	<.001
	Quality of learning spaces	0.730	0.044	0.663	16.677	<.001
	Indoor quality impact on focus	0.393	0.046	0.338	8.516	<.001

a. Dependent Variable: Physical environment support for well-being

Interpretation

The regression coefficients show that both Quality of Learning Spaces and Indoor Quality Impact on Focus significantly predict students' perceptions of well-being support ($p < .001$). Quality of Learning Spaces had the strongest positive influence ($B = 0.730$, $\beta = 0.663$, $t = 16.677$), indicating that improvements in learning space quality are strongly associated with higher levels of student well-being.

Similarly, Indoor Quality Impact on Focus had a significant positive effect on students' well-being ($B = 0.393$, $\beta = 0.338$, $t = 8.516$). Although its contribution was lower than that of learning space quality, it remains a meaningful predictor. This is consistent with findings that indoor environmental conditions such as air quality, lighting, and thermal comfort influence concentration and overall well-being in learning environments.

Overall, the results indicate that both variables make significant contributions to students' well-being, with learning space quality having the stronger effect.

Hypothesis

The regression results show that Quality of Learning Spaces and Indoor Quality Impact on Focus have significant positive effects on Physical Environment Support for Well-being ($p < .001$). Therefore, there is sufficient evidence to support the alternative hypothesis (H_1).

Decision

Since the significance values for both predictor variables are less than the 0.05 level of significance, the null hypothesis (H_0) is rejected and the alternative hypothesis (H_1) is accepted. This indicates that learning space quality and indoor environmental conditions significantly influence students' well-being.

4.7 Discussion of Findings

4.7.1 The Role of Materiality in Sustainable Educational Architecture

The findings of this study indicate that the quality of learning space materials has a significant influence on students' perceptions of their learning environment and well-being. This suggests that the physical condition and finishing of learning spaces play an important role in how students experience comfort and satisfaction during learning.

4.7.2 Healthy Learning Spaces and Cognitive Performance

The results also show that indoor environmental quality affects students' ability to concentrate and their overall well-being. While many respondents had a positive view of their learning environment, issues such as noise and thermal discomfort were still identified as distractions during lectures.

This supports the Environmental Stress Theory, which explains that poor environmental conditions can place strain on individuals and reduce their ability to concentrate effectively. It also aligns with Human Comfort Theory, which emphasizes that comfortable environments enhance learning engagement and psychological well-being.

Empirical studies support this pattern. Asaju et al. (2024) reported that indoor environmental quality significantly influences students' academic experience in universities. In the Nigerian context, Emmanuel-Obot et al. (2026) observed that factors such as air quality, lighting, acoustics, and temperature all play important roles in determining students' learning effectiveness in lecture halls.

4.7.3 Interlinking Material Quality, Indoor Environmental Quality, and Student Well-Being

The findings further show that material quality, indoor environmental quality, and student well-being are closely connected. In practice, this means that the type of materials used in building construction can influence indoor conditions, which then affect how students feel and perform academically.

Overall, the findings suggest that improving material quality alongside indoor environmental conditions can create more supportive and sustainable learning environments that enhance both student performance and well-being.

V. CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

This study examined the relationship between building materiality, indoor environmental quality, and students' well-being at Caleb University, Imota, Lagos. The results suggest that the physical learning environment plays an important role in shaping students' comfort, concentration, and overall well-being.

The regression results showed that material quality and indoor environmental quality jointly explained 52.6% of the variation in students' well-being ($R^2 = .526$, $p < .001$). This level of explanatory power suggests that environmental conditions within learning spaces are major determinants of how students perceive their well-being, alongside other personal and institutional factors.

Among the predictor variables, material quality had the strongest influence ($\beta = 0.663$), indicating that the physical condition and quality of building materials significantly contribute to creating supportive and healthy learning environments.

The study also identified concerns relating to thermal comfort, ventilation, acoustics, and general material conditions within the learning environment. A notable proportion of respondents reported dissatisfaction with these factors, suggesting that they negatively influence learning experiences and well-being.

In addition, variations in students' perceptions across different learning spaces suggest that environmental quality is not uniform across campus facilities. This highlights the importance of consistent design standards in educational buildings to ensure equitable learning conditions.

Overall, the findings confirm that improving building material quality and indoor environmental conditions can significantly enhance students' well-being and learning experience. This reinforces the need to integrate Indoor Environmental Quality (IEQ) considerations into the planning, design, and management of university learning environments.

5.2 Recommendations

Based on what the students shared and the statistical data, here are the practical steps Caleb University should take:

1. Improve the Quality of Building Materials

Caleb University should prioritize the use of durable, sustainable, and thermally efficient building materials in the construction and renovation of learning facilities. Damaged ceilings, wall finishes, and other deteriorated building components should be repaired or replaced to improve students' comfort and overall well-being.

This is important because the study findings showed that material quality has a strong influence on students' well-being. Similar studies have also reported that the physical condition of learning spaces significantly affects students' comfort and academic experience (Asaju et al., 2024; Okunlola & Ibitoye, 2026).

2. Improve Indoor Air Quality and Ventilation

The university should enhance both natural and mechanical ventilation in classrooms through proper window design, cross-ventilation, and maintenance of air systems. This will help improve indoor air quality and reduce discomfort caused by poor airflow. This recommendation is consistent with Fernandes et al. (2024), who reported that improving ventilation and indoor air quality in educational buildings enhances occupant health, comfort, and learning effectiveness.

3. Improve Acoustic and Thermal Comfort

Steps should be taken to reduce noise levels and improve temperature conditions in lecture halls. This can include the use of sound-absorbing materials, better insulation, and roofing designs that reduce heat gain.

This recommendation is based on the finding that poor acoustic and thermal conditions negatively affect students' concentration and learning performance.

4. Integrate Indoor Environmental Quality into Future Building Designs

Future academic buildings should integrate indoor environmental quality considerations from the design stage. This includes daylight access, ventilation systems, thermal comfort strategies, acoustic control, and sustainable material selection.

5. Carry Out Regular Building Performance Assessments

The university should establish a structured system for regular assessment of learning spaces. This should include evaluation of ventilation, temperature, lighting, acoustics, and building material conditions, along with student feedback.

5.3 Contribution to Knowlegde

This study contributes to knowledge by providing empirical evidence on the relationship between building material quality, indoor environmental quality, and students' well-being within Caleb University, Imota, Lagos State. While earlier studies have often examined these variables separately, this research integrates them within a single analytical model in a university learning environment.

The study establishes that both building material quality and indoor environmental quality significantly influence students' comfort, concentration, and overall well-being.

Furthermore, this study contributes to the limited body of research on indoor environmental quality in Nigerian universities by providing context-specific evidence from Caleb University. Studies such as Emmanuel-Obot et al. (2026) also support the importance of thermal comfort, lighting, acoustics, and air quality in Nigerian higher education environments, reinforcing the relevance of this research.

Finally, the study presents an integrated understanding of how building material quality and indoor environmental quality jointly influence students' well-being. This provides a foundation for future research on sustainable, health-focused educational environments in developing countries.

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