Impact of Natural Lighting in Classrooms on The Mental Health of Students of Selected Secondary Schools in Ikorodu

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Abstract- ***Natural lighting has emerged as a crucial environmental factor influencing the mental health and well-being of students in educational settings. Despite its importance, the direct impact of natural lighting on students' mental health remains underexplored in secondary schools. This study employed a mixed-methods approach to investigate the effects of natural lighting on the mental health of students in selected secondary schools in Ikorodu. Data were collected through surveys, interviews, and observational studies, focusing on students' mood regulation, stress levels, and overall mental well-being in classrooms with varying levels of natural lighting. Spatial analysis and user experience assessments were utilized to determine how natural lighting influences students' emotional states and academic performance. The findings revealed that classrooms with adequate natural lighting significantly contribute to improved mental health outcomes, including reduced stress and enhanced mood stability. These results highlight the importance of incorporating natural lighting into educational infrastructure design to create supportive learning environments that promote students' mental health and academic success. The study underscores the strategic role of natural lighting in fostering a healthier and more productive educational setting. Here are some keywords that could be relevant for a research paper on the impact of natural lighting in classrooms on the mental health of students***

Indexed Terms- ***Natural Lighting, Classroom Environment, Mental Health, Student Well-being, Stress Reduction, Cognitive Performance.***

I. INTRODUCTION

The significance of environmental elements in improving student learning outcomes and mental health is becoming more widely acknowledged in the educational industry. The impact of light on human moods is still being researched in the scientific community today. For decades, official and scientific organizations that deal with lighting, like the Lighting Research Center and the International Committee on Illumination (CIE), have been investigating and publishing studies about the potential impact of lighting on students' moods in the classroom and how this affects their performance and ability to learn (Michael & Heracleous, 2020).

In particular, natural lighting has become a vital component of establishing a favorable learning environment. Innovations in architecture that use natural lighting are becoming crucial as educational institutions work to enhance student health and academic performance. In addition to improving visual comfort, natural lighting has a major impact on mood regulation, cognitive function, and mental wellness in general (Hajji et al., 2024).

In recent years, there has been a growing concern about the lack of natural lighting in many classrooms, which can lead to negative impacts on students' mental health and academic performance. The absence of natural light can disrupt circadian rhythms, increase stress levels, and exacerbate symptoms of Seasonal Affective Disorder (SAD) (Heidari Matin et al, 2022) despite these drawbacks. Moreover, students usually spend 6–8 h on average per weekday in classrooms [occupying more than 40% of their daytime (Jia et al., 2021)

Thus, considering the effects on academic performances and long exposure time, the indoor environmental quality within the educational buildings deserves more attention.

Optimizing learning environments to promote students' academic performance and mental well-being is a key component of operational efficiency in educational settings. Due to resource or architectural limitations, schools, especially those in areas like Ikorodu, struggle to provide enough natural sunlight. Studies have shown that classrooms with adequate ventilation rates lead to lower levels of airborne pollutants and allergens, resulting in improved respiratory health among students Also, air flow has been recognized to be vital in total indoor air quality, and this is strongly related to their capacity to maintain temperature regulation. Therefore, to achieve the desired thermal comfort level in the tropics, airflow is crucial because of the elevated temperature and high relative humidity of this region (Okeke et al., 2021). Nonetheless, including natural illumination into classroom design can greatly boost academic performance, lower stress levels, and improve students' mental health outcomes (Coğçul & Kazanasmaz 2023).

Beyond only being aesthetically pleasing, architecture plays a crucial role in creating sustainable and functional learning environments in urban regions with high population densities and educational demands. Because schools serve as centers for social, emotional, and educational growth, they must be designed with natural lighting, ventilation, and temperature control in mind (Heidari Matin et al, 2022). Educational institutions may optimize natural light, lessen their need on artificial lighting, and create healthier learning environments by putting an emphasis on environmental responsiveness.

This study looks into how pupils' mental health is affected by natural lighting in a few Ikorodu secondary schools. It employs a mixed-methods strategy that blends qualitative and quantitative data collecting and analysis to investigate the effects of natural illumination on students' mood regulation, stress levels, and general mental health. The results of this study will shed light on how to best utilize natural lighting to establish nurturing learning environments that improve kids' academic achievement and emotional health.

II. LITERATURE REVIEW

2.1 Concept of Natural Lighting in Educational Settings

In educational environments, natural lighting is an essential environmental component that has a major impact on students' academic performance and mental health. Applying adequate daylighting techniques into the architecture of a school contributes the occupants' physical and emotional health Essential exposure to daylight improves eye comfort, emotional regulation, and general well-being (Gad et al, 2022). As far as classroom design goes, natural lighting blends aesthetic appeal with practical advantages including better mood regulation and lower student stress levels (The Behavior Hub, 2020). Using windows or skylights to capture natural light can help classrooms use less artificial lighting, which not only saves energy but also makes the space more comfortable and natural for learning. Moreover, lighting affects mood and attitude. Daylighting has been associated with improved mood, with an enhancement of morale, lower fatigue, and reduced eyestrain. The seasonal depression is considered as obvious evidence to prove the relationship between natural light and human endocrinal system. The main purpose in the architectural design of schools is to promote learning as well as optimize physical and emotional health. It should be noted that schools are among the most crowded buildings and host young people. Applying adequate daylighting techniques into the architecture of a school contributes the occupants' physical and emotional health (Hajji et al 2024).

2.2 Factors Influencing Natural Lighting in Classrooms.

Natural lighting in classroom design is influenced by a number of important aspects, all of which help to create more supportive and healthy learning environments. The increased understanding of the value of mental health in educational environments is one of the main drivers. Student engagement is a

complicated concept that captures how motivated, interested, and engaged students are in the learning process. Behavioral, cognitive, and emotional are the three general dimensions into which it is divided (Hayes & Hofmann, 2021). When students actively participate in extracurricular and academic activities, they show dedication and discipline. This is known as behavioral engagement. The mental work pupils put forth to comprehend difficult ideas and resolve issues is referred to as cognitive engagement, and it represents their academic commitment (Yundayani et al., 2021). Conversely, students' views and emotions related to learning, such as their excitement, interest, and sense of belonging, are referred to as emotional commitment. By incorporating passive design principles like skylight installation and thoughtful window placement, natural lighting reduces the need for artificial lighting and can greatly enhance students' emotional and cognitive states (Leccese et al, 2020).

Technological advancements also make natural lighting more accessible and efficient of natural lighting. Classrooms may now dynamically manage natural light exposure because of the development of smart glass technologies, which can change transparency depending on the light circumstances. This improves interior comfort and lowers glare (Omidi et al, 2021).

Similar to this, architects may optimize natural light penetration while reducing heat gain and energy loss thanks to advancements in window design, such as solar tubes and low-e coatings Thanks to these technologies, educators may build classrooms that meet contemporary educational standards while also being aesthetically pleasing and functionally efficient.

Another motivating aspect is the market's need for healthy and sustainable learning settings. Given its advantages for students' academic performance and emotional wellness, parents and educators are gravitating toward schools that emphasize natural lighting (North Star News, 2023). By integrating natural lighting into their architecture, schools position themselves as progressive and student-focused, which improves their standing and allure with potential students and families (Leitão et al., 2022). The strategic importance of natural lighting in contemporary educational design is highlighted by this emphasis.

2.3 Case Studies of Natural Lighting in Educational Settings

Case studies from all across the world show how natural lighting can completely change learning environments. For instance, schools with skylights and huge windows that let in a lot of natural light have reported lower absenteeism and happier students (Bakare & Alibaba ,2020). The Waldorf School in California, which uses a lot of natural light from skylights and wide windows, is one prominent example. By optimizing interior lighting, this design lessens the need for artificial lighting and produces a more organic and comfortable learning environment. As a result, the school has reported lower absenteeism and happier students, demonstrating how effective natural lighting is at improving learning outcomes.

In a similar vein, schools equipped with cutting-edge daylighting features like solar tubes and clerestory windows have demonstrated improved academic performance and cognitive function in their children (Leccese, et al, 2020). These examples show how natural illumination may be used to make learning spaces healthier and more effective.

In developing regions, such as Nigeria, implementing natural lighting in classrooms can be challenging due to financial constraints and limited access to advanced technologies. However, innovative and context-sensitive solutions, such as using locally sourced materials and optimizing window placement, can provide cost-effective ways to integrate natural lighting into classroom design (Michael & Heracleous, 2020). These approaches not only reduce construction costs but also promote cultural relevance and environmental sustainability, making them suitable for local conditions.

2.4 Impact of Natural Lighting on Mental Health

By addressing important concerns like mood management, stress reduction, and cognitive function, natural lighting in classrooms has a major positive influence on students' mental health.

According to The Spellbinder (2022), natural lighting enhances mood stability by supplying necessary sunshine exposure, which aids in circadian rhythm regulation and lessens symptoms of Seasonal Affective Disorder (SAD). Adequate natural illumination in classrooms can also increase visual comfort and lessen eye strain by reducing the need for artificial lighting, which promotes a healthy learning environment.

In addition, students' focus and concentration are improved by natural illumination, which improves cognitive function. Research indicates that classrooms with appropriate natural light exposure have more student engagement and better academic results than those with insufficient lighting (Handley, 2023). The psychological advantages of natural light, which promote general mental health and emotional stability, are connected to this increase in cognitive function.

TABLE I: NATURAL LIGHT AND HUMAN BODY

Natural light and human body

Physically		Psychologically	
Improve	Decrease	Improve	Decrease
Vitamin D	Cancer Possibility	Mood	Depression
Visual System	Abnormal Bone Formation	Mental Performance	Stress
Circadian Rhythms	-	Alertness	Sadness
Sleep Quality	-	Brain activity	Violent Behavior

Source: Author (2025)

2.5 Challenges and Barriers to Implementing Natural Lighting

Although there are many advantages to incorporating natural illumination into classrooms, there are also a number of obstacles that need to be overcome. The high upfront costs of implementing sophisticated daylighting systems, including solar tubes or smart glass technologies, can be unaffordable for many schools, making it one of the main challenges . Furthermore, the possibility of natural lighting in certain classrooms may be restricted by physical limitations, such as existing building structures or urban density. Although a building's ventilation system should ideally provide sufficient clean air supply to secure good indoor air quality and to adequately lower the risk of airborne infection transmissions under all occupancy scenarios envisaged by its design, this often is not the case. Worst of all, many existing buildings cannot be retrofitted easily or at an acceptable cost. This is particularly true for schools and aged care facilities that are naturally ventilated. (Morawska et al, 2024).

The lack of technical expertise needed to create and execute efficient natural lighting solutions is another difficulty. To maximize window placement, skylight installation, and other daylighting measures, architects and educators require specialized knowledge, which might be a barrier in areas with little access to such knowledge (Yacoub & ElHajjar, 2021). Without the right instruction and technical assistance, schools run the risk of their lighting systems malfunctioning or becoming inefficient, which might defeat the purpose of natural lighting.

2.6 Opportunities for Future Research and Innovation

Future research and innovation opportunities that address both the technological and practical aspects of sustainable design are greatly enhanced by the incorporation of natural illumination in educational environments. There is exciting promise for maximizing natural light exposure and automating lighting modifications based on environmental circumstances with emerging technologies like AI-powered lighting systems (Emmanuel, Grace & John, 2024). Windows that imitate the self-shading properties of leaves are just one example of how biomimetic design concepts, which draw inspiration from natural processes and structures, may produce creative daylighting solutions that mix in perfectly with their surroundings (Jia et al., 2021).

III. METHODOLOGY

This study adopts a qualitative approach, focusing on selected secondary schools in ikorodu to assess impact of natural lighting in classrooms. The data collection process included structured observations, user feedback surveys, and evaluations of environmental performance.

The topic, methodology, and conclusions of the investigations were then presented clearly and comparably after the extracted facts were organized into a tabular format. This approach maintained the information's relevancy and clarity while guaranteeing an organized and effective arrangement.

S/N	Case Study Location	Reasons for Selection
1	Difas Secondary School Ikorodu Lagos, Nigeria.	Demonstrates innovative use of natural lighting through large windows and skylights.
2	Homat Secondary Ikorodu Lagos	Incorporates natural lighting with reflective surfaces to enhance daylight exposure.
3	First Citizens Secondary Ikorodu	Utilizes cost-effective solutions like solar tubes to improve natural lighting.

Source: Author (2025)

IV. FINDINGS AND DISCUSSION

These case studies illustrate how inclusive design strategies have been effectively integrated into vocational school architecture to enhance educational opportunities and support for children in various parts of the world.

Figure 1.1: Difas Secondary Ikorodu Lagos ,
Source:https://images.app.goo.gl/HfjkC49jNnmYtvQS8wh8(Retrieved 2024)

Case Study 1: Difas Secondary School Ikorodu Lagos, Nigeria.

The strategic placement of windows and skylights allows for optimal natural light penetration, reducing the need for artificial lighting during the day.

Studies have shown that classrooms with sufficient natural lighting have better student engagement and improved cognitive function compared to those with inadequate lighting.

Despite initial costs, the long-term benefits of natural lighting, such as reduced energy consumption and improved student well-being, make it a valuable investment for educational institutions.

Figure 1.2: Homat Secondary Ikorodu Lagos
Source:https://images.app.goo.gl/HfC49jNcvdferS8wh8 (Retrieved 2024)

Case Study 2: Homat Secondary Ikorodu ,Ikorodu Lagos, Nigeria.

Homat Secondary School uses reflective surfaces to distribute natural light evenly throughout the classrooms. This design strategy enhances visual comfort and reduces eye strain, contributing to a healthier learning environment. By optimizing natural lighting, the college aims to improve student focus and academic performance.

Innovative Use of Reflective Surfaces: The use of reflective surfaces, such as light-colored walls and ceilings, helps to distribute natural light more evenly, reducing glare and improving visual comfort.
Improved lighting conditions have been linked to better academic outcomes and higher student satisfaction.

This approach is cost-effective as it maximizes existing natural light without requiring additional infrastructure.

Figure 1.3: First Citizens Secondary Ikorodu Lagos , Source: https://images.app.goo.gl/HvgbhjkuyS8wh8 (Retrieved 2025)

Case Study 3:, First Citizens Secondary Ikorodu Lagos

Employs cost-effective solutions like solar tubes and courtyard system to enhance natural lighting. This approach not only improves daylight exposure but also reduces energy costs, making it a sustainable option for resource-limited schools. By incorporating innovative daylighting systems, the school aims to create a more supportive learning environment.

Solar tubes are a cost-effective way to bring natural light into classrooms, especially in areas with limited window space.

This approach reduces reliance on artificial lighting, contributing to energy savings and a more sustainable educational environment.

Impact on Student Well-being: Enhanced natural lighting has been shown to improve mood stability and reduce stress among students.

Table 2. Comparison of passive design features

Parameters	Difas Secondary School Ikorodu Lagos, Nigeria.	Homat Secondary Ikorodu ,Ikorodu Lagos, Nigeria.	First Citizens Secondary Ikorodu Lagos
Natural Lighting.	Natural lighting and mechanical systems	Limited natural lightning	Good Natural Lighting
Ventilation.	Natural ventilation and mechanical systems	Good Natural ventilation	Limited ventilation natural
Shading.	Effective shading	Limited shading	Advanced shading
Indoor temperature.	Controlled indoor temperature	High temperatures	Stable temperature with passive cooling

Inclusive Spatial Design for Natural Lighting in Classrooms

Inclusive spatial design is crucial for creating educational environments that cater to the diverse needs of students, particularly in terms of natural lighting. This approach ensures that classrooms are designed to promote interaction, comfort, and cognitive function among students. For instance, schools like Difas Secondary School Ikorodu and Homat Secondary School incorporated natural lighting strategies that enhance the learning environment.

The strategic placement of windows and skylights allows for optimal natural light penetration, reducing the need for artificial lighting during the day.

Studies have shown that classrooms with sufficient natural lighting have better student engagement and improved cognitive function compared to those with inadequate lighting.

Natural lighting can also facilitate social interaction among students by creating a more welcoming and comfortable learning environment.

Moreover, First Citizens Secondary School Ikorodu employed cost-effective solutions like solar tubes to enhance natural lighting. This design strategy not only improves daylight exposure but also reduces energy costs, making it a sustainable option for resource-limited schools. By incorporating innovative daylighting systems, the school aims to create a more supportive learning environment.

The principles of inclusive spatial design extend beyond mere aesthetics; they encompass functionality and accessibility. Facilities must be designed to accommodate students with varying physical abilities. For example, incorporating ramps and accessible restrooms ensures that all students can navigate the space independently.

of schools, fostering community pride and support for educational institutions.

Key Findings and Lessons from Case Studies

In reviewing the three case studies, several key findings emerge that underscore the importance of inclusivity of orphans in vocational school design. These case studies not only highlight different approaches to achieving inclusivity but also offer valuable lessons that can be applied to a wide range of contexts. Table 2.0 summarizes the main findings and key takeaways from each case, offering insights for planners and policymakers seeking to create more inclusive environments.

Table: Key Findings and Lessons from Case Studies

School Name	Key Findings	Lessons to Learn
Difas Secondary School Ikorodu	Improved mood stability, enhanced cognitive function	Incorporate large windows and skylights for maximum natural light exposure.
Homat Secondary School	Enhanced visual comfort, reduced eye strain	Use reflective surfaces to distribute natural light evenly.
First Citizens Secondary Ikorodu	Cost-effective solutions, reduced energy costs	Employ sustainable design elements like solar tubes to enhance natural lighting.

Source: Author (2025)

V. CONCLUSION AND RECOMMENDATIONS

In conclusion, natural lighting provisions in classrooms play a vital role in enhancing the mental health and academic performance of students in secondary schools in Ikorodu. The case studies highlight the importance of incorporating large windows, skylights, and reflective surfaces to maximize natural light exposure. This not only improves mood stability and cognitive function but also reduces stress levels among students. Additionally, cost-effective solutions like solar tubes offer sustainable options for resource-limited schools.

RECOMMENDATIONS

5.1 Design strategies

1 Advanced Ventilation Strategies
Incorporate Large Windows and Skylights: Schools should prioritize the use of large windows and skylights to enhance natural lighting improving student well-being and academic performance. Employing reflective surfaces can distribute natural

light evenly, enhancing visual comfort and reducing eye strain.

2. Enhanced Shading and Solar Control
Schools should adopt sustainable design elements like solar tubes to reduce reliance on artificial lighting and contribute to energy savings. Ensure that all classrooms have adequate natural lighting to promote inclusivity and support the educational needs of all students.

3. Smart Building Technologies
The implementation of smart HVAC systems that respond to occupancy levels, external weather conditions, and internal heat sources can enhance energy efficiency and indoor climate control, thereby increasing productivity and reducing energy consumption.

4. Policy advocacy
Policymakers should establish guidelines and incentives to encourage the integration of natural lighting in school design, emphasizing its benefits for student mental health and academic success. Also Encourage collaboration between architects, educators, and policymakers to develop innovative and sustainable natural lighting solutions that align with educational goals.

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