

# The Influence of Landscape Layout and Lighting on Perceived Safety in Higher Institutions; Caleb University as a Case Study

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**Abstract-** Campus safety at Caleb University is influenced by environmental design factors such as landscape layout and lighting. This study examines their impact on students' safety perception using a mixed-methods approach, combining site observations with questionnaire data from 300 students. Findings show that while daytime safety is generally high, nighttime safety is lower due to poor lighting, dark spots, and obstructed visibility from vegetation. The study concludes that improving lighting, maintaining landscapes, and enhancing spatial planning are essential for safer campus environments, providing practical recommendations for design interventions in institutional settings.

**Keywords:** Caleb university, Campus safety, Environmental design, Lighting, Landscape layout.

## I. CHAPTER ONE INTRODUCTION

Campus safety is a critical component of institutional planning and management, particularly in higher education environments where academic, residential, and social activities occur simultaneously (Champagne, 2023). Traditionally, safety on university campuses has been addressed through personnel-based security measures such as guards, surveillance systems, and controlled access points. However, contemporary environmental design theories emphasize that physical planning elements such as landscape configuration, lighting design, spatial organization, and visibility play a significant role in shaping both actual and perceived safety (Lotfjadi, 2025). At Caleb University, safety is influenced not only by the presence of security but also by environmental characteristics such as pathway connectivity, vegetation density, illumination levels, and open sightlines (Joseph-Salisbury, R., Connelly, L., Pimblott, K., O'Neill, S., & Taylor, H. 2023; Onyekwere, W. C., Ajayi, O. O., & Owolabi, T. O. S. 2024)). Poorly lit walkways, concealed corners created by unmanaged

vegetation, and fragmented circulation networks can increase anxiety and perceived vulnerability among users.

Gooren (2023) stated that the concept of environmental safety aligns with principles of Crime Prevention Through Environmental Design (CPTED), which argue that spatial design can deter criminal behavior by enhancing visibility, territorial reinforcement, and natural surveillance. In the Nigerian context, limited empirical research exists on how campus landscape and lighting influence safety perception. This creates a knowledge gap in evidence-based environmental planning for tertiary institutions.

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including landscape configuration, lighting design, spatial organization, and visibility play a significant role in shaping both actual and perceived safety (Lotfabadi, 2025).

At Caleb University, safety is influenced not only by the presence of security personnel but also by environmental characteristics such as pathway connectivity, vegetation density, illumination levels, and open sightlines (Joseph-Salisbury et al., 2023; Onyekwere et al., 2024). Poorly lit walkways, concealed corners created by unmanaged vegetation, and fragmented circulation networks can increase anxiety and perceived vulnerability among campus users.

The concept of environmental safety aligns with the principles of Crime Prevention Through Environmental Design (CPTED), which posit that effective spatial design can deter criminal behavior by enhancing visibility, territorial reinforcement, and natural surveillance (Gooren, 2023). Despite this, there is limited empirical research in the Nigerian context examining how landscape layout and lighting conditions influence safety perception on university campuses. This gap highlights the need for evidence-based approaches to environmental planning in tertiary institutions.

Despite the presence of security personnel, certain areas within Caleb University may still evoke feelings of insecurity due to inadequate lighting, poor landscape planning, and obstructed sightlines. However, there is insufficient documented evidence on how these environmental factors shape users' safety perceptions, making design interventions largely speculative rather than data-driven.

This study therefore investigates the influence of landscape layout and lighting conditions on perceived safety within Caleb University. The aim is to examine how these environmental factors affect safety perception and to propose design interventions that enhance security and user comfort.

The specific objectives of the study are to:

- assess existing landscape layout and lighting conditions on campus;
- evaluate students' perceptions of safety;
- analyze the relationship between environmental factors and safety perception;
- recommend practical and context-appropriate design improvements.

The study is guided by the following research questions:

- How do landscape layout and lighting conditions influence perceived safety on campus?
- Which areas are perceived as unsafe, and what factors contribute to this perception?
- What environmental design strategies can improve safety perception?

Ultimately, this research contributes to the growing discourse on environmental design in Nigeria by providing empirical evidence on campus safety. It offers valuable insights for university management, planners, and designers, supporting the development of safer, more user-centered, and sustainable campus environments while enhancing student well-being and institutional reputation.

## **II. CHAPTER TWO LITERATURE REVIEW**

Campus safety encompasses physical security, psychological comfort, and risk mitigation in educational environments, extending beyond crime prevention to include environmental comfort and spatial legibility (Osegbue et al., 2025). Its theoretical foundation lies in Crime Prevention Through Environmental Design (CPTED), developed by C. Ray Jeffery and expanded by Oscar Newman's Defensible Space Theory, emphasizing natural surveillance, territorial reinforcement, access control, and maintenance to reduce crime via spatial openness, controlled entries, and adequate illumination (Rahayu, 2023). Dense shrubs and irregular pathways obstruct sightlines, while open lawns, trimmed vegetation, and direct routes improve connectivity,

predictability, wayfinding, and reduce anxiety (Liu, J., Zhong, K., & Zhu, L. 2025). Lighting is critical for nighttime visibility and psychological comfort, with adequate illuminance along pedestrian routes, parking lots, and entrances enabling facial recognition, minimizing shadows, and lowering fear of crime, provided it features uniform distribution, appropriate pole height, and glare control (Peng, Y.-L., Li, Y., Cheng, W.-Y., & Wang, K. 2024; Kim & Park, 2025). Although Nigerian campus studies are limited, often prioritizing crime statistics over environmental safety perceptions, this research fills that gap by grounding its conceptual framework in CPTED theory, positing that effective landscape layout and lighting quality boost visibility, surveillance, perceived safety, and user comfort.

### III. CHAPTER THREE RESEARCH METHODOLOGY

A mixed-methods research design was adopted, integrating both quantitative and qualitative approaches to provide a comprehensive evaluation of environmental conditions and students' perceptions of safety at Caleb University, Lagos State, Nigeria. This approach enabled the study to combine measurable data with contextual insights, thereby enhancing the depth and reliability of findings.

The investigation focused on key campus zones, including academic blocks, student hostels, parking areas, and pedestrian pathways. Primary data were obtained through systematic site observations, assessing variables such as lighting conditions, vegetation density, pathway connectivity, spatial visibility, and the presence of obstructed sightlines.

In addition, structured questionnaires were administered to students across different levels of study. A total of 300 valid responses were collected and used for analysis. Due to accessibility and willingness of participants, a convenience sampling technique was employed. Although non-probabilistic, the relatively large sample size improves the reliability and generalizability of the findings within the context of student-based perception studies.

To determine the average perception of respondents on each variable, the mean score was calculated using the expression:

$$\text{Mean} = \frac{\sum(f \times x)}{N}$$

where:

f represents the frequency of each response,  
x denotes the assigned numerical value of each response,

$\sum(f \times x)$  is the total weighted score, and

N is the total number of respondents (300).

The Likert scale adopted in this study was structured as follows:

1 = Strongly Disagree

2 = Disagree

3 = Neutral

4 = Agree

5 = Strongly Agree

The qualitative component of the study was derived from open-ended questionnaire items rather than interviews. This allowed respondents to describe unsafe locations and propose safety improvements in their own words, providing deeper insight into spatial and environmental challenges on campus. Secondary data were sourced from academic journals, campus planning documents, and relevant environmental design literature to support and contextualize the primary findings.

Quantitative data were analyzed using descriptive statistics, specifically mean scores and frequency distributions, while qualitative responses were subjected to identify recurring patterns and key issues related to perceived safety. Ethical considerations were strictly observed throughout the study. Participation was voluntary, respondents' identities were kept confidential, and no form of harm or risk was imposed on participants.

Despite its contributions, the study has certain limitations. The use of convenience sampling may introduce selection bias, and the study focuses solely on students, excluding perspectives from staff and

security personnel. However, the relatively large sample size enhances the robustness of the findings, making them valuable for informing future campus planning and design interventions aimed at improving safety.

#### IV. CHAPTER FOUR DATA PRESENTATION, ANALYSIS AND DISCUSSION

This chapter presents the analysis of data collected from respondents on the influence of landscape layout and lighting conditions on perceived safety at Caleb University. The data were analyzed using descriptive statistics such as frequencies and percentages, and the results are presented alongside interpretations. Its specific objectives include assessing existing landscape layout and lighting conditions, evaluating students' perceptions of safety, analyzing relationships between environmental factors and safety perceptions, and recommending practical, context-appropriate design improvements.

A total of 300 valid responses were collected and analyzed for this study. This sample size is considered adequate for drawing meaningful conclusions regarding students' perception of safety on campus.

##### Demographic Characteristics of Respondents

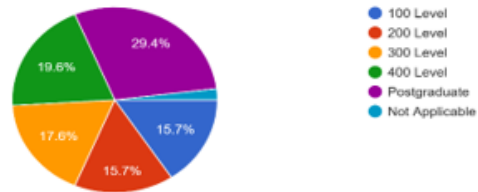
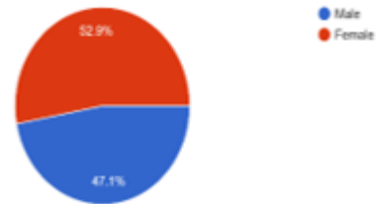
###### Gender Distribution

Out of 300 respondents:

Female: 159 (52.9%) Male: 141 (47.1%)

This indicates a fairly balanced gender distribution, with a slight female majority.

###### Level of Study



Postgraduate: 88 (29.4%), 400 Level: 59 (19.6%), 300 Level: 53 (17.6%), 100 Level: 47 (15.7%), 200 Level: 47 (15.7%), Not Applicable: 6 (2.0%). The majority of respondents are postgraduate students, suggesting that more experienced campus users contributed significantly to the study.

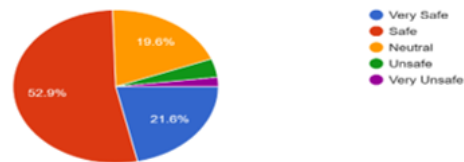
###### Duration of Stay on Campus



1–3 years: 118 (39.2%), 4–6 years: 106 (35.3%), Less than 1 year: 65 (21.6%), More than 6 years: 11 (3.9%). Most respondents have spent between 1–6 years on campus, indicating they possess sufficient familiarity with the campus environment.

###### Perception of Safety on Campus

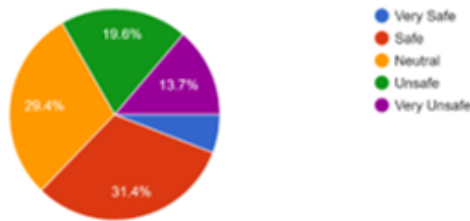
###### Safety During the Day



Safe: 159 (52.9%), Very Safe: 65 (21.6%), Neutral: 59 (19.6%), Unsafe: 12 (3.9%), Very Unsafe: 6 (2.0%). This

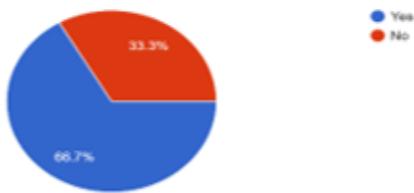
shows that over 74% of respondents feel safe or very safe during the day, indicating a generally positive perception of daytime safety.

### Safety During the Night



Safe: 94 (31.4%), Neutral: 88 (29.4%), Unsafe: 59 (19.6%), Very Unsafe: 41 (13.7%), Very Safe: 18 (5.9%). Nighttime safety perception is significantly lower. Only 37.3% feel safe, while a substantial proportion (33.3%) feel unsafe or very unsafe.

### Avoidance of Certain Areas



Yes: 200 (66.7%), No: 100 (33.3%). A clear majority of respondents have avoided certain areas due to safety concerns, indicating uneven safety distribution across the campus.

### Influence of Landscape Layout on Safety

Analysis of responses on landscape layout reveals that:

- Pathways and connectivity are generally perceived as adequate, supporting movement across campus.
- However, vegetation obstructing visibility remains a concern, suggesting poor maintenance or overgrowth.
- Many respondents acknowledged the presence of hidden or isolated areas, which negatively affect perceived safety.

- Open sightlines received moderate ratings, indicating partial effectiveness in spatial visibility.

Overall, the results indicate that landscape design plays a critical role in shaping safety perception, particularly through visibility, openness, and spatial organization.

### Influence of Lighting Conditions on Safety

The findings show that:

- Lighting along walkways and in hostels is inadequate in several areas
- A strong majority of respondents acknowledged the presence of dark spots on campus at night
- Respondents overwhelmingly agreed that lighting improves their sense of security

This confirms that lighting is one of the most significant factors influencing nighttime safety perception.

### Role of Security and Environmental Design

- Respondents generally agreed that security personnel contribute positively to safety perception
- There is strong agreement that environmental design (landscape + lighting) significantly influences safety
- Most respondents indicated they would feel safer if lighting and landscaping were improved

This suggests that safety is not solely dependent on security personnel but also on physical planning and design quality.

### Least Safe Areas Identified

From qualitative responses, commonly identified unsafe areas include:

- Back of academic buildings
- Hostel pathways
- Parking lots
- Bushy or poorly maintained areas
- Isolated or less frequently used zones

The main reasons include:

- Poor lighting
- Obstructed visibility
- Isolation and low human activity

### **Suggested Improvements**

Respondents recommended:

- Installation of additional lighting systems (streetlights, floodlights)
- Regular trimming and maintenance of vegetation
- Increased security patrol and surveillance systems
- Improved spatial planning to eliminate hidden areas
- Renovation of old or poorly maintained structures

### **Discussion of Findings**

The findings from this study reveal a strong relationship between environmental design and perceived safety on campus. These results are consistent with existing literature on Crime Prevention Through Environmental Design (CPTED), which emphasizes the role of physical environment in influencing user behavior and safety perception.

### **Key insights include:**

- Daytime safety is high due to natural surveillance and visibility
- Nighttime safety is significantly lower, mainly due to poor lighting
- Landscape elements, particularly vegetation and spatial layout, influence visibility and perceived risk
- The high rate of area avoidance (66.7%) indicates serious spatial safety concerns
- Lighting emerges as the most critical factor affecting safety perception

### **Summary of Findings**

- Majority of students feel safe during the day but less safe at night
- 66.7% of respondents avoid certain areas, indicating uneven safety distribution
- Lighting deficiencies and dark spots are major contributors to insecurity

- Landscape design issues, such as poor visibility and hidden areas, reduce perceived safety
- Improvements in lighting and landscape management are strongly supported

## **V. CHAPTER FIVE RECOMMENDATIONS**

Based on the findings of this study, the following recommendations are proposed to improve perceived safety on the Caleb University campus:

### **Enhance Campus Lighting:**

- Install additional streetlights, floodlights, and pathway lighting in dark or poorly lit areas.
- Use energy-efficient LED lights with strategic placement to minimize shadows and dark spots.
- Implement motion-sensor lighting in less trafficked areas to increase visibility while conserving energy.

### **Landscape Management and Maintenance:**

- Regularly trim overgrown vegetation to improve sightlines and eliminate hidden spaces.
- Maintain open and clear pathways to facilitate natural surveillance.
- Design new landscaping to minimize isolated or concealed areas while promoting aesthetically pleasing spaces.

### **Spatial Planning Improvements:**

- Redesign isolated or underutilized zones to increase human activity and visibility.
- Ensure that new campus developments integrate safe pathway connectivity and clear orientation.

### **Security Measures:**

- Increase patrol frequency in identified high-risk areas, especially at night.
- Deploy surveillance cameras strategically in secluded zones and parking areas.
- Encourage student awareness programs on campus safety and reporting procedures.

### **Integration of CPTED Principles:**

- Adopt Crime Prevention Through Environmental Design (CPTED) principles in future planning.
- Combine physical design improvements with security interventions to enhance overall safety perception.

## **VI. CONCLUSION**

The study demonstrates that environmental design, specifically the configuration of landscape elements and the quality of lighting as a substantial influence on students' perceptions of safety on campus. Overall, respondents reported relatively high levels of perceived safety during daytime hours, which they associated with natural surveillance, unobstructed sightlines, and higher levels of pedestrian activity. At night, however, perceived safety declined markedly, primarily due to inadequate lighting, the presence of dark or visually obscured areas, and spatial isolation. Vegetation overgrowth, concealed corners, and poorly organized outdoor spaces were identified as key landscape conditions that contribute to feelings of insecurity and avoidance behavior, whereas well-distributed, sufficiently bright lighting emerged as the most critical environmental factor enhancing perceived safety. These findings underscore the need for an integrated safety strategy that combines improved lighting design, proactive landscape management, and visible security presence. Targeted interventions addressing lighting deficiencies and landscape-related vulnerabilities have the potential to significantly enhance student perceived safety and support a more welcoming, functional, and socially vibrant campus environment.

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