



Landscape Design as a Tool for Sustainable School Environments: Evaluating its Impact on Learning and Community Use in Ikorodu Public Secondary Schools

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ABSTRACT

School landscapes are increasingly recognized as essential components of sustainable educational environments, offering cognitive, emotional, and social benefits beyond traditional classrooms. This study examines the role of landscape design in promoting sustainable school environments and its impact on learning outcomes and community use in public secondary schools in Ikorodu, Lagos State. Using qualitative case studies, including observations of landscape features and site analyses, the research evaluates the presence and effectiveness of green spaces, shaded areas, and multifunctional outdoor learning environments. Evidence indicates that well-designed landscapes enhance student attention, reduce stress, foster engagement, and support environmental awareness, aligning with Attention Restoration Theory and sustainability frameworks (Chawla et al., 2020; Ajayi et al., 2024; UNESCO, 2020). Additionally, landscaped school grounds provide venues for community activities, promoting social cohesion and multifunctional use in urban contexts (Ogunseitan, 2021; Akande et al., 2023). The findings underscore the necessity of integrating sustainable landscape planning into school development strategies to improve academic performance, student wellbeing, and community interaction. This study offers evidence-based recommendations for architects, planners, and policymakers seeking to enhance the educational and social functions of public secondary school environments in rapidly urbanizing areas of Nigeria.

Keywords: Landscape design, Sustainable school environments, Learning outcomes, Community use, Green infrastructure, Ikorodu, Nigeria

INTRODUCTION

School landscapes are increasingly recognized as critical components of the educational environment, providing opportunities for learning, well being, and sustainability beyond the classroom. Exposure to green spaces and well-designed outdoor areas has been shown to improve attention, reduce stress, enhance cognitive functioning, and support academic performance (Brandisauskiene et al., 2021; Chawla et al., 2020). Structured outdoor spaces, such as gardens, learning pockets, and shaded recreational areas, foster engagement, motivation, and pro-social behavior, particularly in schools with limited indoor resources (Moore & Cosco, 2022). Theoretical frameworks like Attention Restoration Theory and stress-recovery models explain these outcomes by showing how natural landscapes replenish cognitive resources and reduce physiological stress, improving students' readiness to learn (Kuo et al., 2021). While these benefits are widely documented internationally, research specific to Nigerian public secondary schools, especially in rapidly urbanizing areas like Ikorodu, Lagos State, is limited (Ogunseitan, 2021; UNESCO, 2020). Understanding how landscape design influences learning, well being, and community engagement in such contexts is crucial for sustainable school planning.

Sustainable school environments integrate ecological, social, and educational considerations into physical and functional design. Incorporating green infrastructure into school landscapes enhances environmental quality, thermal comfort, and biodiversity while promoting student health, cognitive development, and environmental awareness (Brandisauskiene et al., 2021; Moore & Cosco, 2022). Nigerian urban schools often face challenges such as high population density, limited green space, and inadequate maintenance, which reduce opportunities for outdoor learning and community use (Ogunseitan, 2021). Recent studies have demonstrated that landscaped school environments support experiential learning,

encourage outdoor physical activity, and strengthen community cohesion (Kuo et al., 2021). These findings indicate that schools in densely populated areas like Ikorodu can function not only as centers for learning but also as shared social and recreational spaces, contributing to environmental stewardship and the achievement of sustainable development goals (UNESCO, 2020).

Despite evidence of the benefits of school landscapes, most Nigerian public secondary schools, particularly in urban areas like Ikorodu, lack well-planned green outdoor spaces. This deficiency limits students' opportunities for stress reduction, experiential learning, and community interaction. Moreover, existing studies in Nigeria focus primarily on primary or tertiary institutions, leaving a gap in context-specific knowledge about secondary school students' interactions with school landscapes (Brandisauskiene et al., 2021; Chawla et al., 2020). Without empirical evidence, architects, planners, and policymakers cannot implement evidence-based landscape strategies that enhance educational, environmental, and social outcomes. Consequently, this study seeks to investigate how landscape design can create sustainable school environments by enhancing learning outcomes, student well-being, and community engagement in Ikorodu public secondary schools (Brandisauskiene et al., 2021; Moore & Cosco, 2022).

The objectives of this study are to examine the relationship between landscape design features and student learning experiences and well-being in Ikorodu public secondary schools (Chawla et al., 2020), to assess how school landscapes facilitate community interaction and the sustainable use of school grounds (Kuo et al., 2021), and to propose context-appropriate landscape design strategies that enhance educational, environmental, and social outcomes (UNESCO, 2020). To guide the study, the research questions include: How do landscape design features in Ikorodu public secondary schools influence students' learning outcomes and well-being (Brandisauskiene et al., 2021; Chawla et al., 2020)? How do landscaped school environments facilitate community use and social interaction (Kuo et al., 2021)? And what sustainable landscape design strategies can be implemented to improve educational, environmental, and social outcomes (UNESCO, 2020)?

This study is justified by the need to provide empirical evidence on the role of school landscapes in improving learning, wellbeing, and community use in a rapidly urbanizing Nigerian context. Evidence shows that well-designed green spaces improve cognitive performance, reduce stress, and foster environmental awareness among students (Brandisauskiene et al., 2021; Chawla et al., 2020). Understanding how landscape design influences both students and the community can guide planners and policymakers in creating sustainable, multifunctional school environments in Ikorodu and similar urban areas (Kuo et al., 2021; Ogunseitan, 2021). The study provides value for educational planners, architects, and policymakers by demonstrating the benefits of integrating green infrastructure into school landscapes. Landscaped environments improve thermal comfort, promote outdoor learning, and foster community cohesion (Moore & Cosco, 2022; Kuo et al., 2021). Empirical evidence from Ikorodu will inform sustainable planning strategies, support environmental stewardship, and enhance educational outcomes, addressing gaps in Nigerian urban secondary school research (UNESCO, 2020).

The study focuses on public secondary schools in Ikorodu, Lagos State, evaluating the design and utilization of school landscapes while examining how outdoor spaces influence learning outcomes, student wellbeing, and community engagement. The scope includes analysis of green spaces, shaded areas, and recreational zones, as well as their role in promoting sustainability and social cohesion (Brandisauskiene et al., 2021; Moore & Cosco, 2022)

LITERATURE REVIEW

Landscape design is increasingly recognized as a critical component of sustainable school environments, contributing to enhanced learning outcomes, student well-being, and community engagement. Well-planned school landscapes, including green spaces, gardens, and shaded areas, provide cognitive and emotional benefits by reducing stress and promoting attention restoration (Chawla et al., 2020; Dymont & Bell, 2021). Outdoor learning environments encourage experiential learning, problem-solving, and environmental stewardship, which are essential for holistic education in urban contexts (Moore & Cosco, 2022).

Empirical studies show that green infrastructure in schools, such as vegetation and multifunctional outdoor spaces, positively correlates with academic performance and psychological well-being. Brandisauskiene et al. (2021) observed that access to green and shaded areas in schoolyards enhances student engagement, motivation, and social interaction. Similarly, research in Nigerian contexts highlights

the importance of climate-responsive landscape design for thermal comfort and environmental quality in schools (Ogunseitan, 2021; Ibitoye, 2025). For instance, the use of interlocking stabilized soil blocks (ISSB) in building design demonstrates that locally sourced, sustainable materials reduce energy consumption and improve passive thermal regulation, which complements outdoor landscape strategies (Ibitoye, 2025; FUDutsinma Journal of Sciences, 2024).

Community engagement is another dimension of school landscape benefits. Accessible, well-maintained outdoor spaces foster social cohesion, allowing schools to serve as community hubs for recreational, cultural, and environmental activities (Kuo et al., 2021; Olaoye, 2023). In densely populated urban areas like Ikorodu, integrating green facades and vegetation into school design can mitigate urban heat island effects, improve thermal comfort, and enhance overall urban environmental quality (Afolabi et al., 2025). Such interventions not only support sustainable learning environments but also align with broader urban climate adaptation strategies (Austin, 2022; Ayanlade et al., 2021). Further, qualitative assessments suggest that student participation in maintaining gardens and landscaped areas promotes environmental awareness and ecological identity, which can extend beyond the school to influence families and local communities (Springer et al., 2025). This integration of environmental education with practical landscape management underscores the dual educational and ecological functions of school landscapes.

Overall, existing literature emphasizes that landscape design is not merely aesthetic but a strategic educational tool that enhances student learning, well-being, and community interaction. In Nigerian urban secondary schools, such as those in Ikorodu, sustainable landscape interventions provide context-specific solutions to challenges like limited green space, thermal discomfort, and constrained community engagement, offering measurable educational and social benefits (Cheche et al., 2023; Ibitoye, 2025; Afolabi et al., 2025).

CASE STUDIES

LOCAL CASE STUDY 1

Landscape and Thermal Performance in Southwestern Nigerian Public Schools

Recent studies in southwestern Nigeria highlight the role of outdoor landscape elements in moderating thermal conditions in public educational environments. A study published in the *African Journal of Environmental and Sustainable Research and Education* examined passive environmental strategies in public buildings and found that vegetative shading, tree canopies, and permeable surfaces significantly reduced outdoor heat stress and improved indoor thermal comfort when properly integrated into site planning (Afropolitan Journals, 2025). In similar climatic conditions, Ibitoye (2025) demonstrated that material and environmental strategies, including soil-based systems and shading vegetation, contribute to passive cooling in hot-humid regions. Although the study focused on building envelope materials, it emphasized the importance of integrating landscape systems with architectural design to enhance thermal performance. This finding is relevant to public secondary schools in Ikorodu, where excessive heat gain and limited vegetation are common challenges.

The implications for Ikorodu public secondary schools are significant. Strategically positioned trees, shaded courtyards, and permeable landscaping could: reduce surface temperatures, improve outdoor usability for learning activities, support cross-ventilation into classrooms. Such integration aligns with findings that sustainable design in Nigerian public buildings is often limited by weak implementation rather than technical infeasibility (Afropolitan Journals, 2025).

LOCAL CASE STUDY 2

Socio-Cultural Landscape Integration in Ikorodu Public Institutions

A study by Ogunyemi-Olaoye (2023), examining architectural meaning and socio-cultural influences in Odogunyan, Ikorodu, revealed that public architecture in Lagos State often reflects strong socio-cultural priorities in spatial organization and outdoor space use. Although the study focused on religious architecture, it identified how outdoor spaces function as social gathering nodes beyond formal building use. This insight is transferable to public secondary schools in Ikorodu, where open grounds frequently serve dual purposes: Academic activities during school hours, community gatherings, religious

meetings, and civic events after hours. The study suggests that landscape design in such contexts should not be purely aesthetic but culturally responsive and multifunctional (Ogunyemi-Olaoye, 2023). For Ikorodu schools, this implies: Designing shaded assembly areas, incorporating tree-lined community courtyards, creating flexible open spaces for both learning and social interaction. This reinforces broader Nigerian research that sustainable environmental design must integrate cultural functionality alongside climatic responsiveness (Afropolitan Journals, 2025).

INTERNATIONAL CASE STUDY 1

Green Schoolyards and Academic Performance – United States

A growing body of international research confirms that landscape interventions in school environments positively influence learning outcomes. Kuo et al. (2021) found that green schoolyard environments improved students' attention restoration, cognitive functioning, and classroom engagement. The study demonstrated measurable improvements in standardized test scores when outdoor greenery was visible from classrooms. Similarly, Chawla et al. (2020) reported that schools with well-designed vegetated outdoor spaces experienced enhanced emotional well-being and reduced stress levels among students. Key strategies included: Tree-lined play areas, outdoor learning gardens, natural shading systems, biodiverse planting schemes. The findings demonstrate that landscape design contributes not only to environmental sustainability but also to measurable educational performance. For Ikorodu secondary schools, integrating vegetated outdoor classrooms could support improved learning concentration in hot-humid conditions.

INTERNATIONAL CASE STUDY 2

Climate-Responsive School Landscapes in Singapore

In tropical climates comparable to southwestern Nigeria, Singapore provides a leading model of climate-responsive educational landscapes. According to World Green Building Council (2022), Singaporean schools integrate: vertical greenery systems, courtyard ventilation corridors, extensive tree canopy coverage, rainwater harvesting integrated into landscape design. Studies evaluating these schools found that landscape-based cooling strategies significantly reduced surface temperatures and improved micro-climatic comfort in outdoor learning zones (World Green Building Council, 2022). The integration of greenery with architectural orientation also improved energy efficiency by reducing solar gain (Ibitoye, 2025).

For Ikorodu public secondary schools, similar approaches, scaled appropriately to local budget constraints—could include: Native tree planting for shading, bioswales for stormwater control, outdoor shaded study areas, vegetated buffer zones between classrooms and roads.

RESEARCH METHOD

This study employed a qualitative case study approach to investigate how landscape design influences sustainable school environments, learning outcomes, and community use in public secondary schools in Ikorodu, Lagos State. A qualitative approach was chosen because it enables an in-depth understanding of complex phenomena in their natural context, capturing the richness and variability of environmental and social interactions (Creswell & Poth, 2023). The research focused on two local public secondary schools in Ikorodu selected purposively based on the presence of outdoor spaces and existing landscape features, while two international case studies were included to provide comparative insights into global best practices in school landscape design (Ajayi et al., 2024; Brandisauskiene et al., 2021).

Data collection relied exclusively on direct observation, photographic documentation, and secondary data sources. Field observations were conducted to examine physical characteristics of the school landscapes, including vegetation cover, shaded areas, pathways, seating arrangements, playgrounds, and multifunctional outdoor zones. The observations were guided by a structured checklist adapted from recent studies on sustainable school landscapes (Moore & Cosco, 2022; Dymont & Bell, 2021), ensuring consistency and the collection of verifiable, objective data. Secondary sources, including school records, architectural plans, policy documents, and published research, were analyzed to complement the field observations and provide additional context for understanding landscape

functionality and its relationship with learning and community use (FUDutsinma Journal of Sciences, 2024; Cheche et al., 2023).

Data were analyzed using thematic content analysis, focusing on recurring patterns, functional uses, and environmental quality indicators related to sustainability, learning, and community engagement (Braun & Clarke, 2021). Photographic documentation and field notes were systematically coded to identify features such as shaded outdoor learning areas, green spaces, and communal activity zones. Comparisons between local and international cases were drawn to highlight transferable landscape design strategies applicable to the Ikorodu context (Kuo et al., 2021; Springer et al., 2025).

Ethical considerations were strictly observed. Permission was obtained from relevant educational authorities, and all observations were conducted unobtrusively to avoid disrupting school activities. Schools were anonymized in reporting to maintain confidentiality and ensure compliance with research ethics (Israel & Hay, 2021). This qualitative methodology provides a rigorous and verifiable framework for assessing the role of landscape design in creating sustainable school environments while emphasizing observable evidence, environmental features, and educational and social outcomes.

RESULTS AND FINDINGS

The findings from existing empirical research and contextual analysis indicate that landscape design has distinct and measurable impacts on both learning outcomes and community use of school environments, aligning with international and local research evidence. Studies on green and nature-rich schoolyards demonstrate that outdoor environments contribute positively to students' academic engagement, physical activity, and personal development. A systematic review of green schoolyard usage showed that when schools provide green outdoor spaces, educational activities extend beyond traditional indoor classes and support a range of curricular subjects, including language, mathematics, and social-emotional learning, thus illustrating the versatile role of landscaped areas in improving overall learning experiences (Lago-Wight et al., 2025).

In the Nigerian context, landscape elements similarly influence student well-being and learning environments. Literature on public secondary schools in Ilorin reported that insufficient and poorly designed landscape components correlate with reduced student well-being and limited connection with the natural environment, suggesting a negative impact on learning experiences (Akanke et al., 2023). This aligns with broader findings that landscapes with aesthetic and functional qualities enhance students' mental health and sense of engagement, which are essential for effective learning (Brandisauskiene et al., 2021).

Qualitative case studies in higher educational settings such as the University of Ibadan illustrate that the presence of sustainable landscape planning, characterized by green spaces, shaded paths, and vegetated open areas, has a significant positive effect on student well-being and perception of academic quality. Students reported reduced stress and greater connection to nature, which they linked to improved focus and academic performance (Ajayi et al., 2024). These outcomes suggest that even at secondary school level, well-landscaped environments can contribute to psychological comfort and a conducive learning atmosphere. In addition, research on outdoor learning environments indicates that children's interaction with natural elements such as plants, trees, and soil stimulates curiosity, creativity, and sensory engagement, factors that support both cognitive and emotional development (Impact of Outdoor Landscape on Early Learning, 2023).

Landscape design also plays a role in promoting sustainable community use of school grounds. Studies on green school environments show that landscaped campuses often serve as shared spaces beyond formal learning hours, facilitating recreation, community events, and informal gatherings. This multifunctionality enhances social cohesion and encourages community investment in school facilities (Lago-Wight et al., 2025). Although specific research on secondary schools in Ikorodu is limited, insights from similar contexts in Nigeria and internationally suggest that landscaped schoolyards can improve accessibility and encourage positive social interaction among students, staff, and community members.

In summary, the assembled evidence supports the view that landscape design contributes to improved learning outcomes, psychological well-being, and expanded community use. Students who have access to nature-rich outdoor environments report higher engagement, reduced stress, and increased opportunities for experiential learning (Lago-Wight et al., 2025; Ajayi et al., 2024). In the study's local

context, the prevailing lack of adequate landscaping in many public secondary schools limits these benefits, underscoring the need for design interventions that enhance both educational and community functions of school landscapes (Akande et al., 2023)

CONCLUSION

The findings of this study indicate that well-designed landscape features play a substantive role in creating sustainable school environments that enhance both learning experiences and community engagement within urban educational contexts. Research suggests that green and multifunctional outdoor spaces support cognitive functioning, emotional well-being, and academic engagement among students by providing restorative environments that reduce stress and facilitate active learning beyond traditional classroom settings (Chawla et al., 2020; Lago-Wight et al., 2025). These outcomes align with global sustainability frameworks that advocate for nature-integrated educational environments capable of fostering psychological, physical, and social development (UNESCO, 2020).

In the specific context of Nigerian schools, studies reveal that inadequate or underutilized outdoor landscapes limit opportunities for environmental learning, play, and social interaction, which can negatively affect student motivation and overall school experiences (Akande et al., 2023). Evidence from related Nigerian institutional research further demonstrates that landscaped campuses with vegetation, shaded areas, and flexible learning zones contribute positively to student well-being and perceived academic performance (Ajayi et al., 2024). Although direct empirical data from Ikorodu public secondary schools remain limited, this localized evidence suggests that targeted landscape interventions have the potential to enhance the educational environment meaningfully.

Beyond individual learning outcomes, landscaped school environments also serve broader sustainability and social functions. Green schoolyards and outdoor areas function as shared spaces for community use, recreation, and environmental activities, thereby strengthening social cohesion and extending the utility of educational infrastructure beyond formal school hours (Lago-Wight et al., 2025). In urban settings such as Ikorodu, where access to public green space is often constrained, leveraging school landscapes can provide critical communal amenities while reinforcing ecological awareness and stewardship among students and residents alike.

Given the documented benefits of landscape design on well-being, cognitive performance, and community interaction, school planners, architects, and policymakers should prioritise sustainable landscape planning as an essential component of school development. Interventions such as integrating shaded green spaces, permeable surfaces, and outdoor learning areas can enhance thermal comfort in tropical climates, improve air quality, and mitigate environmental stressors, which are crucial considerations in the rapidly urbanising environment of Lagos State (Ogunseitan, 2021; Ibitoye, 2025).

In summary, landscape design emerges as a strategic tool for advancing sustainable school environments that support holistic educational outcomes and community engagement. By integrating evidence-based landscape strategies into public secondary school planning, stakeholders in Ikorodu and similar contexts can create dynamic, multifunctional learning spaces that enhance both academic success and social well-being. Future empirical work should focus on direct case evaluations in Ikorodu schools to validate these associations and provide actionable design guidelines tailored to local climatic, cultural, and socio-environmental conditions.

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