

## Physical School Environment and Students' Achievement: Lessons for Nigeria

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### ABSTRACT

*Nigeria is in crisis regarding its education, and implementing physical school environment policies is a critical component of all that is required to get out of the crisis. Student achievement is linked to student comfort, and student comfort is reported as the most important aspect of the school's physical environment. If Nigerian students, as students in other developing countries, are comfortable in a cognitively stimulating physical school environment, it becomes easier for them to develop the skills, knowledge and values needed for them to become functional citizens of the country. This article discusses the physical environment of the school with particular reference to how student achievement is influenced by such physical aspects of the school's environment as buildings and their surroundings; biological and chemical agents detrimental to health; and by such physical conditions as temperature, noise and lighting. The paper suggests that strategies for creating and maintaining healthy physical school environments for student achievement in Nigeria should address issues having to do with school location, landscaping, hygiene and health, cleanliness and sanitation, classroom size, shelter, acoustics, ventilation, adequate lighting, noise level and suitable furniture.*

**Keywords:** Physical School Environment, Healthy School Environment, Students' Health, Students' Achievement.

### INTRODUCTION

Student achievement is an educational outcome of direct relation to the quality of teachers available. However, there are other factors that also exert some influence on student performance. Parental socio-economic status (Ravitch, 2009) and parental involvement in the education of their children (Bagin, Gallagher & Moore, 2008), though not directly related to factors within the school that generate impact on student achievement, do conspire to exert a significant influence on performance outcomes. There is also the physical environment of the school which is directly related to factors within the school that can function in generating effects on performance scores (Buckley, Schneider & Shang, 2005).

The physical school environment encompasses a school's buildings and all of its contents, including the physical structures, infrastructure, and furnishings and the aesthetic environment of the school's buildings (Marx, Wooley & Northrop, 1989) – the site on which the school is located; and the surrounding environment, including air, water and materials that children may come into contact with (World Health Organisation & United Nations Children's Fund, n.d.). In other words, the physical school environment is related to building conditions, physical safety and classroom conditions that are critical to creating an optimal environment for student achievement. Therefore, the factors that influence the physical environment include school buildings (their age and their architecture) and their environment; chemical or biological agents prejudicial to health; and physical conditions such as temperature, noise, lighting, and anything present that could maximise safety hazards (Marx, et al, 1989).

There is a growing body of literature that students receive the best instruction when the physical aspects of the school environment are modified to create an

environment that is accessible, reasonably comfortable, cognitively stimulating, and free of physical, biological and chemical hazards. Schools, work places and homes provide the major environments where the majority of Nigerians spend most of their time (Pona, Xiaoli, Ayantobo & Tetteh, 2021). Similarly, after the home, the school environment is the most influential factor in a child's development (Ogunfowokan, Esan, Salau, Bamidele & Ojo, 2018). Some of the living environments prevalent in Nigeria expose Nigerians to structural issues, indoor pollution, lead-based paint hazards, electric and fire hazards, and inadequate sanitation and heating (Ezebilo & Animasaun, 2012). These environmental hazards have impacted the health and safety of the population (Pona, et al, 2021). Schools in Nigeria cannot, therefore, be characterised as positive school environments – “having appropriate facilities, well-managed classrooms, available school-based health supports, and a clear, fair disciplinary policy” (U. S. Department of Education, 2022, para. 2). This claim, particularly with regard to the physical school environment, is strongly supported by the findings of numerous studies conducted on the health of physical school environments in Nigeria (e.g. Olatunya, Oseni, Ogundele & Oyelami, 2014; Bisi-Onyemaechi, Akani, Ikefuna, Tagbo & Chinawa, 2019; and Amoran, Kupoluyi, Salako & kupoluyi, 2017). If schools have a vital role in maximising learning outcomes for students to enable them become successful and useful members of their respective communities, then every measure is not out of order to ensure that the physical learning environment is one conducive to the emotional and cognitive development of learners. The physical school environment also affects teachers in terms of their effectiveness in maximising student academic outcomes, since the physical environment is established in research as being of great influence on job satisfaction (Klitzman & Stellman, 1989). The physical school environment therefore not only influences learning outcomes (Schneider, 2002) but also promotes teacher quality which wields the greatest power when it comes to maximising student learning outcomes (Rice, 2003 and Australian Government, 2016).

In Nigeria, access to quality education has continued to be an elusive reality for a good percentage of children. For example, the World Bank in 2015 reported that nationally, 60% of children in primary school who completed Year 4 and 44% of those who completed Year 6 were unable to read a complete sentence (World Bank, 2015). Close to 10% were unable to add numbers at the end of Year 6 (World Bank, 2015). Poor learning outcomes were reported to be most severe in the north of the country. More than two-thirds of children in the region were reported to have achieved no literacy even after passing out from primary school, compared to only 18 – 28% of their counterparts in the south (World Bank, 2015). The lack of the desired learning outcomes achieved from primary school was reported to have often translated into low rates of successful completion of secondary school, especially for students in public or federal schools in the north. This state of affairs remains an ever-present reality for education in Nigeria, as Teach for Nigeria Fellowship (2021) inadvertently attests to. Limited – or lack of – access to a safe and supportive school environment has been reported as a significant factor constraining the realisation of the desired learning outcomes for a good proportion of children in the country. From dilapidated classrooms, inadequate classroom space, lack of health facilities, broken classroom furniture to lack of working toilet facilities, many schools in Nigeria are in appalling conditions (LEAP Africa, 2022). In some schools, students are forced to sit on the floor in poorly constructed or unfinished makeshift

classrooms while others learn in the shade of trees. Many schools in Nigeria are substandard, lacking basic sanitary rooms, health facilities and clean drinking water, classrooms, furniture, electricity and teaching equipment. In some public high schools, teachers are expected to teach more than 90 students, which is more than the recommended class size for one teacher; some students share desks and chairs. Children in Nigeria have been reported to generally learn in unhealthy environmental conditions (A Moran, Kupoluyi, Salako & kupoluyi, 2017). This then is the problem of this paper.

In view of the forgoing, physical school environment policies are important policies that Nigeria needs as a critical component of its effective educational system. The purpose of this paper is to survey the literature on the various investigations conducted into the strong influence that the physical school environment exercises on educational outcomes, and then suggest measures that can be taken in Nigeria for a way forward.

### **Defining Healthy Physical School Environment**

A healthy physical school environment is a fertile environment for student success. A school with a healthy physical environment means a school with an environment that is reasonably comfortable, cognitively stimulating and free from physical, biological and chemical hazards. According to the World Health Organization and United Nations Children's Fund (n.d), having a healthy physical school environment is related to:

- provision of basic needs such as shelter, heat, water, adequate lighting, ventilation, sanitation facilities and emergency medical care;
- protection against biological threats such as vector-borne diseases and those that may arise from molds, unsafe or insufficient water, vector-borne diseases, poisonous animals, dangerous rodents and insects, and other animals (e.g. dogs);
- protection against physical threats such as violence and crime, injuries, extreme heat, cold and radiation; and
- protection against chemical threats that can arise from air pollution, water contamination, pesticides, hazardous waste, hazardous materials and finishes, asbestos, paint, and cleaning agents.

Thus, when the physical school environment is defined in relation to school buildings and all of their contents, including physical structures, infrastructure, and furnishings; the site on which the school is located; and the surrounding environment consisting of vegetation, air, and water, then a healthy physical school environment, according to World Health Organisation and United Nations Children's Fund (n.d.), means that:

- schools are not located near such hazardous areas as transportation corridors, military bases, bus depots, industrial sites, abandoned lots, landfills, utility plants, and construction sites as an antidote to health threats to the student and staff occupants of the school;
- schools are landscaped with trees and flowers planted around the school grounds to give the school a scenic look and to provide shade from a sweltering sun, to minimise the danger of over-exposure to the ultraviolet rays of the sun; (Landscaping can promote the health and emotional well-being of student occupants of schools via the provision aesthetic pleasantness and through encouraging physical outdoor activity as an antidote to stress.);
- spacious classrooms are designed for lower student density so that students do not exceed 20 in number; (Lower student density will facilitate interaction and easy

communication between teachers and students, with concomitant maximisation of student outcomes.);

- emergency medical care facilities are available to facilitate swift response to such tragic accidental events that may arise as injuries and poisonings;
- classrooms and grounds are clean and well maintained;
- the classrooms are clearly visible, inventing and designed with good ventilation and low levels of unwanted or unpleasant sound;
- an incinerator is in place to burn up waste in order to help rein in the spread of communicable diseases, discourage the presence of pests and other vectors, and eliminate the risk of human contact with materials that are potentially hazardous;
- there is hazardous materials storage to ensure that hazardous materials are stored safely and securely, preferably in a structure removed from educational facilities; (Hazardous materials include fuels, some cleaning supplies, solvents, paints and wood pesticides, finishes and fluids for vehicles.);
- provided of separate and well-maintained toilet facilities for boys and girls;
- there are well-designed spaces for outdoor games and recreational activities for student;
- there are well-designed spaces for student outdoor play and recreational activities;
- students are secure, and feel safe and comfortable everywhere on school property.

### **Conceptual and Definitional Issues in Relation to Student Achievement**

Student achievement is the rigorous evaluation of the quantity of academic's content a student learns in a set time frame. Each level of instruction has specific standards or goals whose attainment the school must ensure for students. The ultimate object of any curriculum and its implementation is to raise the knowledge level of individuals in a way that significantly affects their readiness for future endeavours. The attainment of learning goals or instructional standards – called achievement – is usually evaluated through the use of frequent progress and comprehension checks and examinations. However, attainment of learning goals or instructional standards is not sufficient in the definition of student achievement. Learning goals or instructional standards are just the building blocks for higher-order dimensions of achievement. This is because when students are finished with schooling and transit into public life, they are judged not by their ability to perform on a test of basic skills, but by their quality of their work and character, and the usefulness they bring to the table in the advancement of their respective societies. To paint a full definitional picture of student achievement, there is the need to go beyond such narrow traditional definitions as “performance outcomes in intellectual domains taught at school, college, and university” (Spinath, 2012, p. 1). A broader definition of student achievement therefore becomes necessary. Student achievement therefore needs to be defined in the context of students doing well academically, obtaining life skills and giving back to their community. According to Bocian (2021), achievement includes the following three dimensions:

1. **Personal Dimension.** This is where academically achieving students are “prepared to lead lives in which they are content and filled with a sense of wellbeing. They believe in themselves and feel passionate about the careers and vocations to which they aspire.

2. **Social Dimension.** This is the dimension according to which academically achieving students are “prepared to be contributing members of society. They collectively form an informed electorate, upholding our country’s core values of liberty, justice, and equality. They show respect and tolerance for others, stand up for those who are vulnerable, and reject violence and crime.
3. **Economic Dimension.** This is where academically achieving students have the skills to sustain themselves in financially viable careers, and to contribute to a thriving national economy characterized by high levels of innovation and entrepreneurship.

Students’ scores on standardised tests therefore fail to provide a comprehensive picture of such attributes as creativity and critical thinking skills. Studies indicate that standardised tests reward superficial thinking and may discourage more analytical thinking. Additionally, because of the small sample of knowledge that is tested, standardised tests provide a very incomplete picture of student achievement (Harris, Smith & Harris, 2012). In the light of the foregoing, student achievement is here defined as the attainment of specific learning objectives as well as broader goals such as being able to apply a concept learnt to a practical or new situation, being able to think critically, being able to work professionally with others, being able to live in conformity to accepted standards of social and professional conduct; and living a life of service to one’s community

### **Physical School Environment and Student Achievement – Lessons for Nigeria**

The results of numerous studies demonstrate that the quality of the physical environment significantly affects learning outcomes. Good physical school environments facilitate learning, while inappropriate ones act as a constraint to it (Trinity Inclusive Curriculum, 2016). This is because effective teaching that leads to meaningful learning can only take place in a safe and supportive school environment where children work closely with staff members for attainment of optimal academic results. A safe and sufficient water supply, sanitary facilities and shelter from the elements are basic necessities for a healthy physical learning environment. Equally important is protection against biological, physical, and chemical hazards that can create an unhealthy learning environment. Waterborne infectious diseases and physical hazards associated with poor construction and maintenance practices are examples of the risks children face in Nigerian schools. Therefore, a well-structured physical school environment that is free of these biological, physical, and chemical hazards is an integral part of efforts at setting a positive school tone for student success in the country.

Physical school environment also indirectly affects student achievement from its direct impact on teachers. The teacher is Number One on the list of factors required for student achievement, and teachers require good physical environments to be effective in maximising learning outcomes (Rice, 2003 and Australian Government, 2016). The indirect impact of a school’s physical environment on student achievement means, among other things, that dilapidated school buildings contribute to teacher despair and frustration, while building renovations can lead teachers to have a renewed feeling of hope and commitment. Overcrowding and heavy teacher workloads create stressful working conditions for teachers and lead to increased teacher absenteeism. Overcrowded classroom conditions constrain the quantity of time teachers can devote to innovative teaching methods and result in a constant struggle to simply maintain order. All these

increase the likelihood that teachers would experience burnout sooner than would otherwise be the case (U. S. Department of Education, 2022).

Certain physical aspects of the school environment correlational and causal relationships have been established with student achievement. According to Earthman (2002), students who receive instruction in buildings with good environmental conditions can achieve test scores that are 5% to 17% higher than the scores of students in taught in substandard buildings. (Other research has recognised that student achievement lags behind when children are taught in dilapidated school buildings. However, according to Higgins, Hall, Wall, Woolner and McCaughey (2005), this does not mean that student performance inevitably increases when schools graduate from decent buildings to buildings equipped with fancy classrooms, swimming pools, television studios and more).

A survey of primary school children in Ondo State, Nigeria, found that their satisfaction with schooling was significantly related to the physical school environment (Aina, 2015). Another survey on teachers in rural public secondary schools in Ibadan, Oyo State, Nigeria found that physical environmental school factors accounted for 29.2% of the variation in instructional quality (Raji, 2019). Similarly, Ekundayo (2012) surveyed 1200 teachers from 60 secondary schools in south-west Nigeria to determine the relationship between school facilities and student achievement in the affective and psychomotor domains of learning. The findings reported a significant relationship between school facilities and student achievement in the affective domain as well as a significant relationship between school facilities and student achievement in the psychomotor domain of learning. In another study, significant improvements were reported in the learning environment, and these were attributed to improved attitudes towards teaching and learning and improvements in the physical environment created among all users (Higgins, et al, 2005).

On the temperature, air quality, noise levels, light quality on student achievement: Student reading speed, comprehension and performance on Mathematics tests were affected by ambient temperatures above 74<sup>0</sup>(Harner, 1974); Temperature, air quality and heating were found to be individual ingredients of utmost importance to student success (Earthman, 2004); Classroom noise above 40 decibels are negatively related to student achievement (Earthman, 2002); Exposure to chronic noise works against the optimal functioning of cognition, with many research findings reporting reading issues around noise-related problems, impaired pre-reading skills and more general deficits in cognitive functioning (Higgins, et al, 2005); Student performance is enhanced by even distribution of daylight, a wide view, and limited glare and thermal heat gain as one study reported 20% faster student progress in Mathematics and 26% faster progress in reading compared to students in classrooms with less exposure to daylight (Boyce, 2004).

It has also been reported in research that student achievement scores tend to decline as the school buildings deteriorate with age – up to 9%, contingent on maintenance factors (Blincoe, 2008); that schools with better construction conditions have up to 14% lower rates of student suspension (Boese & Shaw, 2005); and that deteriorating conditions and deteriorating infrastructure in schools exercise a negative impact on the morale of occupants of the buildings. Further to that, when morale, pride of place, commitment and enthusiasm are high, teaching and learning reach or approach an expected end (Lumpkin, 2013).

Poorly maintained structures have been reported to be great in the threat to they can pose to children's health. Cracks in floors, walls or foundations usually encourage the presence of insects such as hookworms, mites and jigger fleas which constitute safety threats for students. Broken windows, exposed nail, broken steps and missing stair rails can present students obvious hazards and increase the risk of injury (World Health Organisation & United Nations Children's Fund, n.d.).

Well-designed spaces for student outdoor play and recreational activities are an important aspect of a physical school environment that positively impacts student achievement. This is because outdoor space adds to a cognitively stimulating environment by firing children's imaginations and helping them to develop outward thinking.

Playing outdoors has a cause-effect relationship with tremendously enhanced capacities for creativity, symbolic play, problem solving and intellectual development. Outdoor play has clear physical benefits for developing children including helping children to acquire gross motor skills, eye-hand coordination and helping to prevent obesity. Equally important is the fact that outdoor play is associated with greater amounts of physical activity in children, and whole body exercise has a long-lasting influence throughout childhood (Baranowski, Thompson, DuRant & Puhl, 1993). The physical activity from outdoor play develops muscle strength and improves cardiovascular health. Children who regularly play outdoors tend to be fitter and leaner, develop stronger immune systems, play more creatively, have more active imaginations, report lower stress level (Fjørtoft, 2004), and thus report improved learning outcomes. It is important for outdoor play space to have a design that incorporates natural green features. This is in view of research findings that children who play regularly in natural environments show more advanced motor fitness, including coordination, balance and agility, and they are sick less often (Fjørtoft, & Sageie, 2000).

All of the above statements found in the academic literature and empirical studies speak eloquently to the central place that a well-structured and well-maintained physical school environment should occupy in any education reform initiatives aimed at improving educational quality in Nigerian schools.

## **Conclusion**

The physical environment in Nigeria is not anywhere all it ought to be as an environment particularly conducive to student comfort, necessary for student ability to develop the appropriate attitudes, skills and knowledge for responsible citizenship. An environment that is not truly accessible, not reasonably comfortable, not particularly stimulating to cognition, and not truly free of physical, biological and chemical hazards generally clears the path for low-quality education, which is diametrically at variance with student achievement goals. A clean and well-maintained physical school environment – free of physical, chemical and biological hazards – which promotes the health of students leading to a positive impact on their academic achievement should, therefore, be at the centre of any education reform initiatives in the country.

## **Suggestions**

It is no secret that much needs to be done to improve the quality of education in Nigeria. Creating healthy physical school environments provides a great way to achieve

this. Therefore, ensuring that all schools in Nigeria create and maintain healthy physical environments should be documented as a policy objective of the Government and all education stakeholders. Creating and maintaining healthy physical school environments should address the following issues:

1. **Locations of Schools:** Safety and health considerations should prevail in the choice of locations for schools. Therefore, schools should not be located close to such hazardous/noisy places as transportation corridors, bus depots, industrial sites, abandoned lots, landfills, military bases, utility plants, and construction sites as an insurance against health threats to the students and staff occupying the schools.
2. **Landscaping:** Schools should be landscaped with beautiful spaces for students' social and recreational activities and with trees and flowers planted around the school grounds for scenery and to provide shade from a sweltering sun, to reduce the risk of overexposure to the sun's ultraviolet rays.
3. **Hygiene and Health:** It is important to the health of students that they have clean water to drink, enough water to use for hygiene, and that they have access to clean and well-maintained sanitary facilities – with separate ones for female students. Schools should be equipped with at least a basic first aid kit for prompt response to emergencies, and there should be an incinerator for burning up waste, and a storage facility for hazardous materials.
4. **Cleanliness and Sanitation:** The cleanliness of schools is also an important aspect of the physical school environment. With frequent school cleaning and maintenance practices, there is not only a lowering of the threat of the spread of illness, but also a caring message conveyed to both students and teachers. Students feel better going to clean classes and sitting on clean desks and in clean surroundings. Sanitation in schools is important because young children face unique health hazards, especially respiratory infections, asthma attacks, skin disease, and diarrhoeal outbreaks. The school environment should therefore be one where students feel safe and secured.
5. **Classroom Size:** Classrooms should be spacious enough to prevent overcrowding thereby providing an environment that fosters an interest in learning. They should be designed to accommodate students so that the number of students does not exceed 20. As earlier noted, a lower density of students per classroom will increase teacher and student interaction and communication leading to maximum student outcomes.
6. **Shelter, Acoustics, Ventilation, and Adequate Lighting:** Roofing should consist of durable materials which should be regularly repaired to provide protection from the sun. High ceilings should be provided in classrooms as a check on high temperatures in times of heat. Walls and windows should be insulated to retain heat in time times of cold. Classrooms should be well-ventilated to remove or at least dilute built-up concentrations of pollutants generated indoors. Such pollutants are generated by the breath of students tightly packed in classrooms – which causes a build-up of carbon dioxide – and also by ordours that come from cleaning supplies, paints, perfumes and such like. This returns us to the importance of having spacious classrooms to prevent overcrowding thereby providing an environment that fosters an interest in learning. Well-designed



windows, when open, are minimally OK for letting in fresh air for ventilation purposes, and for letting in adequate lighting for students to read and write. It is therefore recommended that window size should correspond to at least 20% of the classroom floor area, and that there should be auxiliary electric lights if possible.

7. Noise Level: Noises can significantly disrupt an environment otherwise congenial to optimal learning. This returns us to the position that schools should not be located near such hazardous areas as transportation corridors, bus depots, industrial sites, which could prove a huge source of noise distractions. There should also be good quality walls between classrooms to avoid noise interference from adjoining classrooms.
8. Appropriate furniture: Classroom furniture should be provided in adequate numbers, with a plan for regularly replacing broken items. Furniture should be of dimensions appropriate for the age of students, and mobile pieces are preferable, as they allow for more flexible learning strategies.

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