
IMPACT OF SUSTAINABLE SCHOOL ENVIRONMENT ON STUDENT'S HEALTH AND ACADEMIC PERFORMANCE

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Abstract

Understanding about the role of sustainable school environment among educationist is growing considerably in the recent years. In another vein, Students' health and academic performance has been a topic of discussion though a unique position on the sustainable school environment in making and enhancing student health and academic performance cannot be overemphasized especially in this 21st century. In fact the composite elements to sustainable school environment in this regard could be regarded as an imperative phase during school facility planning. It is in line with these considerations that this review paper shed light on the concepts of sustainability, sustainable school, student's health and academic performance, relationship between two elements of sustainable building design, day lighting and indoor air quality impact on the student's health and performance. The review further reveals that sustainability and sustainable school are new concepts that will be applied in learning and teaching and as a support services for sustainable development.

Keywords: Sustainability, Sustainable School Environment, Student's Health and Academic Performance

Introduction

It is clear that nowadays, we need to adopt a more sustainable way of living. This requires changes in the way we think and act, work and play, live and learn. Schools have a crucial and fundamental role to play in ensuring these changes take place and in preparing children for a lifetime of sustainable living. It is for this reason that schools should be sustainable schools. Hence, the importance of school buildings has been recognized as a fundamental element of society (Smedje, Norback & Edling 1997). Healthy environment is needed to create better learning environments. It's not only to embrace the concept of sustainability but is in itself a teaching approach to sustainability.

As one of the 21st century icons that attract researcher's attention. Apart from Sustainability widest acceptability and its application in learning and teaching process, the Sustainable School environment is also recognized to make an impact on the student attendance dropout (Jack and Jewi, 2011). It is in this regard that Baker & Bernstein (2012) argued that if the education system in Africa is furnished with the sustainable school environment; the schools could be geared towards churning out job-creators rather than Job seekers. This requires adequate and effective policies to be designed, developed and implemented to support the Mission of greening school Environment as it was done in many developed countries.

According to National Research Council, (2007), sustainable school (green school) will account for over a third of new education construction in

2010. This report has raised argument among educational policy makers, educational researchers, school administrators and designers in the context of the sustainable school environment. However, McGraw-Hill (2010), re-examining the potential role that school environments may have on the learning and health of the people who spend their days with them and convinced that the quality of the school physical environment can have an impact on student health and learning. Similarly, Wah, (2008) & Rickinson, Lundholm & Hopwood (2009) reveals close relations between school Physical environment with almost all student's academic variables and conditions. The enormous contributions of sustainable school environment have fast beyond what is just required from the ordinary school building environment. This assertion has been supported by National Research Council, (2007) that, it appears to be noticeably high impact of the sustainable school environment on student's and teacher's variables than just in a regular school building.

Sustainable school environment (SSE) has been reflected in many research works to connote Green School. SSE comprised seven main indicators; which could lead to sustainable education. Experts in Green school design for instance, Wendy, Kim & Laura, (2008) & Abramson, (2011) enumerated these indicators as Waste Reduction, Energy Conservation, Water Conservation, Sustainable Transportation, Sustainable School Ground and Green School Environment. In addition, The Academy for Global Citizenship, (2011) conceptualised the key



Figure 1: Determinants for Greening Schools Environment, adopted from The Academy for Global Citizenship, (2011)

Indeed, in a recent report, by the American Society of Civil Engineers (2009) observed that there is growing attention for the need to improve the school environment through healthy building, green design and operations, and this trend is growing. It is worthy to note that this awareness has made a great impact on school administrators and designers to have clear features of setting a green school that can provide learning opportunities for students and support healthy and natural environments for current and future generations.

Consequently, while the interest of educationist and the general public on the use of sustainable school is on the increase, studies in this area is still in its infancy, especially that which focus on sustainable school and its impact on students health and performance (Neilson and Zimmerman, 2011). In order to lead by example, developing worlds especially the African Nations must consider how sustainable practices can be integrated throughout all spectrums of our schools, ranging from facilities management of learning and teaching. Each of these decisions impacts school children, the communities and the planet (The Academy for Global Citizenship, 2011). This could strive to prepare school

students for excelling in the 21st century, and create a healthy and sustainable world.

Moreover, the issue of sustainable school environment has gained acceptance in schools due to its importance. Many Nations considered it as one of the benchmarking tools in school for receiving score and medal for pursuing accreditation (Baker, 2011), create incentives for teachers, administrators, students and janitorial staff (Porritt, Hopkins, Birney & Reed 2009). It also enables the students and teachers to engage in a hands-on learning experience while helping to keep environment healthy (Bartosh, Tudor, Ferguson & Taylor, 2006), provide healthy building blocks for students minds and bodies (National Research Council 2007), students grow an awareness of the physical environment and develop a sense of connectedness with their land (Gallagher, Wheeler, Mcdonough & Namfa 2000) and providing both physical and emotional safety to the children (SEER 2005). In recognition to these enormous contributions Governments, philanthropic organizations, voluntary organization and Parent Teacher Association support training institutions for making sustainable school environment.

Certainly, schools are often judged by the physical appearance and presentation of the

grounds and buildings. Increasing the diversity and extent of vegetation cover in school grounds not only enhances the image of the school but also maximizes the potential of these spaces to provide educational and environmental experiences to the students. In line with this, Neilson and Zimmerman, (2011) reveals that in commitment to pioneering the effort of sustainable school environment, a general policy could be devised to provide the context, commitment and guidelines for courses of action, and the framework for monitoring performance and results. The important of establishing good sustainable school environmental policy has been considered by experts as a crucial stage in making sustainable school environment. In fact, The International Institute for Sustainable Development (IISD) (2008) highlighted the following points:

“Broadly construed, school policies for sustainable development should aim to create a healthy, ecological, economic and socially responsible living and learning environment for all students and staff, and to make the school a model of best practice for the whole community. Sustainable development policies may be set at the school division level. Policies may simply establish a commitment to the environment, with general guidelines on the range of plans and actions that could be adopted at the individual school level”.

In addition, Students, staff and parents can be actively involved in the sustainable school management through activities such as habitat creation, mulching, vegetable gardening, landscaping, productive enterprises (if appropriate) and litter reduction (Abramson, 2011). These opportunities are limited only by the imagination and enthusiasm of the school community. The fact that sustainable school environment (SSE) enhanced student academic performance and Health; its integration in school remained less considerable and valuable in many schools.

An Overview of Sustainability

Sustainability is defined by the World Commission on Environment and Development (2009) as meeting the needs of today without compromising the ability of future generations to meet their own needs.” Sustainable building is a fully integrated; “whole building” approach to design, construction, and operation. Sustainable buildings also referred to as green or high performance buildings are designed to: provide optimum environmental and economic performance; increase efficiencies thereby saving energy, water, and other resources; furnish

satisfying, productive, and quality indoor spaces; use environmentally preferable materials; and educate building occupants about efficiency and conservation.

Baker, (2011) perceives sustainable development as the development that meets the needs of the present without compromising the ability of future generations to meet their own needs. Malaysia Productivity Corporation (2010) explained “Green Technology” as the development and application of products, equipment and systems used to conserve the natural environment and resources, which minimizes and reduces the negative impact of human activities. This has been argued and used in the educational context with respect to school premises about what value SSE indicators could make on the development of instruction. Therefore, sustainable school environment could yield to students’ development when priority is given to issues related to sustainability from use of space, transport in education and other exemplary roles.

Therefore, sustainable development is pursued in magnitude to a preferable future that includes a cleaner environment, a sustained level of economic development without excessive waste and pollution, and the protection of natural resources and biodiversity. To achieve this, we need to develop a sense of citizenship in the sustainable development process through the delivery of quality education, a reappraisal of our core value systems, and the empowerment of communities to make their own decisions on the future that they want to see - both for ourselves and the children. Sustainability netted the interest of young people because they could see its relevance to their own lives and futures.

There was evidence of an upturn in knowledge and understanding of the importance of leading more sustainable lives, and there were examples of more positive attitudes to learning, better behaviour and attendance, and enhanced standards and achievement. Environmental sustainability was a factor in improving learning and teaching in schools. Such benefits are also shown in other research in England, for example, Porritt et al., (2009), and also in USA research, for example, Falco (2004), Bartosh et al, (2006), NEETF, (2000), SEER, (2005), Ernst and Monroe (2004).

An Overview of Sustainable School on Student’s Health and Academic Performance

Schools represent a complicated network of interrelated systems, including building characteristics, the surrounding physical environment, as well as administrative and educational activities directed toward student

achievement and well-being. Environmental sustainability has become a popular paradigm for managing these systems and improving student health and performance. Consequently, school buildings have been recognized as an essential element of society since most of the youngest citizens spend the majority of their hours of the day in school buildings.

Evidence of the impact of sustainable schools is supported by growing research, policy, and practitioner literature. Multiple internationally evidences for instance, Yaks, (2008) and Falco (2004) have shown that a sustainable school raises standards and enhances well-being. This is because sustainable schools engage young people in their learning therefore improving motivation and behaviour; they also promote

healthy school environments and lifestyles. In addition, the evidence shows that sustainable schools advance community cohesion by making valuable connections between the school and its parents, careers and the wider community.

Moreover, Figueiro & Rea 2010 also observed strongly on the evidence of sustainable school environment on students' health and their ability to learn, and ensure that the impacts are positive, such as: when deprived of natural light, children melatonin cycles are disrupted, thus likely having an impact on their alertness during school. Teachers report higher levels of comfort in their classrooms when they have access to thermal controls like thermostats or operable windows (Heschong, 2003, and Lackney, 2001).

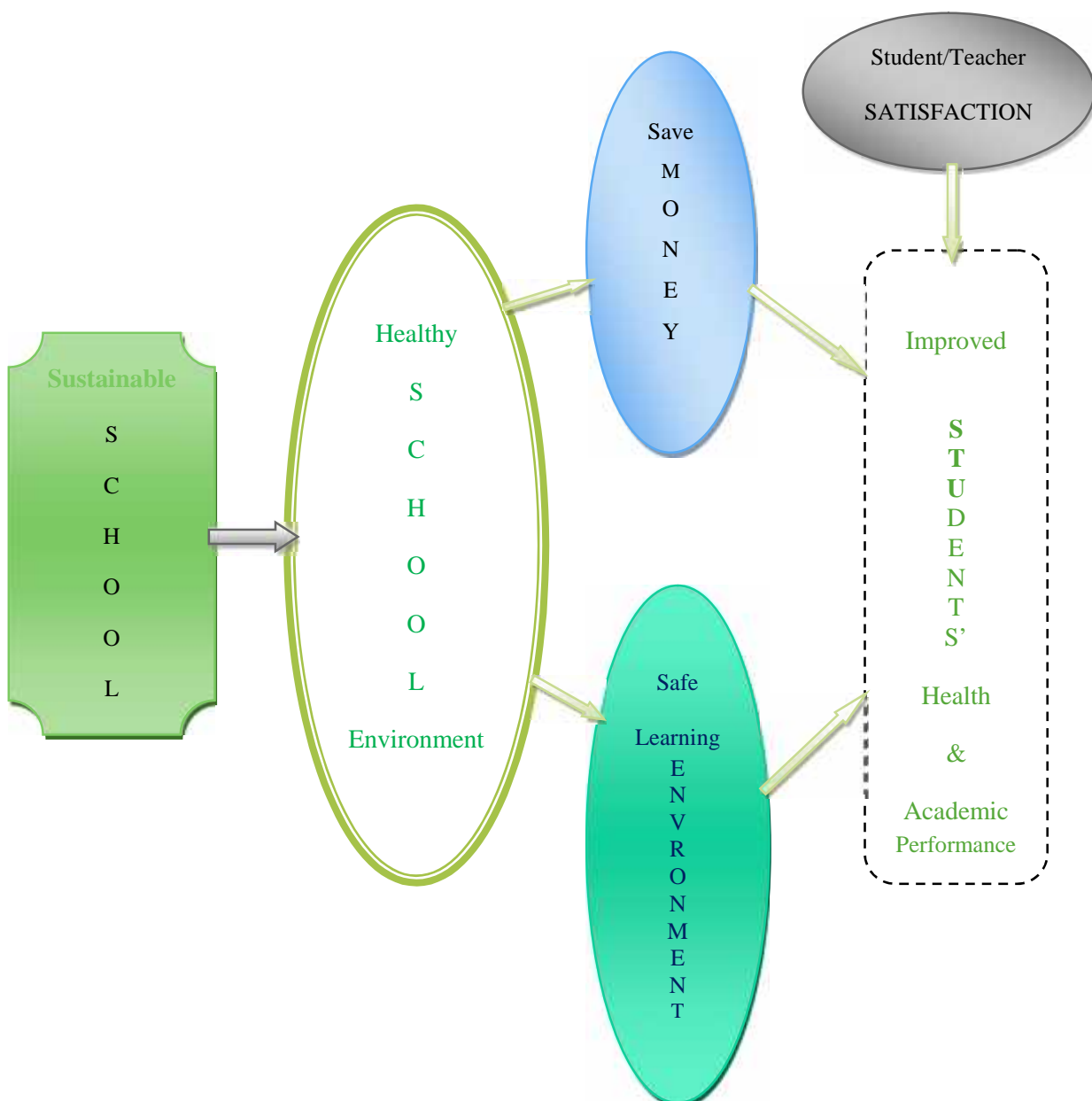


Figure1: Casual Links Model Relating Sustainable School to Student Health and Academic Performance (Yaks, 2008).

Facilities play a significant role in improving students' learning thereby saving energy, resources, and money, but more importantly, there exists a correlation between sustainable buildings and improved student performance (Baker, 2011). This seems intuitive, and a growing number of scientific studies show the relationship between a school's physical condition and student performance.

There have been several studies undertaken on school effectiveness and the influence of the learning environment for education. Healthier and more comfortable classrooms also help school districts recruit and retain teachers. Teachers can also incorporate sustainable school features into their curriculum to provide students with hands-on learning opportunities. As a result, society benefits from the decreased impact on the environment and the increased comfort, health, and quality of life for building users.

Two elements of sustainable building design that have received recent attention, and have been shown to have a profound effect on student performance, are day lighting and indoor air quality (IAQ). Day lighting refers to the wise use of natural sunlight for task illumination normally provided by artificial lighting fixtures. Air quality is concerned with chemical and biological airborne impurities that can have an adverse effect on student, faculty, and staff health. As a result of the integrated sustainable design strategy to use more day lighting, the upfront costs remain relatively the same while the learning environment is substantially improved and operational costs are reduced for years. For that, a whole-building mindset is required from the start of design through the building's entire life cycle.

Daylight and Student Performance

Daylighting reduces the need for electrical lighting and cooling, and can cut lifetime energy expenses. It also makes school buildings more attractive, and improves students' health and productivity. Daylighting includes baffles, roof monitors, skylights, and clerestory structures, not just eye level windows. The design must bring in diffuse light, not direct sunlight, which adds heat. More recently, schools have been built with more windows and lights, but the justification for natural lighting has in large part depended on subjective arguments. The 1990s spurred numerous studies that have shown the positive effect that daylighting has on student performance. The 1992 "Study into the Effects of Light on Children of Elementary School Age: A Case of Daylight Robbery" was conducted in Alberta, Canada by the Policy and Planning Branch of Alberta Education. Over a two-year period, the study compared children attending elementary schools with full spectrum light versus

children attending similar schools with normal lighting conditions. The two-year study found that students under full spectrum light to trace ultraviolet (Hathaway, 1992):

- learned faster,
- tested higher,
- grew faster and had 2/3 fewer cavities than expected,
- 1/3 fewer absences due to illness (3.5 fewer days absent per year)
- increased school attendance
- improved their verbal test scores by 26%, and math scores by 20%

These results support the conclusion that lighting systems are not neutral and have non-visual effects on people who are exposed to them over long periods of time.

Indoor Air Quality and Student Performance

Children have greater vulnerability to some environmental pollutants than adults, because they breathe higher volumes of air relative to their body weights and their tissues and organs are actively thermal, visual, acoustic, or olfactory effects that reduce performance (Gallagher, Wheeler, McDonough, and Namfa, 2000). These pollutants are commonly referred to as indoor pollutants when they affect human health and performance. Indoor temperature and relative humidity can also affect health and performance directly, and can affect human performance indirectly by influencing the airborne level. There is a direct link between poor air quality and respiratory illness such as asthma. In the US asthma is the cause of an average 4.6 missed days of school per child annually (Wakefield 2002). Reduced attendance may ruin learning by decreasing class time for direct verbal and visual transfer of information from the teacher or by causing students to fall behind in their work. In addition, findings are consistent with those of Cox-Ganser and Colleagues (2005) who found that between 1994 and 1996, asthma was the cause of 14 million days of school loss or around 3.4 school days per child. Poor indoor air quality can trigger symptoms including: headache, fatigue, shortness of breath, sinus congestion, cough, sneezing, eye, nose, and throat irritation, skin irritation, dizziness, and nausea, as well as trigger asthma attacks and allergic reactions, spread disease, and expose occupants to toxic substances. These symptoms, according Porritt et al (2009) are collectively referred to as "sick building syndrome" (SBS), a term used to describe situations in which building occupants experience acute health and comfort effects that appear to be linked to time spent in a building, but no specific illness or cause can be identified.

In contrast, the term "building related illness" (BRI) is used when symptoms of diagnosable

illness are identified (e.g. certain allergies or infections) and can be attributed directly to airborne building contaminants (CHPS, 2003). Mould, dust and pollen have an impact on indoor air quality (IAQ) and can affect children with asthma.

The impacts of these needs were to be minimized by appropriate air filtration, education of building users about when to close windows and control of moisture. These findings are consistent with those of Cox-Ganser, White, Jones, Hilsbos, Storey, & Enright, (2005). who found that between 1994 and 1996, asthma was the cause of 14 million days of school loss or around 3.4 school days per child. According to the American Lung Association, (2006), asthma, which is exacerbated by poor indoor air quality, alone accounts for 14 million missed school days each year, making it a leading cause of school absenteeism. Research on asthma in school children by Smedje, Norback & Edling (1997) confirmed that asthma prevalence in schools is associated with elements of poor air quality as a result of higher relative air humidity, higher concentrations of volatile organic compounds, and mould or bacteria. Smedje, Norback & Edling (1997) also found that reported asthmatic symptoms were less common in schools that had installed a new ventilation system, as the new system resulted in higher air-exchange rates, lower concentrations of several airborne pollutants, and lower relative humidity. Further evidence suggests that lower outdoor air ventilation rates, known to cause generally higher concentrations of the pollutants produced indoors, were related to reduce performance among occupants (Wargoeki et al 2000; Smedje, Norback & Edling 1997). Consequent to these effects, Sustainable living must be the new pattern for all levels: individuals, communities, nations and the world. To adopt the new pattern may require a significant change in attitudes and practices of many people.

Conclusion

Research shows that the physical environment provided by school facilities has a significant effect on students and teachers who study and work within schools. Sustainable schools provide a well-lit, healthy, comfortable environment conducive to learning and student achievement while saving money, energy, and resources (Baker, 2011). Creating sustainable schools, either through new construction or existing building renovation, and then operating these buildings in a sustainable way, has the power to improve student academic performance, at a cost less than conventionally built schools. A unique opportunity exists to take advantage of the impact that sustainable schools have on student performance. Sustainable schools allow success above and beyond in meeting the needs of today without compromising the ability of future generations thereby given students and teachers what they deserve: comfort, healthy learning environments contributing to academic success and the achievement of each student's maximum potential, necessary to be responsible and productive citizens and lifelong learners beyond the classroom. Therefore, a sustainable school building project is much more than an end result of merely a fine building; hence a flexible and properly organized design process is the best guarantee to achieve optimum sustainable schools.

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