COMPARATIVE ANALYSIS OF SMART GREEN SCHOOLS AND CONVENTIONAL SCHOOLS IN ENUGU STATE: EVALUATING STUDENTS' HEALTH AWARENESS, ENVIRONMENTAL BEHAVIOURAL PRACTICES, INFRASTRUCTURAL DESIGNS AND MAINTENANCE EFFECTIVENESS

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DOI: https://doi.org/10.5281/zenodo.13736080

Abstract: The study delved into the comparative analysis of smart green schools and conventional schools by evaluating students' health awareness, environmental behavioural practices, infrastructural designs, and maintenance effectiveness. The study was carried out in Enugu urban. The study adopted a descriptive-analytical survey research design as its research methodology. Four research questions were formulated and addressed in line with the purpose of the study, and one hypothesis was tested. A questionnaire and a checklist were used to collect data. The data collection instruments underwent validation by three specialists in measurement and evaluation, and their insights were thoughtfully integrated into the final instrument. The instrument was also tested for reliability using Cronbach Alpha and the reliability coefficient was 0.86. The population for the study was 1,797 teachers from government secondary schools in Enugu Urban and 185 teachers from privately owned secondary schools. A sample of 37 teachers from five privately owned green schools and 300 teachers from ten conventional schools was drawn through purposive sampling. The data collected were analysed using the mean and standard deviation, and the percentage proportion for the checklists and hypothesis was tested using the Independent Samples T-test. The findings from the study indicated that green schools enhance students learning more than the conventional school. It was recommended among others that conventional schools in Enugu State should be upgraded with green features and smart nature to develop quality education.

Keywords: Smart green schools, conventional schools, health awareness, environmental behavioural practices, infrastructural design, maintenance effectiveness

Introduction
The need for a holistic approach to education cannot be overemphasized. Holistic education is a comprehensive approach to teaching that goes beyond mere academics. It recognizes that students are more than just their test scores, students are whole individuals with emotional, social, and ethical needs. In holistic education, educators create positive school environments and provide wraparound support to address both academic and non-academic aspects. This holistic approach requires that education must understand and follow the signs of the time in this tumultuous era, where climatic change, social disparities, political upheavals, and other unprecedented challenges

are facing society. In the dynamic realm of education, where change is constant and innovation abounds, two distinct paradigms emerge the traditional and the transformative. On the one hand are the familiar conventional schools, and on the other hand, are the smart green schools.

Conventional schools are the kind of schools that most people easily think of when they hear the word "school." In conventional schools, students attend classes in classrooms, and each class has a teacher who teaches different subjects. These schools follow a set schedule. Conventional schools use a standard curriculum which means that the same topics are taught to all the students. Students take tests and get grades and with the grades can move to the next level. Conventional schools have rules about behaviour, uniforms, and attendance. Students must follow these rules. Team Bright champs (2024) sustains that conventional schools offer a consistent and organized approach to education. They follow set schedules, established routines, and a structured curriculum to facilitate learning. The organized approach of conventional schools helps students learn time management skills and prepares them for future responsibilities.

Conventional or traditional schooling emphasizes direct in-person communication between students and teachers (Eng, 2023). These interactions also foster communication and collaboration among students. These interactions also foster communication and collaboration among students. However, (Tucher & Izadpanahi, 2017) sustains that conventional schools focus primarily on delivering educational programs and curriculum content, often overlooking the importance of sustainability. This entails that the conventional schools' system of education emphasizes learning based on the provisions of the curriculum without extending learning to sustainable actions. Learning experiences are narrowed down to the classroom environment. This raises the question of whether green schools extend learning beyond the classroom environment. What makes a school green?

A green school is an educational institution that fosters a clean, healthy, and sustainable environment while conserving energy, natural resources, and finances (Chaudhary, 2019). The concept of "green schools" was formulated by the World Summit on Sustainable Development (WSSD) during its conference held in Johannesburg in 2022. The primary emphasis of green schools lies in empowering children to employ relevant skills and take essential steps toward addressing urgent environmental, economic, and social challenges. These critical issues demand immediate attention and action. For WSSD (2022), green schools operate based on the principles of environmental sustainability. Their goal is to raise awareness among teachers and students about environmental issues by actively engaging the community.

A smart green school, therefore, embraces a comprehensive approach to Education for Sustainable Development (ESD). Its goal is to revolutionize educational institutions by promoting cooperation, environmentally friendly methods, and inclusivity. In this framework, students gain knowledge not only from textbooks but also through their surroundings, personal experiences, and interactions (Chaudhary, 2019). Smart green schools place a strong emphasis on indoor air quality, recognizing its direct impact on cognitive function. By ensuring adequate ventilation and effective air filtration, these schools enhance students' capacity to focus, engage in critical thinking, and retain information (Vakalis, et al, 2020).

According to (Gordon, 2013), research has demonstrated that green schools, particularly those with Leadership in Energy and Environmental Design (LEED) certifications have a more positive impact on students' performance. These eco-friendly schools, equipped with features like ample natural light, improved acoustics, and non-hazardous materials, can lead up to a 20% increase in student exam performance. Green schools consistently surpass their conventional counterparts in terms of academic performance. Their focus on

sustainability enhances indoor air quality and thoughtful design that contributes to better student outcomes. These schools are not only nurturing young minds but also cultivating a greener, more promising future. Carver and Wheeler (2021) added that the connection between green space and student health supports this positive impact. That has a positive impact on students' performance. Additionally, green schools are associated with improved test scores, reduced disciplinary issues, and a more conducive learning environment for both students and teachers (Linstroth, 2020).

Green schools cultivate a profound bond with nature. Having access to green spaces promotes physical activity, reduces stress, and enhances mental well-being. Students attending green schools frequently demonstrate improved emotional flexibility and overall happiness (Tucker & Izadpanahi, 2017). Students attending green schools experience reduced absenteeism due to better indoor air quality and a healthier environment, resulting in fewer missed days due to illness (Gordon, 2013).

The goal of green schools is to equip students with an understanding of natural processes, human society dynamics, and ways to harmonize them for the benefit of both people and other species on our planet (Chatham House, The Royal Institute of International Affairs, 2021). Green School strives to mold students into visionary advocates for sustainability practices, empowering them to align their thoughts and actions with environmental responsibility (The Green Institute, 2017). However, (Gough, et al, 2022) argued that even though green features enhance students' learning, prioritizing sustainability can sometimes conflict with traditional academic goals. Therefore, it is very important to strike a balance to avoid compromising educational quality. Parry and Metzger (2023) also added that the disconnect between policy and classroom practice can hinder students' exposure to holistic, multidisciplinary sustainability concepts. Many teachers are not finding it easy to integrate sustainability into their teaching effectively.

In Enugu State, the researchers observed that sustainability education is not being practiced in conventional schools. School infrastructures are not being maintained, many of them are dilapidated and school children study under such conditions. Recently, the Enugu State Government has taken initiatives to transform and redefine education by constructing smart and green integrated school campuses in each political ward within the state. These smart and green integrated schools are still under construction except for the one in Owo, Enugu Smart Green School which is operational and waiting for some AI devices to be supplied and the teachers to be trained. Notably, the researchers discovered that some privately owned schools in Enugu State have the principles of sustainability and innovation. Though they cannot be labelled as smart green schools, they have some green features, they incorporate environmentally conscious practices and modern technology. So far, the conventional curriculum has no room for smart green. For those privately owned schools, it seems they have a dual curriculum. They use one curriculum to attract people to make it look like smart green. It is based on this framework that the researchers seek to make a comparative analysis of smart green schools and conventional schools in Enugu State by evaluating students' health awareness, environmental behavioural practices, infrastructural design, and maintenance effectiveness.

Purpose of the Study

The main purpose of the study was to make a comparative analysis of smart green schools and conventional schools in Enugu State: evaluating students' health awareness, environmental behavioural practices, infrastructural designs, and maintenance effectiveness. The study specifically investigated:

1.   Students' health awareness level in smart green and conventional schools in Enugu State.

2. Students' environmental behavioural practices in smart green and conventional schools in Enugu State.

3. How infrastructural design enhances students' overall learning experiences in both smart greens and conventional schools in Enugu State.

4. The maintenance effectiveness of smart green and conventional schools in Enugu State

Research Questions

The following research questions guided the study:

1. To what extent is students' health awareness level in green and conventional schools in Enugu State?

2. To what extent are students' environmental behavioural practices in green and conventional schools in Enugu State?

3. To what extent does infrastructural design enhance students' overall learning experiences in both green and conventional schools in Enugu State?

4. To what extent is the maintenance effectiveness of green and conventional schools in Enugu State?

Hypothesis

The following null hypothesis was tested at a 0.05 level of significance:

1. There is no significant difference in mean scores between green schools and conventional schools in Enugu State

Methodology

The study was carried out in Enugu State. It adopted a descriptive analytical survey research design. Existing scholarly works were examined to inform the study. Four research questions were formulated and addressed in alignment with the study's objectives. Instrument for data collection questionnaire and checklist on Green Schools and Conventional Schools (GSCS) in Enugu State. The response scale for the questionnaire items was Very Great Extent (VGE), great Extent (GE), Small Extent (SE), Very Small Extent (VSE), whereas that of the checklist was Available and Not Available for infrastructural design, and Very Good (VG), Good (G), Fair (F), Poor (P) for maintenance effectiveness. Three specialists reviewed and validated the research instruments, and their insights were integrated into the final version of the developed tool. The instrument was also tested for reliability using Cronbach Alpha and the reliability coefficient was 0.86.

The population for the study was 1,797 teachers from government secondary schools in Enugu Urban (Source: Planning Research and Statistics, PPSMB 2024) and 185 teachers from privately owned secondary schools. So far there is no public school in Enugu State that is green or smart and in features. Most of the schools have computer laboratories which are not effectively used. Presently, the Enugu State Government is constructing smart and green integrated school campuses in each political ward except for the one in Owo, Enugu Smart Green School which is operational and waiting for some AI devices to be supplied and the teachers to be trained. On the other hand, some of the privately owned schools have some green features. They have no smart boards or digitalized devices that use AI. A sample of 37 teachers from five privately owned green schools and 300 teachers from ten conventional schools was drawn through purposive sampling. The data collected were analysed using the mean standard deviation, and percentage proportion for the checklist, and the hypothesis was tested using an Independent Samples T-test. To assess the respondents' extent of agreement or disagreement with the items in the questionnaire, a numeric scale was employed as indicated below:

Nominal value	Real limits of numbers	scaling statement
4	3.50 – 4.00	Very Great Extent
3	2.50 – 3.49	Great Extent
2	1.50 – 2.49	Small Extent
1	0.50 – 1.49	Very Small Extent

Items with a mean value of 2.50 or higher were interpreted as positive responses, whereas those with mean ratings below 2.50 were categorized as negative responses.

For the checklist, a real limit of numbers was adopted for the percentage proportion as follows:

Real limits of numbers	Scaling statement
0.90 – 100	Highly Available / Excellent
0.80 – 0.89	Very Available / Very Good
0.70 – 0.79	Quite Available / Good
0.60 – 0.69	Reasonably Available / Reasonably Good
0.50 – 0.59	Moderately Available / Fair
0.40 – 0.49	Poorly Available / Poor

Results

Research Question 1: To what extent is students' health awareness level in green schools (GSs) and conventional schools (CSs) in Enugu State?

Table 1

Mean ratings of the extent of students' health awareness level in green and conventional schools in Enugu State

In my school,	$\bar{X}$ GSs	SD	$\bar{X}$ CSs	SD	Remarks GSs	CSs
1. there are hygiene practices such as washing of hands, clean toilets, clean space for eating, etc.	3.9	0.13	2.1	0.34	VGE	SE
2. students participate in physical exercise and sports.	3.41	0.11	3.48	0.23	GE	GE
3. we have a green field	3.64	0.10	3.72	0.27	VGE	VGE
4. we have equipment for physical exercise	2.54	0.10	1.56	0.42	GE	VSE
5. there is indoor air quality	3.44	0.10	2.54	0.32	GE	GE
6. a health education programme is offered	3.62	0.10	2.3	0.32	VGE	SE

Data presented in Table 1 showed that out of six items rated, mean scores of 3.9, 3.64, and 3.62 for students' health awareness in green schools were to a very great extent. Also, mean scores of 3.41, 2.54, and 3.44 were to a great extent. For the conventional schools, mean scores of 3.72, 3.48, and 2.58 of students' health awareness were of very great extent and great extent respectively. While the mean scores ranging from 2.1 to 1.56 were small and very small extent. This showed that green schools created more awareness of students' health practices than conventional schools.

Research Question 2: To what extent are students' environmental behavioural practices in green and conventional schools in Enugu State?

Table 2

Mean ratings of students' environmental behavioural practices in green schools (GSs) and conventional schools (CSs) in Enugu State

In my school,	$\overline{X}$ GSs	SD	$\overline{X}$ CSs	SD	Remarks GSs	CSs
1. I feel responsible for taking care of the school environment	3.32	0.22	2.32	0.32	GE	VSE
2. I make use of the recycle bin whenever I have something to throw away	3.8	0.12	1.84	0.37	VGE	VSE
3. my action can positively impact the school environment	3.44	0.23	2.74	0.33	GE	GE
4. I participate in tree planting	3.28	0.21	1.44	0.57	GE	VSE
5. I participate in environmental cleanups	3.58	0.10	1.4	0.45	VGE	VSE
6. there are gardens in the school premises	3.08	0.36	1.36	0.46	GE	VSE

The data presented in Table 2 showed that students' environmental behavioural practices in green schools had their means ranging from 3.08 – 3.8. Each was above the cut-off point of 2.50, indicating that all the items were to a good extent practiced by the students. The conventional schools had their means ranging from 1.36 – 2.74. Apart from item 3, which had a mean score of 2.74, all the other items were to a very small extent, indicating that environmental behavioural practices were very poor.

Research Question 3: To what extent does infrastructural design enhance students' overall learning experiences in both green and conventional schools in Enugu State?

Table 3

Percentage proportion of infrastructural design of green and conventional schools in Enugu State

Checklist of infrastructural design	Green schools		Conventional schools	
1. Ventilation system	0.62	RA	0.23	VPA
2. Natural light in classrooms with ample windows for daylight exposure	0.53	MA	0.44	PA
3. Outdoor green spaces	0.52	MA	0.38	VPA
4. Green roofs	0.50	MA	0.28	VPA
5. Outdoor learning areas	0.64	RA	0.33	VPA
6. Physical activity zones such as playgrounds	0.68	RA	0.47	PA
7. Non-toxic materials				
	0.56	MA	0.41	PA

Checklist scale statement: Highly Available (HA), Very Available (VA), Reasonably Available (RA), Quite Available (QA), Poorly Available (PA), Very Poorly Available (VPA)

Data in Table 3 show that the infrastructural designs rated in the green schools had percentage scores ranging from 0.50 – 0.68, which indicates that the items were available to a reasonable or moderate extent respectively.

The percentage scores of the infrastructural designs rated in the conventional schools range from 0.23 – 0.47. This implies that infrastructural designs in conventional schools were poorly and very poorly available.

Research Question 4: Percentage proportion of the extent of the maintenance effectiveness of green and conventional schools in Enugu State?

Table 4

Percentage proportion of the extent of maintenance effectiveness of green and conventional schools in Enugu State

Checklist of Maintenance Effectiveness	**Green schools**		**Conventional schools**	
1. Regular inspection to identify and address maintenance issues	0.66	RG	0.13	VP
2. Proactive repairs	0.52	F	0.16	VP
3. Green cleaning practices	0.60	RG	0.36	P
4. Landscaping	0.64	RG	0.21	VP
5. Ground Maintenance	0.68	RG	0.28	P

Checklist scale statement: Excellent (E), Very Good (VG), Good (G), Reasonably Good (RG), Fair (F), Poor (P), Very Poor (VP)

Data in Table 4 shows that out of five items rated for the green schools, a percentage score of 0.52 indicated item 2 was fairly done, while the rest ranging from 0.60 – 0.68 were reasonably good. The percentage scores of the items for conventional schools range from 0.13 – 0.36, implying that the maintenance effectiveness of conventional schools was very poor.

Hypothesis

There is no significant difference in mean scores between green schools and conventional schools in Enugu State. A two-sample t-test was performed to compare green schools and conventional schools (see Appendix A). In item 1, there was a significant difference in hygiene practices of green schools M = 3.86, SD = 0.347, and conventional schools M = 1.98, SD = 0.886; t (335) = 12.778, p = 0000. The t-statistics indicate that there is a significant difference between the means of green schools and conventional schools. The p-value of 0.000 suggests that this difference is statistically significant.

In item 2, there was a significant difference in students' participation in physical exercise and sports for green schools with M = 3.27, SD = 0.450, and conventional schools with M = 2.15, SD = 0.860; t (335) = 7.766, p = 0.000. The t-value indicates a substantial difference in mean scores between the two schools. The p-value is less than 0.05, which means that the observed difference is statistically different.

In item 3, there was a significant difference in having a green field for green schools with M = 3.59, SD = 0.498, and conventional schools with M = 2.60, SD = 0.925. The t-statistics of 6.400 and p-value of less than 0.05 indicate a significant difference between the means of green schools and conventional schools.

In item 4, there was a significant difference in having equipment for physical exercise for green schools with M = 3.57, SD = 0.502, and conventional schools with M = 1.74, SD = 0.555; t (335) = 19.111, p = 0.000. The mean score of green schools is significantly higher than the mean score of conventional schools. The t-test result

indicates that there is a statistically significant difference between the means of green schools and conventional schools.

In item 5, there was a significant difference in the indoor quality of green schools with M = 3.65, SD = 0.484, and conventional schools with M = 1.96, SD = 0.629; t (335) = 15.779, p = 0.000. The mean score of green schools is significantly higher than the mean score of conventional schools. The t-test result indicates that there is a statistically significant difference between the means of green schools and conventional schools.

In item 6, the health education programme offered in green schools has a mean score of 3.59, SD 0.498, and conventional schools with a mean of 2.27, SD 0.621; t-value of 12.493 and p-value of 0.000. This implies, that there is a statistically significant difference in the mean of health education programme offered in green schools and conventional schools.

In item 7, the respondents' responses on the responsibility for the care of school environment have a mean of 3.57 with an SD of 0.502 for green schools and a mean of 1.89 with an SD of 0.817 for conventional schools. The t-value of 12.205 and p-value of 0.000 indicates a significant difference between the two schools.

In item 8, the respondents' responses on the use of recycle bins in green schools have the mean and SD of 3.89 and 0.315 respectively, while the mean and SD of conventional schools are 1.26 and 0.441 respectively. They have the t-value of 35.133 and p-value of 0.000 which suggests a statistically significant difference between the two schools.

In item 9, the respondents' responses on how their actions can positively impact the school environment showed a mean and SD of 3.46 and 0.650 for green schools and a mean of 2.37 and SD of 0.708 for conventional schools. They have the t-value of 8.940 and p-value of 0.000 which suggests a statistically significant difference between the two schools.

Item 10 presents the respondents' responses on their involvement in tree planting showed a mean and SD of 3.78 and 0.417 for green schools, and a mean of 1.26 and SD of 0.438 for conventional schools. They have the t-value of 33.311 and p-value of 0.000 which means that there is a statistically significant difference between the two schools.

In item 11, respondents' participation in school cleanups in green schools has a mean of 3.65 with an SD of 0.484, while conventional schools have a mean of 1.18 with an SD of 0.385. The mean score of green schools is significantly higher than the mean score of conventional schools

The t-value of 35.717 and p-value of 0.000 indicate that there is a statistically significant difference between the two schools.

In item 12, about having gardens within the school premises, green schools have a mean of 2.84, SD = 0.898, and conventional schools M = 1.10, SD = 0.305. T-value is (335) = 24.170, and p = 0000. This result shows that there is a statistically significant difference between green schools and conventional schools.

Discussion of the Findings

The findings from research question one showed that the extent of students' health awareness level in green schools was higher than that of the conventional schools. The result in Table 1 showed that green schools offer students opportunities for hygiene practices, participation in physical exercise and sports, green field, provision of equipment for physical exercise, indoor quality in classrooms, and health education programmes. Prashant and Gowri (2020) pointed out that green schools contribute to students' health awareness by fostering a healthier

environment. These schools emphasize physical activity, nutrition, and mental well-being. By integrating green practices, students become more conscious of their health and learn sustainable practices.

The findings from research question two showed that the extent of students' environmental behavioural practices in green schools is an appreciable extent than the conventional schools. The result in Table 2 showed that students feel responsible for the care of the environment, making use of recycle bins, influencing the school environment through their actions, participating in tree planting, and getting involved in environmental cleanups. Bourke et al, (2022) noted that green schools engage students in sustainable practices, and foster awareness and behaviour aligned with environmental stewardship. Green schools, therefore, prioritize an optimal learning environment.

The findings from research question 3 revealed that the extent to which infrastructural design enhances students' overall learning experiences in green schools is an appreciable extent than that of conventional schools. Infrastructural designs provided in green schools are reasonably and moderately available. Infrastructural designs improve students' learning. This is in line with the comprehensive study, where (Barrettet al, 2019) explored the relationship between school infrastructure and educational outcomes. It was discovered that factors such as optimal school size, classroom design, green spaces, outdoor learning areas, and well-designed school spaces positively impact students' learning experiences and overall academic achievement.

The findings from research question four showed that the percentage proportion of the extent of maintenance effectiveness of green schools was reasonably better than conventional schools. These include regular inspections to identify and address maintenance issues, proactive repairs, green cleaning practices, landscaping, and ground maintenance. According to (Gelfand & Freed, 2010), ongoing maintenance is important to ensure the longevity and effectiveness of green school features. Results from the statistical analysis revealed that there was a significant difference between the green schools and conventional schools in Enugu State in the following areas: students' health awareness, environmental behavioural practices, infrastructural designs, and maintenance effectiveness. Therefore, the hypothesis of no significant difference was rejected at a 0.05 level of significance.

Conclusion and Recommendations

Based on the findings, the following conclusions were made: The extent of students' health awareness level in green schools has an appreciable extent than the conventional schools. The extent to which infrastructural design enhances students' overall learning experiences in green schools is an appreciable extent than the conventional schools. The extent of students' environmental behavioural practices in green schools has an appreciable extent to the conventional schools. The extent to which infrastructural design enhances students' overall learning experiences in green schools is an appreciable extent than conventional schools. There was a significant difference between the green schools and conventional schools in Enugu State.

The recommendations derived from the findings can be summarized as follows:

1.   There is a need to upgrade conventional schools in Enugu State with green features and smart nature to develop quality education.

2.   Students' health awareness levels should be improved in conventional schools in Enugu State.

3.   Students' environmental behavioural practices should be encouraged in conventional schools in Enugu State.

4.   Further studies on smart green schools in Enugu State to ensure proper provision of smart features.

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