BUILDING VENTILATION, LIGHTING AND STUDENTS ACADEMIC PERFORMANCE IN KEBBI STATE SECONDARY SCHOOLS, NIGERIA

SANI DANTANI MANGA, Ph.D.

Department of Education
Faculty of Education and Extension services
Usmanu Danfodiyo University, Sokoto
Dantani.sani@yahoo.com

ABSTRACT

Poor school plant construction in Nigerian secondary schools has become a national malaise at a time when the global focus is on providing conducive a child-friendly learning environments. This undesirable phenomenon has resulted in designing and constructing buildings that have inadequate provision for ventilation and lighting, which are critical for comfort and concentration on learning tasks. This study focuses attention on how ventilation and lighting of school buildings relate to student academic performance in kebbi State secondary schools. Stratified random sampling technique was sued to select 26 of such schools, while simple random sampling was used to select 500 teachers as participants. Examination results format, observation inventory and questionnaire were used to generate data for the study. Two hypotheses were formulated and tested using Pearson correlation analysis. The study revealed that ventilation and lighting in Kebbi State secondary schools was 60% below the required standards and that student academic performance was poor with a mean performance rate of 22% in the six years studied. It was found that both ventilation and lighting were significantly, positively and highly correlated with student academic performance having Pearson calculated value of .98. It was recommended among others, that school plant construction should strictly be in line with educational specifications, such that adequate provision is made for ventilation and lighting of school buildings as a strategy for enhancing student academic performance in Kebbi State secondary schools.

Introduction

Education is globally accepted as a potent instrument of national transformation. Since the advent of Western Education, formal schooling has been considered as a gateway to the acquisition of desirable skills knowledge and attitudes that would uplift the individual and the nation in general. Thus, various levels of schooling have naturally evolved to provide the equality of education that is expected to satisfy the yearnings and aspirations of society. The secondary school level stands in the middle of the superstructure in the educational ladder between primary and territory levels.

According to the National Policy in Education of the Federal Government (2004), the objectives of secondary education among others include the preparation of students for useful living in society and for higher education. But the extent to which secondary schools in Nigeria are performing their expected roles is seriously in doubt as there is a growing concern about the poor quality of education at that level (Iyamu and Aduwa, 2004). This is not surprising because of the glaring irregularities and inadequacies in the secondary school system that has largely remained unresolved.

Among the numerous problems that seem to afflict the secondary school is the unconducive environment under which students are forced to learn. Taiwo (2001) noted that the physical environment in most secondary schools in Nigeria is literacy aggressive and that the first impression in most secondary schools is that of degradation and decay, which clearly shows that the learning environment is not learner friendly. The situation is even more worrisome in the case of Kebbi State secondary schools where these inadequacies are glaring.

The unsuitability of the physical environment in Kebbi State secondary school seams to have it's genesis from the poor quality of school plant construction, which has contributed in having school buildings that are deficient in ventilation and lighting. These critical ambient factors could generate comfort or discomfort with serious implication on student's academic performance. This is because with poor ventilation air circulation is inhibited and expired air generates discomfort and poor concentrate on learning tasks. Students could experience blurry vision and headaches due to poor lighting.

Although these factors seen very familiar to educational mangers, yet they are seriously neglected in school plant construction. The neglect could probably stem for either deliberate negligence or lack of a true appreciation of the relationship among ventilation, lighting and student academic performance. The purpose of this study therefore, was to determine the relationship among building ventilation, lighting and student academic

performance in Kebbi State secondary schools, with a view to suggesting ways of improving the quality of school buildings for a better learning environment.

Review of Related Literature

The review of literature was conducted with particular focus on the relationship among building ventilation, lighting and student academic performance.

Building ventilation and students' academic performance

The discovery of the components of the atmosphere, which culminated in 1775 in the work of lavoisier marks the beginning of scientific study of ventilation (Lee and Chang 1999). According to Areola, Irueghe, Ahmed, Adeleke and Leong (1992), the components of air as are known today include Nitrogen 78%; Oxygen 21%; Carbon dioxide 0.03%; minute traces of Helium, Argon and other rare gasses; dust; soot; water vapour; and organic substances. With the knowledge of the components of the air and their significance in respiration, efforts to explain the physiological effects of the air of occupied rooms focused on changes in the context f Oxygen and carbon dioxide in expired air. The result was that Carbon dioxide was designated as the harmful agent in poorly ventilated rooms. In the course of time other explanations were offered. According to Lugg and Baty (1999) the various theories of ventilation that have been gradually advanced were based on: the supposed injurious effects of Carbon dioxide in expired air; the assumed existence of toxic substances in expired air; the physical properties of air, that is, temperature, relative humidity and air movement.

These theories captured the attention of educationists toe extent that they led to various studies that portrayed ventilation as crucial factors in the design and construction of school buildings. For instance, Jeffery and Lackney (2006), studied the influence of ventilation on learning in Mississippi Public schools. In that experiment, they divided the pupils into two groups and placed one group in well-ventilated classrooms, while the other group was placed in windowless classrooms in which the windows were shut and blinds were drawn. While there was adequate lighting, neither the fans nor the air conditioner were operated. The two groups were subjected to the same curriculum and similar teaching methods. After a period of time, they compared the academic performance of the two groups using teacher made tests in mathematics and languages. They found that students who were placed in poorly ventilated classrooms performed 26% below their colleagues in well-ventilated classrooms. But the extent to which these findings were applicable in the African context has not been clearly ascertained. This study, shifted focus from Mississippi to Nigeria and rather used descriptive correlation

techniques to establish the relationship between ventilation of school buildings and student academic performance in Kebbi State secondary schools.

Lighting of School building and student academic performance

According to the California Board for Energy Efficiency (2006) a growing number of studies are confirming the relationship between a schools physical condition especially its lighting and students academic performance. For example one of the studies was that which the Hescong Mahone Group conducted on behalf of the Board for Pacific Gas and Electric Company. The study was done in three districts of California, Washington and Colorado. The study indicated a strong correlation between increased hours of day light and improved student performance. In the California district for example, students that had the most daylight progressed 20% faster on Mathematics test and 26% faster on reading tests in one year as compared with those with the least amount of day light.

This confirmed the study by Goroff and Brophy (1995) who in their study on electric lighting and daylight in Pennsylvania High Schools divided their participants into two groups. They placed one group of students in poorly lit classrooms by switching off the lights and blunting daylight by drawing window blinds in the experimental classes to create semi-darkened classrooms. The other group of students was kept in classrooms that had adequate electric lighting as well as natural daylight streaming into the classrooms. The researchers used pre-post-test quasi experimental design to establish difference in performance between the two groups. The study found that students in poorly lit classrooms performed 27% below their mates in well-light classrooms. These studies were however conducted in the United States. The extent of their applicability to Africa is not clearly determined. This study shifted the geographic locate from America to Nigeria and used correlational analysis to establish the relationship between lighting and students academic performance.

Methodology

This study used descriptive research design of the co relational type conducted ex-post-facto. Attention was focused on testing the relationship among school building ventilation lighting and students academic performance in Kebbi State secondary schools. Two hypotheses were drawn to guide the conduct of the study. The population for this study was made up of all the secondary schools in Kebbi State. The target population comprised of 41 senior secondary schools made up to science technical and grammar schools. Stratified random sampling technique was used to select 26 out of the 41 senior secondary schools, representing 63% of the total population. Proportionate random

sampling technique was used to select 69% of teachers in each of the selected schools to get 587 participants out of 850. a combination of WAEC results format. Observation inventory on building ventilation and lighting as well as questionnaire were used as research instruments. The questionnaire tagged: Building Ventilation, Lighting and Student Academic performance Questionnaire (BVLSVAQ) was validated by experts and it had a reliability index of .79 after a test-re-test exercise. Pearson correlation analysis was used to test the two hypotheses generated for this study.

Data Analysis and Discussion

In analyzing data, student academic performance was taken as the dependent variable, while school building ventilation, and lighting were independent. Results are presented in tables 1 to 3.

Table 1: Kebbi State students performance in WAEC examination 2000 to 2005

Year	Number Presented	Number of 4 credits	Success Rate	Number Failed	Failure Rate
2000	5,037	779	16%	4,258	84%
2001	6,155	1,433	23%	4,722	77%
2002	6,490	1,495	20%	5,195	80%
2003	6,685	1,539	23%	5,146	77%
2005	90,41	2,348	26%	6,693	74%
Total	41,080	9,065	130	26,820	470%
Average	6,847	1,511	22%	4,470	78%

Source: Field work 2009.

Table 1 indicates that Kebbi State students recorded the highest success rate in the year 2005 when 9,041 students were presented for WAEC examination and 2,348 of them were able to pass with four credits of students was represents 26% success rate. The poorest performance of students was recorded in the year 2000 when the failure rate was 84%. Within the six years studied, 41,080 candidates were presented for the examination. Out of this number one 9,065 scored up to four credits and above, while the remaining 26,820 failed to score up to four credits. The average success rate was therefore poor, as it stood at 22%.

Hypothesis One:

Ho_1: There is no significant relationship between student academic performance and building ventilation in Kebbi State secondary schools.

Table 2: Relationship between building ventilation and students Academic performance.

Variables Entered	N	$\bar{X}$	SD	DF	Calculated r-value	critical r-value	Decision
Academic	26	1.49	.17	24	.98	.42	Significant
Ventilation	26	1.50	.18				

Results in table 2 shows that school plant ventilation was significantly, highly and positively correlated with students academic performance with a calculated r-value of .98 being greater than the critical r-value of .42 at 05 level of significance. This means that the hypothesis, which states that there is no significant relationship between school plant ventilation and student academic performance in Kebbi State secondary schools is rejected. This means that the higher the adequacy of ventilation, the better enhanced the academic performance of students could be. On the other had the poorer the adequacy of ventilation the poorer the academic performance of the students could be. Majority of participants to this study (64%) agreed that proper ventilation in school buildings could enhance student academic performance.

The higher correlation between ventilation student academic performance could e explained in the context of the fact that poor ventilation could generate unbearable heat especially in highly congested classrooms, which is capable of affecting students concentration on learning tasks. This finding agreed with Jeffery and Lackney (2006) who found that adequate ventilation had a direct strong relationship with students' comfort and academic achievement. They found that poor ventilation of classrooms, libraries, laboratories and workshops led to problems associated with respiratory illness caused by "Sick Building Syndrome" (SBB) in which students in poorly ventilated classrooms experienced fatigue, due to increased susceptibility to higher concentration of indoor pollutants. Children in badly ventilated stuffy classrooms ware also found to exhibit clear signs of sensory irritation, skin rashes and mental fatigue, all of which have the potential of decreasing the ability of students to learn.

Results from the observation inventory, which was based on approved education specifications for school buildings ad provided in the Kebbi State Ministry of Education policy on school plant construction, indicated that 50% of schools were not properly ventilated. Though windows were generally large but they were not always aligned for proper cross- ventilation and there was virtually little or no provision for functional fans and air conditioners to supplement natural ventilation. The fact that majority of respondents appreciated the value of ventilation of school buildings shows that the poor level of ventilation of school building in Kebbi State secondary schools was probably due to deliberate neglect on the part of planners and policy makers.

Hypothesis Two:

Ho_2: There is no significant relationship between lighting of school buildings and students academic performance in Kebbi State secondary schools.

Table 3: Relationship between lighting of school buildings and student academic performance.

Variables Entered	N	$\bar{X}$	SD	DF	Calculated r-value	critical r-value	Decision
Academic	26	1.49	.17	24	.98	.42	Significant
Lighting	26	1.50	.18				

Results in table 3 indicates that the lighting of school buildings was significantly, highly and positively correlated to students academic performance in Kebbi State secondary schools with calculated r-value of .98 at .05 alpha level. The hypothesis, which states that there is no significant relationship between lighting of school buildings and students academic performance is rejected. This means that the higher the adequacy of lighting in school buildings, the better the academic performance of students could be enhanced. It also shows that where the lighting of schools buildings is grossly inadequate, the academic performance of students could be correspondingly inhibited. Majority of participants to this study (69%) agreed that proper lighting of school buildings could enhance students' academic performance.

The high correlation between lighting and student academic performance could be appreciated from the fact that academic activities could be seriously jeopardized especially at night when there is no light, as it will be impossible for students to do their assignments and revise their notes. This finding agreed with Goroft and Broply (1995),

who found that lighting, was highly correlated with student's achievement. They noted they adequate lighting of school buildings minimizes mental fatigue and hyperactivity in children.

However, data generated from the observation inventory showed that 60% of school buildings in the 26 sampled schools were poorly lit. But the fact that majority of participants highly appreciated the value of lighting in enhancing student academic performance was an indication that adequate lighting as a tool for enhancing students academic performance in Kebbi State secondary schools has not been given the seriously attention it deserved.

Summary of Findings

The results of the analysis of data in this study have shown that in Kebbi State secondary schools:

1. There was a significant, positive and high correlation between the ventilation of school buildings and student academic performance.
2. There was a significant, positive and high correlation between the lighting of school buildings and student academic performance.

Conclusions

The quality of construction of school buildings in Kebbi State secondary schools was poor due to inadequate provision for, proper ventilation and lighting. The poor quality of ventilation and lighting had negatively contributed to the poor academic performance of students. The poor quality of school buildings was more as a result of deliberate neglect rather than lack of knowledge on the important of validation and lighting on student academic performance.

Recommendations

Based on these findings and the subsequent conclusions arrived at in this study, the following recommendations were tendered.

Ventilation of school buildings should be improved by having large windows with cross-ventilation. At least one third of wall space should be provided in each classroom, Library, laboratory, workshop and other academic buildings.

Adequate lighting should be provided in school buildings by ensuring that windows are large and properly aliened to the direction of sunlight. There should be at least four functional electric bulbs or florescent tubes in each classroom and other academic buildings.

Construction of school buildings should be strictly in line with the educational specifications and any violation of the standards should be severely penalized.

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