
Effect of School Housing Facilities in Enhancing Psychometric Potentials of Science Biased Students for Technological Innovativeness

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Abstract

This paper argues that science students require friendly studious environment for optimum performance. The study examined the shortfall in performance of science students consequent on dearth of schoolhousing and illogical maintenance of existing structures in secondary schools. The objectives were: (i) to verify if schoolhousing condition has significant link with performance of science students; (ii) to ascertain the degree of the link; (iii) to determine the causal implications of schoolhousing condition on the performance of science students. Data was collected by survey method. The sample used was one thousand four hundred and four (1404) respondents. Chi square statistic showed significant link between schoolhousing and performance of science students; $\chi^2_{cal} = 30.99 > \chi^2_{table} = 24.996$, $p > 0.05$, 15 d.f. Spearman's Rank Correlation indicated high degree of link; $r_s = 0.916$. Therefore, performance of science students is contingent on schoolhousing condition.

This paper examined how schoolhousing supports the development of psychometric potentials of science students in view of technological innovativeness. Psychometric development is basically comprehended from psychological perception as “a science of the nature, functioning and development of the human mind” (Sattler, 1974). It deals with the mind as an entity and in its relationship to the body and to the environmental or social context, based on observation of the behaviour of individuals or groups of individuals in particular circumstances" (Hornby, 2006). Encarta (2005) argued that much of the early theoretical and applied work in psychometrics was undertaken in an attempt to measure intelligence or academic performance.

Examination is a structure designed to objectively measure the academic performance of students from varying social backgrounds and with different educational experience. Akinsolu (2011) had revealed that the performance of students both in internal and external examinations has been a matter of worry to parents. This worry is a concern over the decline of standards of operation in our educational system consequent on students' performance in West Africa School Certificate Examination (WASCE).

According to Aniefiok (2010), as reported in “Businessday” magazine that the decline of education standard was mostly felt in science related subjects and this combine to derate the national literacy rate to be 57 percent. It is not hidden fact that knowledge of science helps in technological development of any nation. Knowledge of sciences, both physical and natural sciences is an anchor for scientific and non scientific development.

Osugwu (2012) agreed with Akinsolu that students' poor performance in external examinations in Secondary Schools Certificate Examination (SSCE) and the General Certificate Examinations (GCE) has become a source of worry especially in view of the nation's goal to be one of the world's top 20 economies by 2020. Osugwu further reported that recent statistics released by the two examination bodies, WAEC and NECO, showed that the standard of teaching and learning especially in public schools have continued to wane at alarming rate.

In the discourse, Olawale in Osugwu (2012) attributed students' poor performance to lack of conducive environment for teaching and learning, adding that the structures were lacking, for instance, some schools in different parts of the country that presented candidates for science subjects were without laboratories; where they have laboratories; there were no equipments. In order to amass the full benefit accruing from excellent academic performance, a studious friendly environment is inevitable.

Aghyeneku in Sakiyo and Sofeme (2008) noted that students' performance in science subjects is low in both national and state examinations. Ahiakwo (2003) argued that reasons for poor performance were the science curricula, teachers' methods of teaching, parents' interference, government apathy and lack of science facilities. According to Ajayi (2007), survey revealed that inadequacy of good instructional materials; equipment and laboratory facilities in the schools also affected effective learning of science subjects. In another study, Ango (1990) blamed poor performance in science subjects basically on lack of involving the students in the teaching-learning activities right from the beginning of any new concept to be taught and lack of qualified teachers as well as experiences in teaching and unavailability and/or insufficiency of materials in the laboratories.

This paper argues that science oriented students in Nigeria require friendly studios environment for optimum performance. For instance, Ogbeifum and Evelyn (2001) observed that oftentimes attention was usually focused on teachers and scholars with less emphasis on built environment. Looking beyond the local system, Poplin and Weeres (1992) asserts that school facilities have a profound impact on their occupants and such perform such functions of building as teaching and learning. The study of Edwards (1992), in the District of Columbia school system discovered that after controlling other variables such as a student's socioeconomic status, that the students' standardized achievement scores were lower in schools with poor building conditions. The work showed that school buildings with poor condition had achievement that was 6% scores lower than schools in fair condition; and 11 % scores lower than schools in excellent condition. The research concluded that as the school housing condition improved students' performance increased.

According to Lowe and Jerry (1990), poorer academic achievement was associated with specific building condition such as substandard facilities; air conditioning; locker conditions; and classroom furniture. In agreement, Andrews and Richard (1988), contended that in school arrangement, students need a healthful and stimulating environment in which to learn. Berner and Maureen (1993) showed in their study that there is a positive correlation between building and student performance and further highlighted that poor classroom acoustics can be annoying. If students were unable to hear their teacher, they are unable to "fill in the blanks" as adults with life experience are able to do, and this can disrupt learning.

According to Lemer and Andrew (1995), demand is on the rise for schools that feature high-performance design and technologies to enhance learning. This supports the basis why Craig (2008) suggested that school administrators, parents, teachers, and students should focus on meeting new building standards, which calls for an enhanced learning environment with appropriate technology and comfort control systems.

According to ActionAid (2005), the interest of parents to get sound education for their children is one of the strong reasons for residential relocation and rural/urban migration. Dike (2000) argued that frequent moves presents negative impact on students' academic routine and potential success and this issue is prevalent in most third world countries including Nigeria.

In a related instance, Asiabaka & Mbakwem (2007) evinced that most public schools in Imo state experienced dearth of instructional facilities. These instructional facilities were remarkable in absence of laboratories and libraries; toilet facilities were not available in virtually all the schools. The school buildings were dilapidated and floors needed re-plastering. According to Oghuvbu (1999), the decay of school facilities were due to employment of unqualified and low skilled maintenance staff to superintend the affairs of secondary schoolhousing. Maintenance management was not logically patterned to address the existing facilities and these structures dilapidate (Anih, 2012).

In view of the above challenges, Hunt and McKenna (1992) suggested that building a solid educational foundation should begin in early childhood to support lifelong learning.

Purpose of the Study

- (i) To verify if schoolhousing condition has significant link with the performance of science students
- (ii) To confirm if the degree of failure in science subjects is due to want of ideal schoolhousing
- (iii) To determine the causal implications of schoolhousing on the performance of science students

Research Question

- (i) How do you establish if there is a significant link between Schoolhousing and performance of science students?
- (ii) To what extent do you agree that the degree of failure in science subjects is due to want of ideal schoolhousing?
- (iii) How will you determine that schoolhousing has causal implication on the performance of science students?

Hypotheses

- (i) There is no significant link between Schoolhousing and performance of science students
- (ii) The degree of failure in science subjects is not due to want of ideal schoolhousing

- (iii) Schoolhousing has no causal implication on the performance of science students

Methodology

Study Area: The areas used for the study were: Enugu urban, Awgu, Nkanu-West, Udi, Nsukka and Oji-River local government areas. Twenty four schools from the six studied areas were observed.

Research Design: The study approach was designed to address the research questions. Pragmatist theory was the research philosophy adopted because it argues that the most important determinant of the research philosophy is the research questions. The theory employed exploratory and survey research strategies. The study was designed to examine the nature and status of the situation of schoolhousing; the way it existed during the period of the study.

Population Studied: The population used for the study was comprised of secondary schools in Enugu state; science students; science tutors and principals; parents of science students examined; and staffs of Ministry of Education and State Universal Basic Education Commission.

Samples and Sampling Plan: Probability and non probability sampling plans were used to select the respondents for the survey. A total sample of one thousand four hundred and four (1404) respondents was selected through triangulated sampling technique. The distribution was as follows:

1. Extreme or deviant case sampling was used to select 840 pupils and 288 parents
2. Purposive or judgmental sampling method was used to select 240 science tutors, 24 principals and 12 staff of Ministry of Education and State Universal Basic Education Commission.
3. Cluster sampling was used to select the studied areas
4. Proportionate stratified sampling technique was used to select the classes surveyed.

Table 1: The Respondents Administered with the Questionnaires and the Returns Were as Follows

Respondents	Administered	Returned	Unreturned	%Administered	%Returned	%Unreturned
Students	840	720	120	100	85.7	14.3
Parents	288	247	41	100	85.8	14.2
Teachers	240	223	17	100	92.9	7.1
Principals	24	20	4	100	83.3	16.7
*UB&Edn	12	10	2	100	83.3	16.7
Total	1404	1220	184	100	86.9	13.1

Source: Field Survey 2012

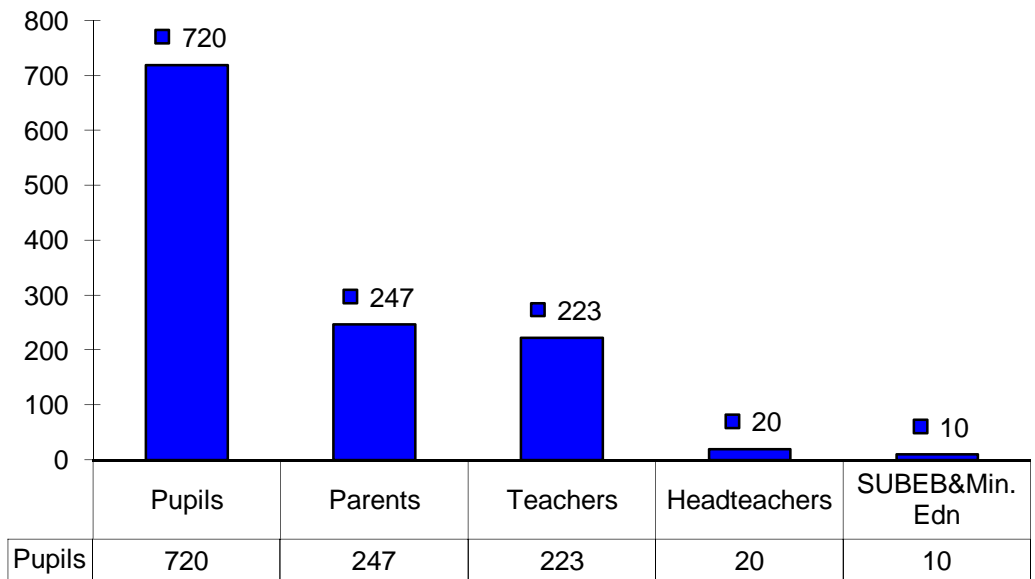


Figure 1. The Bar chart shows the sample distribution of the respondents
Source: Field Chart 2012

The table above shows percentage of total return of 86.9 from a total administered one thousand, four hundred and four (1404) instruments. The figure 86.9% was arrived at, from the ratio of the administered instrument and the return (1220/1404).

Instrument: The instrument for the data collection was structured questionnaire. The scale of measurement was ordinal scale. The instrument was designed with rating parameter of 5-point likert scale of “strongly agree” with 5points; “slightly agree” with 4points; “Undecided” with 3points; “slightly disagree” with 2points; and “strongly disagree” with 1point. The researchers were interested in understanding the degree of effect of schoolhousing on psychometric development of science students.

Validity and Reliability of Instrument: The instrument used was content validated by three specialist lecturers from Estate Management; Science Education; and Statistics departments of University of Uyo and College of Education, Eha-Amufu. The possibility of achieving the reliability of the instrument was attained by considering the stability and internal consistency of the instrument. The reliability (Cronbach’s Alpha) for the 3-items (research questions) tested was .907 which is very high and indicated strong internal consistency for the items. The three items were administered to a group of 10 respondents and their scores for each of the items were reported below in Table 3.

Table 3 – Scores on Research Questions 1-3 by 10 Respondents for Reliability of the Instrument

S/NO	Respondents	Research	Q1Research	Q2Research	Q3
1	Science student 1	4	5	4	
2	Science student 2	4	4	5	
3	Science tutor 1	1	3	4	
4	Science tutor 2	2	1	2	
5	Parent 1	3	4	3	
6	Parent 2	1	1	1	
7	Principal 1	5	5	4	
8	Principal 2	4	4	4	
9	Min. of Education	2	3	4	
10	SUBEB*	1	2	1	

Source: Field Survey 2012

*State Universal Basic Education Board

Data Analyses: The statistical methods used for the research were: SPSS package for Reliability Analysis (Cronbach’s Alpha); Chi square test was used to verify the link between schoolhousing and performance of science students. Spearman’s rank correlation coefficient was used to verify the degree of the link between schoolhousing and performance of science students. Coefficient of determination was used to

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determine the causal implication of schoolhousing on the performance of science students.

Findings

Table 4 - Research Question-1 on how would you agree that schoolhousing condition is significantly linked with the performance of science students?

Teachers' Opinion

Locality	Strongly Agree (%)	Slightly Agree (%)	Undecided (%)	Slightly Disagree (%)	Strongly Disagree (%)	Total
Awgu	22	10	0	3	0	35
Enugu	26	10	0	1	1	38
Nkanu West	15	21	2	1	0	39
Nsukka	21	11	2	2	2	38
Oji River	15	12	4	4	1	36
Udi	18	12	2	3	2	37
Total	117 (52)	76 (34)	10 (4)	14 (6)	6 (3)	223

Source: Field Survey 2012

Table 4 showed that 52% and 34% of the science tutors strongly and slightly agreed that schoolhousing is significantly linked with performance of science students. While 6% and 3% of the tutors slightly and strongly disagreed that schoolhousing is strongly linked with performance of science students.

Table 5: Hypothesis 1- School Housing Condition is not Significantly Linked with the Performance of Science Students

Contingency Table (Students Were Observed)

Variables	Awgu	Enugu	Nkanu West	Nsukka	Oji River	Udi
	O (E)	O (E)	O (E)	O (E)	O (E)	O (E)
Performance	57 (67.8)	68 (71.1)	76(77.0)	65(62.3)	83(78.1)	75(67.2)
Learning	69 (63.1)	76(66.3)	84(71.7)	63(58.4)	54(72.8)	49(62.6)
Health	40 (40.3)	43(42.3)	37(45.8)		57(46.4)	47(39.9)
Comfort	76 (70.8)	67(74.3)	78(80.5)	68(65.5)	85(81.6)	69(70.2)

Source: Field Survey 2012

$$\chi^2 = \sum (O - E)^2 / E$$

The Chi-square is $\chi^2_{cal} = 30.99$. The degree of freedom (df = 15); the table value is $\chi^2_{table} = 24.996$ at 0.05 significant level. It was observed that the Chi-square calculated was in the rejection region so null hypothesis was rejected base on decision rule; therefore, schoolhousing condition is significantly linked with the performance of science students.

Table 6 - Research Question 2 on what Extent do you Agree that the Degree of Failure in Science Subjects is Due to Want of Ideal Schoolhousing?

Principals' opinion

Locality	Strongly Agreed (%)	Slightly Agreed (%)	Undecided	Slightly Disagreed (%)	Strongly (%) Disagreed (%)	Total (%)
Awgu	3	1	0	0	0	4
Enugu	2	1	0	1	1	4
Nkanu	3	0	0	0	0	3
West						
Nsukka	1	0	0	1	0	2
Oji River	2	2	0	0	0	4
Udi	2	0	0	1	0	3
Total	13(65)	4(20)	0(0)	3(15)	1(5)	20

Table 6 showed that 65% of the principals observed strongly agreed that the degree of failure in science subjects is due to want of ideal schoolhousing. 20% of them slightly agreed while on the contrary, 20% of the principals were slightly disagreed (15%) and strongly disagreed (5%) that the degree of failure in science subjects was due to want of ideal schoolhousing. Twelve principals also rated both schoolhousing condition and degree of failure of science subjects; the Spearman's Correlation Coefficient showed that the high degree of failure, $\rho_s = 0.916$ was due to want of ideal schoolhousing.

Table 7 - Research Question 3 on how will you Agree that Schoolhousing has Causal Implication on the Performance of Science Students?

Parents

Locality	Strongly Agree (%)	Slightly Agree (%)	Undecided (%)	Slightly Disagree (%)	Strongly Disagree (%)	Total
Awgu	17	16	4	5	1	43
Enugu	24	9	3	7	2	44
Nkanu West	17	15	3	2	3	40
Nsukka	19	11	2	3	1	36
Oji River	16	16	8	1	2	43
Udi	18	14	3	4	2	41
Total	91 (37)	81 (33)	23 (9)	22 (9)	11 (4)	247

Source: Field survey 2012

Table 7 showed that 37% of the parents strongly agreed that schoolhousing has causal implication on the performance of science students followed by 33% of the parents who slightly agreed. 11 parents (4%) strongly disagreed while 9% of the parents slightly disagreed. Parents who were undecided on the assumption were 9%.

Coefficient of Determination (R^2) on School housing has Causal Implication on the Performance of Science Students

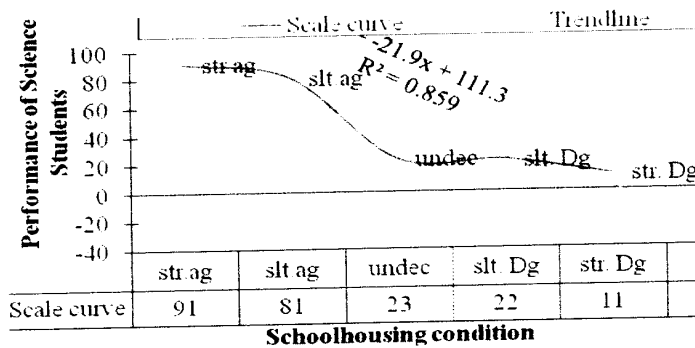


Figure 3: Graphical illustration of Coefficient of Determination (R^2)

Source: Field Survey 2012

Figure 3: Graphical illustration of Coefficient of Determination (R^2)

Source: Field Survey 2012

The coefficient of determination is $r^2 = 0.859$ which implied that $r = 0.927$. This showed that there is statistically strong positive affirmation that schoolhousing has causal implication on the performance of science students.

Discussion

The question of schoolhousing having significant link with performance of science students was verified from the tutors and the majority of the science tutors strongly agreed. The assumption that schoolhousing is significantly linked with performance of science students was statistically established to be true. This agreed with the work of Ogbeifum & Evelyn (2001) who observed that oftentimes less emphasis is on built academic environment. In another case, Poplin and Weeres (1992) argued that school facilities have a profound impact on such functions of building as teaching and learning. Another parallel research to this work is Berner and Maureen (1993) who showed in their study that there is a positive correlation between building and student performance.

Considering the research question 2 and the hypothesis; there was a verification of whether the degree of failure in science subjects was due to want of ideal schoolhousing. The finding established that majority of the school principals strongly agreed that want of ideal schoolhousing was peculiar reason for high degree of failure in science subjects in both internal and external examinations. The finding of this work is not wholly consistent with Ahiakwo (2003) who argued that reasons poor performance includes the science curricula, teachers' methods of teaching, parents' interference, government apathy, lack of science facilities and others. However, Ahiakwo mentioned several variables and did not specify whether the science facility is school building. The extant research is all embracing of schoolhousing but Ajayi (2007) was specific on laboratory facilities which agrees that inadequacy of equipment and laboratory facilities in the schools affected effective learning of science subjects.

The coefficient of Determination showed that there is statistically strong positive affirmation that schoolhousing has causal implication on the performance of science students. This agrees with Cash (1993) who examined the relationship between building condition and student achievement and found that students scored on achievement tests 5 percent lower in buildings with lower quality ratings.

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Conclusion

Based on the findings, it was concluded that:

1. There is a significant link between schoolhousing and performance of science students. The Chi-square (X^2) test statistic showed that $X^2_{cal} = 30.99$ and $X^2_{table} = 24.996$ at 15df, 0.05 significant level. The $X^2_{cal} = 30.99$ was in the rejection region because it is more than $X^2_{table} = 24.996$ and therefore, the null hypothesis was rejected.
2. Having established that there was a significant link between schoolhousing and performance of science students, the Spearman's Rank Correlation coefficient showed a significantly high degree of the strength as: $P_s = 0.916$. This is an indication that there was strong positive link between Schoolhousing and performance of science students.
3. The regression line showed an equation of $y = -21.9x + 111.3$ and the coefficient of determination is $r^2 = 0.859$ which implied that $r = 0.927$. This showed that there is statistically strong positive affirmation that schoolhousing has causal implication on the performance of science students.

Recommendations

The following recommendations are drawn from the findings of this study.

- i. Since schoolhousing and performance of science students have been proved to be significantly linked, schoolhousing should be designed to accommodate all elements that will support efficient learning and teaching environment.
- ii. All building related professionals should be integrated in the planning of secondary schools to meet new building standards, which calls for an enhanced learning environment with appropriate technology and comfort control systems.
- iii. Housing Modification Approach (HMA) should be adopted to explore pattern of schoolhousing that depicts pedagogical facilities ideal for learning for science students.

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