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Evaluating the Adequacy of laboratory facilities on students' academic Performance in Secondary School in Calabar, Nigeria

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Abstract: *In recent times, the provision of laboratory facilities in secondary schools in Calabar have yielded little or no result in terms of students' academic performance. This paper seek to evaluate the extent of adequacy of laboratory facilities on students' academic performance in Calabar. However, a total of three hundred and fifty copies of questionnaire were administered to Chemistry students in order to assess the facilities impact on the students' academic performance. The results obtained from the data collected and analyzed show that laboratory facilities in secondary schools are not adequately enough for teaching chemistry. This result was also affirmed in the tested hypothesis which show that adequacy of facilities does not significantly contribute to the variance in students' academic performances in chemistry***.

Key words: *Adequacy, academic, chemistry, performance, students.*

I. Introduction

We live in a world of science and technology, throughout our lives, human beings encounter issues and problems that have their root in science. Science and technology have become critical factor of economic and social development. Through science resource of nature have been well utilized and transformed into meaningful resources for a better living in the world. The tremendous emerging trends in science education has assured man of a comfortable living within the society (FGN, 2004, p. 5).

Fundamental research among science educators and cognitive scientists focuses on how people learn science and how they apply this knowledge in their daily lives. Science education provides students with knowledge, training, and learning experience while stimulating their physical and mental growth. According to the National Science Board Commission on Pre-college Education, Mathematics, Science and Technology, in its report stressed that, most states are failing to provide its students with adequate tools, resources or facilities needed to excel in the 21st Century. It is necessary to provide students with a strong broad background in the area of science and mathematics education when laboratory facilities are adequate in schools, students should be offered opportunities to enable them grow in their problem solving abilities, think critically and acquire scientific and technological literacy, William and Maureen (2012).

Academic achievement of students in science subjects generally had witnessed a deplorable trend in the past decades. Science education at all levels of education in Nigeria is in a deplorable state from the primary, secondary to the tertiary institutions. There is a dearth in science facilities in the laboratories and this contributes to students' poor academic performance in science (Chemistry) at the secondary school level (Ihuarlam, 2008; Ifeakor, 2006; Udo, 2006; Okafor, 2000). Today this scenario is applicable to secondary schools in Calabar, Cross River State. However, despite the numerous secondary schools in Calabar the level of students' academic performance is alarming especially those overing science courses such as physics, biology and chemistry. It is on this note this research wish to evaluate the adequacy of laboratory facilities on academic performance of students in secondary schools in Calabar with specific reference to assessing the extent at which laboratory facilities in the secondary schoolsare adequate for the teaching of Chemistry and to what extent does the adequacy of laboratory facilities in secondary schools affect students' academic performance.

II. Literature review

Adequacy of laboratory facilities and students' academic performance, the teaching and learning experience centre on the extent of adequacy of laboratory facilities in secondary schools and the teachers' effectiveness in the use of laboratory facilities with the aim of facilitating and providing meaningful learning experiences in the learners. Hager (1974), based on the instructional theory of learning interaction, hypothesized that the laboratory had a direct effect on both students' attitudes and academic performance. It is generally believed that constant practice leads to proficiency in what the learner learns during classroom instruction; hence, the dictum 'practice makes perfect'. This has given rise to the expectation that laboratory facilities should be adequately provided to secondary schools for effective teaching and learning.

Investigating the relationship between adequacy and academic performance in Chemistry, Akpan (2006) examined adequacy of laboratory facilities using frequency counts and percentages. The result revealed

that 61.1% of the total respondents agreed that the laboratory facilities for the teaching of Chemistrywere adequate in secondary schools, while 38.9% of the respondents agreed that laboratory facilities were not significantly adequate. At a workshop organized by the Cross River State Ministry of Education for Science Teachers Vacation Course (TVC) in 2008, the science teachers complained that laboratory facilities for teaching various science subjects were not adequate in secondary schools for the teaching and learning of the physical sciences. Secondary school laboratories should be furnished with adequate laboratory facilities for effective teaching and learning of sciences.

Lagoke (1997) emphasized that science education needs to build on the knowledge and skills acquired by the learners so that students can understand the scientific principles, laws and theories. The adequacy of laboratory facilities used during science instruction helps to develop values that aid the learners in decision making. Okeke (1995) examined the adequacy of laboratory facilities and academic performance in basic sciences, and revealed that the adequacy of laboratory facilities had no significant relationship with students' academic performance in basic science.

The aim of science laboratory and adequacy of laboratory facilities in secondary schools is for effective teaching and learning to take place. Thus, to access the status of laboratory facilities in secondary schools, the adequacy of these facilities must be emphasized by the science teachers. Hoftein and Ginetta (1992) contended that the laboratory has been a distinctive feature in science teaching and learning. For students to learn efficiently, teachers should ensure that adequate laboratory facilities are procured.

The extent of adequacy of laboratory facilities for science teaching depends on the population of students in a particular school. Eshiet (1996) holds that the adequacy of laboratory facilities makes Chemistryteaching more concrete and stimulating and hence for better students' academic performance in secondary schools. Academic performance depicts the level of educational attainment of an individual. It differentiates one with high knowledge content from the other with low and less competency in academic performance. Okafor (2000) found that the adequacy of laboratory facilities had a significant effect on the students' academic performance in Chemistry. Aburime (2004) investigated the influence of adequacy of laboratory facilities and academic performance in Chemistryand found that adequacy had significant influence on students' academic performance in secondary school Chemistryteaching.

III. Methodology

This study was conducted in Calabar, Cross River State taking into consideration public secondary schools in Calabar Education Zone. However, a population of about 2652 chemistry students in Calabar education zone was used of which three hundred and fifty (350) senior secondary school three (III) chemistry students were sampled from the population using the multiple sampling procedure, involving the use of stratified random sampling. Two set of instrument were the instrument captured adequacy of laboratory facilities which consist of 50 items on laboratory facilities and the second was chemistry achievement test (CAT) which consist of 30 items. Nevertheless, the data collected was analyzed using the analysis of variance (ANOVA) which try to compared the mean of two variables. Furthermore, the Pearson Product Moment Correlation was also used to test the relationship that exists between adequacy of laboratory facilities on students' academic performance in chemistry.

IV. Result analysis

The data collected and analyzed on adequacy of laboratory facilities presented in table 1 show that the calculated t-value is -17.71 and since it is greater than the critical t-value of 1.96 at 0.05 level of significance and 349 degrees of freedom, it means that it is statistically significant. Therefore, the null hypothesis is rejected. Since the sample mean (X=103.41, SD = 22.80) is less than the population mean (m=125.00), it means that the adequacy of laboratory facilities for teaching Chemistry in secondary schools is significantly not high, less than expectation.

Table 1Theadequacy of laboratory facilities for teaching Chemistry in secondary schools

Variable	N	$\bar{X}$	SD	m	t
Adequacy of laboratory facilities	350	103.41	22.80	125.00	-17.71*

Source: Data analysis 2012

However, findings also revealed that 24 out of the 50 laboratory facilities were non-significant in terms of adequacy while 26 out of the 50 laboratory facilities show that the facilities are significantly adequate in secondary schools for the teaching Chemistry. Results showed that 48% of the facilities show non-significance while 52% show significance based on adequacy..

Accordingly, the adequacy of individual items of laboratory facilities presented in Table 2 show that 24 out of the 50 laboratory facilities were non-significant in terms of adequacy while 26 out of the 50 laboratory facilities show that the facilities are significantly adequate in secondary schools for the teaching Chemistry. Results showed that 48% of the facilities show non-significance while 52% show significance based on adequacy. Laboratory facilities such as Chemistrylaboratory, electricity supply, water supply, periodic charts, tripod stands, silver nitrate, computers, accumulator, electrolytic cell, etc shows non-significance while other facilities shows averagely significance based on adequacy.

Table 2Adequacy of individual items of laboratory facilities

S/N	Facilities	$\bar{X}$	t-value	Level of significance
1.	Chemistry laboratory	1.93	1.93	Non-significant
2.	Preparatory table	2.11	2.11	Significant
3.	Electricity supply	1.79	1.80	Non-significant
4.	Water supply	1.62	1.62	Non-significant
5.	Periodical charts	1.76	1.77	Non-significant
6.	Tripod stands	1.87	1.88	Non-significant
7.	Retort stands	2.55	2.57	Significant
8.	Test tubes	2.58	2.60	Significant
9.	Beakers	2.93	2.97	Significant
10.	Pipettes	2.59	2.69	Significant
11.	Measuring cylinders	2.36	2.54	Significant
12.	Weighing balance	2.09	2.17	Significant
13.	$AgNO_3$	1.76	1.81	Non-significant
14.	CaOH	1.98	2.03	Significant
15.	Computers	1.80	1.81	Non-significant
16.	Overhead projectors	2.20	2.21	Significant
17.	Thermometer	1.95	1.95	Non-significant
18.	Bunsen burners	2.14	2.15	Significant
19.	Test tube rags	2.41	2.42	Significant
20.	Volumetric flask	2.19	2.20	Significant
21.	Fume cupboard	2.11	2.12	Significant
22.	Descicator	2.11	2.12	Significant
23.	Spatula	2.00	2.03	Significant
24.	Burette	1.93	1.94	Non-significant
25.	Bom calorimeters	2.16	2.17	Significant
26.	Accumulator	1.77	1.78	Non-significant
27.	Electrolagtic cell	1.85	1.86	Non-significant
28.	pH meter	1.75	1.54	Non-significant
29.	Red litmus	1.75	1.75	Non-significant
30.	Blue litmus	1.86	1.87	Non-significant
31.	Evaporating discs	1.72	1.76	Non-significant
32.	Condensers	1.65	1.73	Non-significant
33.	Thermometers	1.59	1.63	Non-significant
34.	Benzoic acid	1.80	1.86	Non-significant
35.	NaOH	1.95	1.88	Non-significant
36.	NaCl	1.88	2.52	Significant
37.	Na_2SO_4	1.77	1.77	Non-significant
38.	NH_4OH	1.64	1.66	Non-significant
39.	Copper turnings	1.91	1.94	Non-significant
40.	Ethyl alcohol	1.80	1.83	Non-significant
41.	Potassium permanganate	1.90	1.93	Non-significant
42.	Salicylic acid	2.23	2.23	Significant
43.	Methyl orange indicator	2.11	2.11	Significant
44.	Indicator bottle	2.20	2.21	Significant
45.	Preparatory room	2.20	2.23	Significant
46.	Laboratory tables	2.06	2.09	Significant
47.	Wash bottles	1.94	2.01	Significant
48.	Aqueous ammonia	2.18	2.22	Significant
49.	Test tube holders	2.00	2.15	Significant
50.	Ethanoic acid	2.02	2.30	Significant

Source: Data analysis 2012

Moreso, the hypothesis which try to assess the relationships between adequacy of laboratory facilities on students' academic performance in chemistry indicate that the calculated r-value is .015, which means that there is a positive relationship between adequacy of laboratory facilities and students' academic performance in Chemistry. In other words, as the adequacy of laboratory facilities increases, the students' academic performance also increases. However, the observed positive relationship is not statistically significant because the significance level of the calculated r-value, which is 0.778, is far greater than 0.05 significance level at 348 degrees of freedom. This means that the null hypothesis is retained.

Table 3:Analysisof the relationship between adequacy of laboratory facilities and students' academic performance in Chemistry (N=350)

Variables	$\bar{X}$	SD	$\sum x^2(\sum y^2)$	$\sum xy$	r	Sig level
Adequacy of laboratory facilities	103.41	22.80	181447.60			
Academic performance				1789.21	.015	.778
	37.13	14.86	77111.95			

Source: Data analysis 2012

V. Conclusion and Recommendations

The study was specially meant to find out the extent of adequacy of laboratory facilities in practicals and students' academic performance in chemistry laboratory facilities can be adequate for effective teaching and learning of chemistry in secondary schools of the Nigerian educational system. Findings of this study showed that laboratory facilities are adequately less than expectation. Study also revealed that adequacy laboratory facilities do not significantly contribute to the variance in students' academic performance in Chemistry. It is therefore recommended that government should adequately equipped chemistry laboratories Cross the state of effective teaching and learning of chemistry. Chemistry teachers should be resourceful in providing alternative material for chemistry teaching and learning.

References

[1]. Aburime, E. F. (2004). Refocusing research technology and Mathematics education: A case for Mathematicslaboratory.Proceeding of the 45th annual conference of Science Teachers' Association of Nigeria (STAN),Akure, September 18– 21.

[2]. Akpan, O. (2006). Laboratory facilities for Chemistry teaching. Unpublishedseminar paper, University of Calabar, Nigeria.

[3]. Eshiet, I. T. (1996).Improvisation in science teaching philosophy and practice.Abak: Belpot Press.

[4]. Federal Government of Nigeria (FRN) (2004).National policy of education (4thed.). Lagos: National Educational Research and Development Council.

[5]. Hager, W. R. (1974).An investigation of verbal behaviour and learning climate in undergraduate engineering classroom.Journal of Research in Science Teaching, 11(2), 121-131.

[6]. Hosfstein, A. &Ginetta, A. (1998).Trends in assessment of laboratory performance in secondary schools in instruction. Iowa: University of Iowa Press.

[7]. Ifeakor, A. C. (2006). The status of resources for effective teaching of Chemistryin Nigerian secondary schools.46thannual conference of STAN, Calabar, August 3-7.

[8]. Ihuarulam, A. I. (2008). Chemistry teachers' perception of availability and utilization of resources for curriculum development in Kano State.Published M.Ed. thesis, University of Kano, Nigeria.

[9]. Lagoke, B. A. (1997). Toward an elimination of the gender gulf in science concept attainment through the use of environment analogs.International Journal of Science Education, 9(4), 365-367.

[10]. Okafor, P. N. (2000). Difficult concepts in Physicsas experienced by senior secondary students in AkwaIbomState.Journal of Research Information in Education, 1(1), 114-121.

[11]. Okeke, R. J. (1995). Principles of development selection, utilization, evaluation storage and retrieval of instructional materials. In F. A. Okwo and G. A. Ike (Eds.),Educational technology: Basic concepts of issues. Nsukka: University Trust Publishers, 45-76.

[12]. Udo, E. U. (2006).Availability, selection and utilization of instructional resources for teaching primary science in Uyo Local Government Education Authority, AkwaIbom State.47thannual conference of Science Teachers' Association of Nigeria, Calabar, August 3-7.