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Utilization of Laboratory Facilities and Students' Academic Performance of Chemistry Students in Calabar, Nigeria

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Abstract
The study investigate the utilization of laboratory facilities and their relationship with students' academic performance in Calabar. A total of three hundred and fifty students drawn from fourteen public secondary schools were used for this study. The data were analyzed using two instruments which include; questionnaire on utilization (QULF) Chemistry and Achievement Test (CAT). The data collected were analyzed using population t-test and Pearson Product Moment Correlation. However, it was observed from the data analyzed that laboratory facilities are not adequately utilized in secondary schools for teaching Chemistry. It was also noticed that laboratory facilities do not significantly contribute to the variance in students' academic performance in Chemistry.
Keywords: Academic, Facilities, Chemistry laboratory, utilization.

Introduction

Science had been of great importance worldwide for suitable and socio-economic development as well as for technological advancement of the nations. Knowledge of science education is therefore required in all countries globally due to the numerous challenges that are facing them.

One of the science subject learners choose at the senior secondary classes is chemistry. They believe with chemistry, other related physical sciences and mathematics, they can become medical doctors, engineers, pharmacists, nurses, science teachers, scientists, and other science personnel in technological and national development is acknowledged worldwide.

The continuous record of students' poor performance in SSCE examination is a serious indication that all is not well in the Nigeria educational system, most especially at the secondary school level. Several assertions, Eshiet (1996) observed that not much attention has been given to the issue of enriching the science laboratories for effective teaching and learning of science. A lot of research has been carried out on students poor academic performance in science. Jegede (1990), Ivowi (1999) and Bajah (1994) notes that poor academic performance among secondary school students in science is due to poor utilization of laboratory facilities by teachers. The utilization of laboratory facilities have been an issue of great concern to science stakeholders in educational system (Uche and Umoren, 1998).

Ivowi, (1993); Okebukola, (1990); and Bajah, (1994); observed that the utilization of laboratory facilities in chemistry teaching enables learners to develop problem solving skills and positive attitude, interest towards science learning. In Cross River State, the government in a bide to developed the education sector embarked on the provision of learning facilities to public schools so as to enhance teaching in all government schools in the state. Apart from this, the state government provided laboratory facilities to almost all government schools in the state for effective academic work. Today, in spite of the huge amount invested by the state government in promoting the educational sector in Cross River State and Calabar in particularly, the rate of failure recorded during senior school certificate examination still pose a serious concern to the government. Besides, the rate of failure recorded in science subjects despite the huge amount of investment by the state government in the provision of laboratory facilities still pose great concern to both the government and the stakeholders in the educational sector. It is in this note that this work seeks to examine the extent of utilization of laboratory facilities in teaching science courses and with particular affect in teaching chemistry in secondary schools in Calabar.

Literature review

Utilization of laboratory facilities and students' academic performance; Availability, adequacy and utilization of laboratory facilities and students' academic performance in Chemistry

Literature and researches on the extent of utilization of laboratory facilities and academic performance in Chemistry seem to be relatively limited and scanty. Utilization of laboratory facilities is the frequency with which the available laboratory facilities are used during laboratory experiments. Laboratory facilities can be available, adequate but not utilized during science teaching. The experiences gathered so far indicate that there is still much research to be done on the extent of utilization of laboratory facilities in secondary school science teaching and learning. This is why it becomes expedient to find out if teachers and students are actually utilizing laboratory facilities during Chemistry teaching.

Jatau (2008) analyzed the extent of utilization of laboratory facilities and students' academic

performance in secondary schools in Pankin. The finding was that science teachers possessed adequate knowledge of the utilization of laboratory facilities for teaching science in secondary schools. Oriade (2008) in a separate study investigated the utilization of laboratory facilities in Biology. Results revealed that most laboratory facilities were not adequately utilized during Biologyteaching and learning in secondary schools, while some of the facilities were seldom adequate in schools.

Mathew (1998) examined the utilization of laboratory facilities and students' academic performance, and discovered that utilization of laboratory facilities had a positive relationship with students' academic performance towards science teaching and promotes good academic performance in the subject. An earlier work by Adeniyi (1983) drew attention to the relationship between utilization of laboratory facilities and students' academic performance in Chemistry and found that the utilization of laboratory facilities was not significantly related with students' academic performance in the subject.

Olarewaju (1994) working on the extent of utilization of laboratory facilities and students' academic performance, explained that utilization of laboratory facilities as a process of "doing science" through practical procedures, was a manipulative process of learning which promoted good academic performance in Chemistry teaching and learning. Olarewaju, added that among other factors, when laboratory facilities were adequately utilized by students, it elicited desired behavioural change in the learners. Utilization of laboratory facilities is an activity-oriented instruction, student centred and leads to self-reliant instruction.

Edet (2008) investigated the influence of utilization of laboratory facilities and students' academic performance in Biology. Using a sample of two hundred (200) Senior Secondary School one (SS I) students taught by utilizing laboratory facilities and the control group taught without utilizing laboratory facilities during Biology teaching. The results showed that students taught using laboratory facilities frequently achieved higher than those taught without utilizing laboratory facilities during Biology lessons. The recommendation made based on this finding was that utilization of laboratory facilities should be encouraged at all levels of the education sector.

Opara (2008) examined the utilization of laboratory facilities and students' academic performance in Chemistry. The findings, using analysis of co-variance (ANCOVA), revealed that the 26.4% of the laboratory facilities were utilized during Chemistry teaching and learning while 74% showed that laboratory facilities were never utilized during Chemistry teaching. The finding also revealed that laboratory facilities had a significant influence on the students' academic performance in Chemistry.

The laboratory-based mode of presentation of concepts has been consistently found to be an important strategy in Chemistry teaching and learning in secondary schools. Ihuarulam (2008) investigated the perception of Chemistry teachers and students based on the utilization of laboratory facilities in secondary schools for Chemistry teaching. The findings, using a total of one hundred and fifty (150) students, showed that 41.2% of the total respondents agreed that laboratory facilities were adequately utilized during Chemistry teaching. More than half (58.9%)of the respondents said that laboratory facilities were never utilized during teaching.

Chukwuemeka (2008) examined the efficacy of utilization of laboratory facilities in teaching basic science in junior secondary schools and revealed that pupils who were allowed by their teachers to manipulate laboratory facilities by themselves did better academically than those who were not allowed. Moreover, it showed that the extent of utilization of laboratory facilities during teaching of basic science had a significant influence on the students' academic performance in basic science.

Maduabum (1998) investigated the utilization of laboratory facilities and academic performance in science and found that students who utilized laboratory facilities during science teaching and learning achieved higher than those who had no experience in laboratory activities in science. In a similar vein, Chukwuneka (2010) findings based on utilization of laboratory facilities/equipment in secondary schools showed that 74% of the science teachers utilized laboratory facilities during science teaching and learning, while 26% of the teachers never utilized laboratory facilities. The findings also revealed that laboratory facilities significantly influenced students' academic performance in science.

Igboabuchi (2010) investigated the utilization of laboratory facilities in secondary schools in Nsugbe. Findings showed that Biology

laboratory facilities were seldom utilized by both teachers and students during Biology teaching. The results also revealed that the use of Biology laboratory facilities had a significant relationship with the students' academic performance in Biology. Etiuben (2010) investigated the effect of utilization of Chemistry laboratory facilities and academic performance in Chemistry. The findings revealed that utilization of Chemistry laboratory facilities has no significant influence on students' academic performance in Chemistry. A review by Benedict (1994) showed that utilization of laboratory facilities has a significant relationship with students' academic performance in science.

Brewton (2000) analyzed the effect of utilization of laboratory facilities on students' academic performance, and discovered that the teaching of science concepts is more effective and meaningful when laboratory facilities are well utilized during science teaching. Brewton concluded that effective utilization of

laboratory facilities during classroom interaction influenced students' academic performance in science.

Methodology

This study was conducted in Calabar, Cross River State taking into consideration senior secondary two chemistry students in Calabar Education Zone. A total of three hundred and fifty students drawn from fourteen public secondary schools were used for this study. Two instruments were used and the first instrument was to captured variables such as the utilization of laboratory facilities (QULF) while the second one was to captured the chemistry achievement test (CAT). Furthermore, a checklist was designed which contain all the chemistry laboratory facilities. The chemistry achievement test was a thirty item four response option objective test. However, every correct answer in each instrument attracted one mark and wrong answer zero mark. The maximum marks for all the thirty items in the instrument was sixty marks. The data collected was analyzed using the Pearson Product Moment Correlation which try to assess the existing relationship between two variables.

Findings

The data analyzed which try to investigate the extent of utilization of laboratory facilities for teaching Chemistry in secondary schools present in Table 1 indicate that the calculated t-value of -36.85 which is greater than the critical t-value of 1.96 at 0.05 significance level and 349 degrees of freedom. This means that the calculated t-value is statistically significant at 0.05 level of significance. However, from the analysis the null hypothesis is rejected since the calculated t-value is negative it means the extent of utilization of laboratory facilities for teaching Chemistry in secondary school is significantly less than expectation.

Table 1: Utilization of individual items of laboratory facilities

S/N	Facilities	$\bar{X}$	t-value	Level of significance
1.	Chemistry laboratory	2.18	2.21	Significant
2.	Preparatory table	2.10	2.11	Significant
3.	Electricity supply	2.23	2.24	Significant
4.	Water supply	2.05	2.06	Significant
5.	Periodical charts	1.85	1.85	Non-significant
6.	Tripod stands	2.04	2.05	Significant
7.	Retort stands	2.02	2.03	Significant
8.	Test tubes	2.35	2.36	Significant
9.	Beakers	2.56	2.56	Significant
10.	Pipettes	2.56	2.62	Significant
11.	Measuring cylinders	2.60	2.66	Significant
12.	Weighing balance	2.66	2.48	Significant
13.	$AgNO_3$	2.48	1.97	Significant
14.	CaOH	1.96	1.81	Non-significant
15.	Computers	1.96	1.72	Non-significant
16.	Overhead projectors	1.71	1.67	Non-significant
17.	Thermometer	1.70	1.51	Non-significant
18.	Bunsen burners	1.50	1.75	Non-significant
19.	Test tube rags	1.74	1.60	Non-significant
20.	Volumetric flask	1.59	1.67	Non-significant
21.	Fume cupboard	1.66	1.57	Non-significant
22.	Descicator	1.56	1.72	Non-significant
23.	Spatula	1.72	1.67	Non-significant
24.	Burette	1.64	1.83	Non-significant
25.	Bom calorimeters	1.83	1.54	Non-significant
26.	Accumulator	1.54	1.62	Non-significant
27.	Electrolagtic cell	1.58	1.46	Non-significant
28.	pH meter	1.45	1.64	Non-significant
29.	Red litmus	1.64	1.86	Non-significant
30.	Blue litmus	1.83	1.93	Non-significant
31.	Evaporating discs	1.93	1.65	Non-significant
32.	Condensers	1.65	1.84	Non-significant
33.	Thermometers	1.83	1.58	Non-significant
34.	Benzoic acid	1.57	1.73	Non-significant
35.	NaOH	1.72	1.75	Non-significant
36.	NaCl	1.68	1.68	Non-significant
37.	Na_2SO_4	1.78	1.79	Non-significant
38.	NH_4OH	1.60	1.61	Non-significant
39.	Copper turnings	1.68	1.70	Non-significant
40.	Ethyl alcohol	1.83	1,81	Non-significant
41.	Potassium permanganate	1.87	1.88	Non-significant
42.	Salicylic acid	1.85	1.86	Non-significant
43.	Methyl orange indicator	1.71	1.72	Non-significant
44.	Indicator bottle	1.83	1.83	Non-significant
45.	Preparatory room	1.60	1.61	Non-significant
46.	Laboratory tables	2.00	2.02	Significant
47.	Wash bottles	1.72	1.73	Non-significant
48.	Aqueous ammonia	1.75	1.77	Non-significant
49.	Test tube holders	1.81	1.84	Non-significant
50.	Ethanoic acid	1.60	1.61	Non-significant

Source: Data analysis 2012

Table 2: Population t-test analysis of the extent of utilization of laboratory facilities for teaching Chemistry in secondary schools

Variable	N	$\overline{X}$	SD	$\mathcal{M}$	t
Utilization of laboratory facilities	350	93.01	16.24	125.00	-36.85*

*P<.05; df = 349; critical t = 1.96, n = 50.

Accordingly, the result of the analysis of laboratory facilities and academic performance present in table 2 show that 74% of the laboratory facilities showed non-significance while 27% of the facilities are significantly utilized by both Chemistry students. 37 out of the 50 laboratory facilities showed non-significance while 1 out of 50 of the facilities show that the laboratory facilities are significantly utilized. Facilities such as periodic charts, calcium hydroxide, computers, overhead projectors are non-significant. While other facilities shows significance in terms of utilization. The data analysed revealed that there is no significant relationship between extent of utilization of laboratory facilities and students' academic performance in Chemistry.

Furthermore, the Pearson product moment correlation which was used to analyzed the relationship between extent of utilization of laboratory facilities and student academic performance presented in Table 2 indicate a calculated r-value as 0.024 which means that there is a positive relationship between the extent of utilization of laboratory facilities and students' academic performance in Chemistry. In other words, academic performance increases with the extent of utilization of laboratory facilities and vice versa. Be that as it may, the calculated r-value of 0.024 is not statistically significant at 0.05 significance level and 348 degrees of freedom because the significance level associated with the calculated r-value (0.657) is far greater than 0.05 alpha level. This means that there is no significant relationship between the extent of utilization of laboratory facilities and students' academic performance in Chemistry. To this end, the null hypothesis was therefore upheld.

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

Variables	$\overline{X}$	SD	$\sum x^2(\sum y^2)$	$\sum xy$	r	Sig level
Utilization of laboratory facilities	93.01	16.24	92076.97			
Academic performance	37.13	14.86	77111.95	2046.61	).024	0.65

Source: Data analysis 2012

Conclusion and Recommendations

The study showed the importance and significant role played by the utilization of laboratory facilities on students' achievement in chemistry. The study revealed that laboratory facilities do not significantly contribute to the variance in academic performance in chemistry. Students' variance in achievement as attributed to other variables. Laboratory facilities allowed students to interact and understand chemistry concepts. Therefore, adequate laboratory equipment's must be provided if the teaching and academic performance of students offering chemistry in schools must be enhance

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