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A correlational study on laboratory facilities availability and academic performance in biology

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Abstract

This study sought to investigate the relationship existing between laboratory facility availability and students' academic performance in Biology across Secondary School in Ethiope East L.G.A., of Delta State, Nigeria. In the course of this study, three research questions were developed and three null hypotheses were formulated. The study used was delimited to senior secondary schools two (SSII) because it is at this stage students are being exposed to practical activities that require the usage of laboratory facilities and equipment. A descriptive survey design was used while the sample of the study was made up of one hundred and three (103) respondents. The study employed a questionnaire as an instrument to gather data. The data collected was analysis Chi-square and t-test statistics. The results revealed a significant difference in academic performance of students having fairly adequate laboratory facilities in their school compared to those with in school having inadequate laboratory facilities for biology practical. Difference was also recorded in terms of the performance of male and female students in biology. No significant difference was obtained in the supplies of biology laboratory facilities in private schools and those in public schools. It was suggested that science/biology laboratory facilities should be provided to biology teachers to enable them to know how to handle the facilities.

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Introduction

Development of a sound scientific background by students, in sciences, science education and other aspect of studies is the bedrock of a progressive human development. Hence, no educational system can be seen to rise higher than the standard of its teacher as no nation can rise above its educational standard (Aleyideino, 2017). The utilization of scientific equipment and knowledge transfer of science from teachers to student requires the availability and appropriate utilization of laboratory facilities. Emphasis has been laid on the relevance of science education as it encompasses teaching processes and principles of science (FME, 2014), leading to applied and fundamental research in science across all level and subject areas. Hence, availability of laboratory facilities for student's utilization brings about effective teaching and learning process (Ughamadu, 2016).

Biology is a major subject in life science and also forms a fraction of science education. It is an integral part of science which requires the availability of facilities in field and especially laboratory processes which is crucial and relevant to students' academic achievement (Milgwa, 2019). Biology is directly related to everyday life and effective scientific knowledge of biology requires practical teaching and learning process. It is a continuous process of exploration, experimentation and research which requires that laboratory facilities should be made available at all time for practical (Ogunkoya and Olatoye, 2015). Thus, enhancement of processes relevant for teaching and learning can never be overestimated.

The problem of poor performance and lack of interest in science, most especially biology has been due to the theoretical nature of the educational system. In most schools, there is total absence of laboratories while those with laboratories only brag with the structure while there is either no facilities relevant for teaching and learning biology, or there is inadequate laboratory facilities. The degenerated nature is a leading cause of poor performance in academic achievement in biology across secondary schools.

Therefore, this study tends to correlate the implications of laboratory facilities on secondary schools students' biology performance using selected schools in the Ethiope East region of Delta State, Nigeria.

Materials and methods

Research Questions

The following research questions/hypotheses were formulated to guide this study:

i. Is there difference in academic performance of biology students in schools having fairly adequate laboratory facilities and students in schools inadequate laboratory facilities?

ii. Are biology laboratory facilities more adequately supplied to public female schools than to public male schools?

Research Hypotheses

Hypothesis H01: There is no difference in academic performance of biology students in schools having fairly adequate laboratory facilities and students in schools inadequate laboratory facilities.

Hypothesis H02: There is no significant difference in biology laboratory facilities supplies to public female schools than to public male schools.

Population and sampling

The population of the study consists of all Senior Secondary Schools Two (SSSII) students in the public and private secondary schools within the study area. One hundred and three (103) SSII students balloted from four (4) secondary schools in the study area were used for the study. Using well-structured questionnaire, the respondents were sampled to indicate their view on the subject matter. Test for reliability using a pilot study, administered to a class of fifty (50) students yielded reliability coefficient of 0.71 using the Spearman's Rank reliability coefficient.

Collection and analysis of data

For the purpose of the study, the researcher employed the services of co-researcher in the field of science education (biology) to carry out the collection of data on the research work.

The administration and the collection of the instrument were carried out by the researcher with the assistance of the assigned biology teachers and school's principal. The data collected for this study were analyzed using Microsoft Office Excel tools (Chi-square statistics) and t-test statistic. Hypotheses were tested using Chi-square and at p ≤0.05 and t- test statistics.

Results

The study showed that there is observed difference in the performance of students subjected to different levels of laboratory facilities as shown in the results obtained from students' response.

Research Question 1:

Is there any difference between the academic performance of students from schools with fairly adequate biology laboratory facilities and those schools with inadequate?

Table 1. Analysis of data from responses on research question one

Variables	N	X	SD
Students from schools with fairly adequate biology laboratory facilities	148	43.26	10.26
Students from schools with inadequate biology laboratory facilities	227	21.79	5.91

Table 1 show the mean and the standard deviation of schools with fairly adequate laboratory facilities (43.26 and 10.26) to be greater than that of inadequate laboratory facilities (21.79 and 5.91). Thus, revealing a difference in academic performance among biology students in the different school.

Research Question 2:

Are biology laboratory facilities more adequately supplied to public female schools than to public male schools?

Table 2. Analysis of data from responses on research question two

Schools (Variables)	Adequately provided	Fairly adequate	Inadequate
Male public school students	0(0)	11(11.63)	28(27.37)
Female public schools students	0(0)	6(5.37)	12(12.63)

Table 2 showed the mean and the standard deviation of fairly adequate laboratory facilities (11.63 and 5.37) which is greater than that inadequate laboratory facilities (27.37 and 12.63). Thus, it implies that a difference exist in biology performances of both male and female students with laboratory facilities more adequately supplied to public female schools than to public male schools.

Hypothesis Testing

Hypothesis H_{O1}:

There is no significant difference between the academic performance of students from schools with fairly adequate and those from schools with inadequate biology laboratory facilities.

From the analysis, t-calculated of 69.78 was recorded which is higher compared to the critical value (t_{cal} - 1.76) at 0.05 significance level. Hence, a significant difference in academic performance of biology students from schools supplied with fairly adequate laboratory facilities having better performance than their counterparts from schools with inadequate biology laboratory facilities supplies (Table 4).

Table 4. Test for hypotheses one

Variables	N	X	SD	DF	t-cal	t-crit	Remark
Students from schools with fairly adequate biology laboratory facilities	148	43.26	10.26	373	69.78	1.76	Rejected
Students from schools with inadequate biology laboratory facilities	227	21.79	5.91				

Not significant at p≤ 0.05

Hypothesis H_{o2}:

There is no significant difference between the biology laboratory facilities supplied to public female schools and those supplied to public male schools.

From the analysis of data obtained, Chi-square value calculated (t_{cal}- 0.715) indicated a greater value as against critical value of 0.103. Thus implying a significant difference between the supplies of biology laboratory facilities to public female schools as against supplies to public male schools (Table 5).

Table 5. Test for hypotheses two

Schools (Variables)	Adequately provided	Fairly adequate	Inadequate	RT	DF	X^2-cal	X^2-crit	Remark
Male public school Students	0(0)	11 (11.63)	28 (27.37)	39	2	0.715	0.103	Rejected
Female public schools Students	0(0)	6(5.37)	12 (12.63)	18				

Significant at $p \leq 0.05$

DISCUSSION

The study revealed a significant difference between the academic performance of students from schools with fairly adequate and those from schools with inadequate biology. This result was in accordance with the findings of Abdulrahman (2009) that secondary school laboratories are sparsely furnished and unused by science teachers and non-availability of laboratory facilities for effective teaching of biology in our secondary schools persists thereby giving rise to poor academic performance, as discussion and lecture methods of teaching have been dominating the teaching and learning activities where students need to do practical work. Kamar (2007) found that all the schools in his study sample had functional biology laboratories that were reasonably equipped with the basic apparatus necessary for the conduct of laboratory practical work only during and mainly for external examination and whatever was left over after the examination was distributed to the few laboratories. This makes the laboratories inadequately equipped.

Also, the study revealed that there is a significant difference between the biology laboratory facilities supplied to public female schools and those supplied to public male schools. This finding agree with Adeyemi (2006), whose study shows the difference between the mean scores in the supply of biology laboratory facilities to public female schools and those of male public schools. Also, Fagbemi (2012) stated that the availability of Biology laboratory facilities is more in the private schools than those in the public schools but the difference is not significant.

Conclusion and Recommendations

From the findings, it was observed that a difference exists in the academic performance of students from schools with fairly adequate and those from schools with inadequate biology as well as between the biology laboratory facilities supplied to public female schools and those supplied to public male schools. Based on the findings, the need for effective biology supervision and supplies of facilities by ministry of education and schools and training for teachers to update their knowledge on the use of the biology laboratory facilities should be undertaken.

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