

The Effect of Biology Practical Activities on Academic Performance of Secondary School Students in Cross River State, Nigeria

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Abstract

The study investigated the effect of Biology practical activities on the academic performance of secondary school students in cross river state. Three hypothesis were formulated to guide the research. A quasi experimental research design was adopted for the study. 120 SSIII students formed the sample of the study. Biology Achievement Test (B.A.T) was the main instrument used in gathering data for the study. The data collected were analyzed using analysis of covariance (ANCOVA). Findings from the research showed that there is a significant difference on the academic performance of students taught with practical Biology activities. Also, there is a significant influence of gender on the academic performance of students offering Biology. The researchers on the basis of these findings, recommended that practical activities approach to the teaching and learning of Biology should be obligatory to Biology teachers in all secondary schools. It was also recommended that the government should provide well equipped laboratories in all secondary schools across the State.

Introduction

Science is a systematic process of obtaining verifiable and testable knowledge about nature through theoretical and practical activities. Development in science over the years have influenced and dominated every aspect of human endeavour such that any individual lacking in scientific literacy find it very hard to survive in the contemporary society. For any nation to attain this rapid scientific growth and advancement, it is important that such a nation improve the standard of her educational system by setting up science laboratories in schools as a prime component of a school science programme because science has globally become a basis of an increasing workforce such that all students need a strong exposure to science (Biology) practical activities. In order for the students to achieve their career objectives, hands-on practical aspect of learning should be mandatory for all students and the proper place for this practical aspect of learning in any science subject is in the laboratory and biology being one of the science subjects cannot be taught or learnt effectively in the absence of practical activities. Uche, (2018) defines science laboratory as a place where students may acquire new knowledge, concepts and skills, in order to achieve better understanding of rules, processes, principles, laws, theories and natural phenomena.

Literature Review

Teaching is said to be effective when resources such as laboratory practical activities, diagrams, charts, models, field works and real objects are efficiently utilized to explain the subject matter Nwagbo (2016). Practical activities in Biology is essentially important for concretizing theoretical classroom learning experiences and stimulating the students urge to study Biology. It also provides opportunity for students to interact with materials and ideas, and by so doing, stimulate the development of affective and psychomotor dimensions of learning alongside with the cognitive dimension in order to ensure an all-round and comprehensive development of the student Agbowuro (2006). Experimental activities in Biology could be seen as a method that could be adopted to make the task of teaching Biology more concrete or real to students as opposed to theoretical or abstract presentation of principles, facts and concepts. Experimental activities in Biology is important to students' academic performance because, it is a teaching method that has to do with practical demonstration of scientific concepts, principles, theories and laws. From its experimental engagement, the students ultimately gain capacity to acquire new facts, develop concepts and principles and skills, which lead to the cultivation of scientific attitudes and habits Onyegegbu (2006). For instance, practical activity on the influence of carbon (iv) oxide on photosynthesis, offer students the opportunity of collecting relevant data and conceptualizing on the appropriateness of the theories associated with photosynthesis and carbon (iv) oxide. It is in view of the above that, Nwagbo (2016) stated that "the used of practical activities approach to the teaching and learning of Biology concepts should therefore be made mandatory other than an option to Biology teachers, if we hope to produce students that would be able to acquire the necessary knowledge, skills and competence needed to meet the demands of the nation". This implies that, the academic performance of students in any science based subject like Biology is closely related to both theoretical and practical knowledge. Alison (2013) said that, Biology is centered on problem solving and laboratory is the most convenient place for careful observations, accurate calculations and logical inferences, therefore, practical activities should be regarded as the main instructional procedures in which cause and effect of any concept is determined. Rughill (2011) in his study on laboratory investigative approach for a successful teaching methodology for high school science instruction, revealed that, students showed significant high grade for this cognitive dimension. Ajevalemi (2011) blame the state of student's poor performance in Biology on lack of laboratories facilities.

Apart from practical activities, Okeke(2015) observed that, gender disparity could also be implicated on student's poor academic performance in Biology. He maintained that, the issue of gender stereotyping cut across social, economic, political and educational development. He described gender stereotyping in schools as 'hidden curriculum' which send out messages to girls to conform to role expectation. This has created a big psychological alienation or depression in the minds of the female students. As a result, boys dominate in science while the girls go into reading languages and Arts. Akpochofo (2009) reported that in Nigeria as in many African societies, there is gender bias, a situation in which cultural beliefs and structural arrangement favour men over women. It is generally accepted that environment is critical to learning and that success in school learning is related to the environment in which the learning takes place. Nduka(2012) believes that, schools located in urban areas are better positioned to attract more quality academic performance than those in the rural areas. But Ajayi and Ogunyemi (1990) and Gana (1997) in their different studies on the influence of school location on student's academic performance revealed that, there is no significant influence of school location on academic performance of students in urban and rural schools. They maintained that what is needed is the zeal necessary to teach all the concepts by the teacher and the readiness on the part of the students to learn.

Statement of Problem

In spite of efforts through research to improve performance of students in Biology, the teaching and learning of Biology have continually received a lot of criticism from the society sequel to students'

poor performance in Biology external examinations. Biology chief examiners reports have in recent years, indicated a declined in candidates' performance in biology external examinations and this weakness was attributed to students' inability to understand some Biology concepts theoretically due to inadequate exposure to practical work. This situation has created the need for an effective teaching methodology to redressed student's continual poor performance in Biology. Therefore, the problem of this study is posed as a question; could Biology practical activities, gender and school location/environment have any influence or effects on student's academic performance in Biology?

Purpose of the Study

This study aimed at investigating the effect of Biology activities on student academic performance in Cross River, Nigeria. Specifically, the study sought to:

1. Determine the effect of Biology practical activities on student academic performance in Cross River State
2. Determine the influence of gender on student academic performance when taught Biology with practical activities in Cross River State
3. Determine the influence of school location on student academic performance when taught Biology with practical activities in Cross River State

Hypothesis

HO1: There is no significant difference in Biology academic performance of students when taught with practical Biology activities.

HO2: Gender does not significantly influence student's academic performance in Biology when taught with practical Biology activities.

HO3: School location does not significantly influence students' academic performance in Biology when taught with practical Biology activities.

Methodology

The study area was Cross River State. The design adopted for this study was a quasi-experimental design. Out of two thousand, four hundred (2400) SSIII students in Cross River State, a sample of one hundred and twenty (120) students were selected using stratified simple random sampling. The instrument used for data collection was Biology Performance Test (B. A.T). The instrument was validated by three professionals in measurement and evaluation Department University of Calabar, Calabar. Students t-test was used to determine the reliability and the reliability indices ranges from 0.77-0.81.

Procedures for Data Analysis

Three hypotheses were formulated to guide the study. Data collected were analyzed using Analysis of Covariance (ANCOVA). All hypothesis were tested at 0.5 level of significance

Presentation of Results

The result of the analysis is presented in the table 1, 2 & 3. The hypotheses were tested at 0.05 significance level.

Hypothesis one: There is no significant difference in Biology academic performance of students when taught with practical Biology activities. The independent variable is teaching method while dependent variable is academic performance of student in Biology. One-way Analysis of Covariance (ANCOVA) adopted; the result is presented in Table 1

Table 1: One-way Analysis of Covariate (ANCOVA) of scores of students performance in Biology when exposed to Practical Biology activities

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	3702.193 ^a	1	3702.193	137.892	.000	.539
Intercept	489.386	1	489.386	18.228	.000	.134
Pre-test	3702.193	1	3702.193	137.892	.000	.539
Error	3168.132	118	26.849			
Total	124621.000	120				
Corrected Total	6870.325	119				

a. R Squared = .539 (Adjusted R Squared = .535)

The results presented in Table 1, shows that significant difference exists in Biology academic performance of students when taught with practical Biology (F=137.892;p=.000). Therefore, the null hypotheses which states that; there is no significant difference in Biology academic performance of students when taught with practical Biology activities was rejected at .05 level of significance and the alternative was retained. Also the R squared value of .539 indicated that about 53.9 percent of the variation in the dependent variable (Biology performance) was accounted for the treatment and pre-test given.

Hypothesis two: Gender does not significantly influence student’s performance in Biology when taught with practical Biology activities. The independent variable is gender difference in practical Biology while dependent variable is academic performance of student in Biology. One-way Analysis of Covariance (ANCOVA) was adopted; the result is presented in Table 2

Table 2: One-way Analysis of Covariate (ANCOVA) of scores on gender difference in student’s performances in Biology when taught with practical Biology activities

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	3864.144 ^a	2	1932.072	75.196	.000	.562
Intercept	497.000	1	497.000	19.343	.000	.142
Pre-test	3705.659	1	3705.659	144.224	.000	.552
Gender	161.952	1	161.952	6.303	.013	.051
Error	3006.181	117	25.694			
Total	124621.000	120				
Corrected Total	6870.325	119				

a. R Squared = .562 (Adjusted R Squared = .555)

The results presented in Table 2, shows that gender significantly influence student’s performance in Biology when taught with practical Biology activities (F=6.303; p=.013). Therefore, the null hypotheses which states that; gender does not significantly influence student’s performance in Biology when taught with practical Biology activities was rejected at .05 level of significance and the alternative was retained. Also the R squared value of .552 indicated that about 55.2 percent of the variation in gender accounted for the treatment and pre-test given in Biology performance. With practical Biology activities, male students with mean score of 32.567 perform better than their female counterpart with mean score of 30.238.

Hypothesis Three

School location does not significantly influence student’s performance in Biology when taught with practical Biology activities. The independent variable is school location in practical Biology while dependent variable is academic performance of student in Biology. One-way Analysis of Covariance (ANCOVA) was adopted; the result is presented in Table 3.

Table 3: One-way Analysis of Covariate (ANCOVA) of scores on influence of school location on student's performance in Biology when taught with practical Biology activities

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	3711.013 ^a	2	1855.507	68.716	.000	.540
Intercept	497.394	1	497.394	18.420	.000	.136
Pre-test	3508.768	1	3508.768	129.942	.000	.526
Location	8.821	1	8.821	.327	.569	.003
Error	3159.312	117	27.003			
Total	124621.000	120				
Corrected Total	6870.325	119				

a. R Squared = .540 (Adjusted R Squared = .532)

The results presented in Table 3, shows that school location does not significantly influence student's performance in Biology when taught with practical Biology activities ($F=.327$; $p=.569$). Therefore, the null hypotheses which states that; school location does not significantly influence student's performance in Biology when taught with practical Biology activities was retained at 05 level of significance while the alternative was rejected. Also the R squared value of .540 indicated that about 54 percent of the variation in the school location accounted for the treatment and pre-test given in Biology performance. Although with practical Biology activities students from urban area with mean score of 31.592 perform slightly better than their rural area with mean score of 31.040.

Discussion of the Findings

The results of the first hypothesis showed that there is a significant difference on the academic performance of Biology students taught or exposed to practical Biology activities. This confirmed the assertion of Rughnill, (2011) Alison, (2013) Alexander, (2016), Uche, (2018), that students exposed to Biology practical activities (experimentation) tend to learn more of what is taught, retain it longer, appear more satisfied with their practical work and perform better in examinations than when taught with other instructional formats. This is also in line with the empirical investigation reported by Nwagbo (2016), that students learn best when they are actively involved in the learning process.

The result of the second hypothesis showed that there is a significant influence of gender on the academic performance of Biology students. This confirmed the assertion of Aguisiobo, (2008), Akprochafo, (2009), that gender stereotyping in the educational sector and cultural beliefs hinders girls' participation in science.

The result of the third hypothesis showed that there is no significant influence of school location on academic performance of Biology students. This confirmed the assertion of Ajayi and Ogunyemi, (1990) Gana, (1997), that school location is not a factor that influence academic performance of a learner, what is needed is the zeal and readiness on both teachers and students.

Conclusion

Biology practical activities and gender has been found to correlate significantly with students' academic performance in Biology and school location do not have influence on academic performance in Biology if all variables were held constant, where there are well- equip laboratories and teachers takes practical activities as their main instructional procedures and discourage gender stereotyping.

Recommendations

Based on the findings of this study, the following recommendations are made;

1. The use of practical activities approach to the teaching and learning of Biology should be made mandatory to all Biology teachers.
2. Gender stereotyping should be discouraged and girls should be encouraged to study Biology.
3. Government should build and equip all laboratories in all the secondary schools.

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