AVAILABILITY AND UTILIZATION OF LABORATORY FACILITIES ON SECONDARY SCHOOL STUDENTS' ACADEMIC ACHIEVEMENT IN BIOLOGY IN CALABAR EDUCATION ZONE, CROSS RIVER STATE

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Abstract
The study examined the influence of availability and utilization of laboratory facilities on secondary school students' academic achievement in biology in Calabar Education Zone, Cross River State. Two research questions and two hypotheses were formulated to guide the study. The study adopted ex-post facto research design with stratified and simple random sampling techniques. The population of the study consisted of 2992 SS II biology students in Calabar Education Zone; from where 300 students were sampled. A structured questionnaire titled, Availability and utilization of laboratory facilities and secondary school students achievement in biology questionnaire (AULFSSSABQ) and biology achievement test (BAT) were the instruments used for data collection. The data collected were analyzed using simple linear regression. The result showed that there was a significant influence of availability of laboratory facilities on students' academic achievement in biology. Again, there was a significant influence of utilization of laboratory facilities on students' academic achievement in biology. The study recommended among others that government and educational stakeholders should endeavour to provide laboratory facilities so as to improve students' academic achievement in Biology. Teachers should be encouraged to improve their teaching competence through attending conferences, seminars and workshops of stakeholders in Biology and science education to enhance students' academic achievement.

Introduction

Education is generally considered one of the basic needs of human beings (Sekegor & Agadaigho, 2020). Science has been characterized as a body of knowledge evolved by scientists which science education builds on the knowledge and skills acquired by the learners so that students can understand specific principles, laws and theories. The emphasis on teaching and learning of science is on ensuring that teachers not only teach the processes of science but also enable sensory learners to learn scientific concepts. By this, the "hands" and "minds" of learners

must be on scientific activities such that learners will be able to learn actively and thereby participate in knowledge construction (Chepkorir, Cheptonui & Chemutai, 2014).

According to Bathsheba, Damak, Wajim and Akwayamai (2020), science is a dynamic human activity concerned with understanding the workings of the world. This understanding helps man to know more about the universe. Without the application of science, it would be difficult for man to explore the other planets of the universe. Science comprises the basic discipline such as physics, chemistry, mathematics and biology.

Biology, a science of life occupies an important position in the secondary school curriculum. The subject is designed ultimately to educate individuals who may or may not pursue biology related career. Biology is a natural science of living things which is philosophically known to be one of the most central subject areas in the educational curriculum that prepares and develops learners' cognitive, affective and psychomotor domains (Sekegor & Agadaigho, 2020).

Biology is the science of life which studies organisms, their interactions with one another. Biology is related to many things in human's daily life, it is a prerequisite for certification at the senior secondary school level (SSCE) and for admission into the tertiary institution for most science oriented courses that will pursue careers in science related fields such as medicine, nursing, pharmacy, food and nutrition, medical laboratory, etc., in which all of these fields requires a laboratory.

Biology as a science subject is studied or taught using different methods which employs the use of all sense organs including olfactory (smell), gustatory (taste), auditory (hearing), kinesthetic (skin) and optical (seeing) of which only the application of theory in teaching and learning could not yield 100 percent accuracy without the use of laboratory resources. Thus, effective teaching and learning of biology in secondary school with the use of laboratory facilities is very necessary if students must achieve maximally in biology (Mukagihana, Nsanganwimana & Aurah, 2020).

Availability of laboratory facilities in secondary school can solve problems of students' poor academic achievement in internal and external examinations in biology. According to Omeodu (2018), the success of science students in secondary schools largely depends on the availability and effective utilization of available laboratory facilities. Adebule and Ayoola (2016) stated that instructional resources use in teaching raises students' level of discovery and stimulates students to learn more as they see what they are taught. Biology laboratory facilities provide students with various opportunities to learn through several experimentations, which plays a crucial role in the intellectual development of students at any academic level. Science laboratories give student the time, space and resources to explore and experiment. Laboratory teaching assumes that firsthand experience in observation and manipulation of the materials of science is superior to other methods of developing understanding and appreciation.

Arokoyu and Chimuanya (2017) attested that the teaching process becomes less stressful for both teachers and students when laboratory facilities are used. Therefore, identifying available laboratory facilities at schools, is of imperative need as learning by hands-on and observation of instructional resources raise students' level of memory and enhance learning achievement (Waigera, Mweru, & Ngige,(2020). This attestation is supported by Adebule and Ayoola (2016) who affirmed that instructional resources use in teaching raises students' level of discovery and stimulates students to learn more as they see what they are taught.

Ahmed, Auta, Mohd, David, Buba and Usman (2019) in their work opined that students will understand the concepts expected of them if practical activities are used in all science classes; otherwise, learning short of this could be considered abstract content teaching. The authors went further to report that the unavailability of laboratory facilities causes students to become less engaged and more prone to memorization of facts, which in turn fosters rote learning, a problem that has plagued biology education.

Utilization of laboratory facilities is the frequency in which the available laboratory facilities are used during laboratory experiments. Adebisi, Tewogbade and Olajida (2017) stated that laboratory facilities can be available but not utilized during biology teaching, thus, the authors expressed frequent need for utilization of the laboratory facilities in teaching and learning of biology. Ahmed, et al (2019) opined in their work that students will understand the concepts expected of them when practical activities are used in teaching biology in class otherwise, learning short of this could be considered abstract content teaching

Achievement is a measure of accomplishment in a specific field of study (Abakpa, 2011; Ibok, .Meremikwu, & Umoh, 2020). Furthermore, Abakpa maintained that student's achievement is the demonstration of the abilities to attain certain levels of instructional objectives outcome of their classroom instruction and experience. It is believed that without the ability of attaining this level, academic achievement may not be possible (Meremikwu, Ibok, Adie, Inah & Okri , 2022). . Low achievement in Biology is worrisome to both teachers and educational administrators. Oyekan (2016) stated that the academic achievement of candidates in Biology at the Senior School Certificate Examinations (SSCE) conducted by both, the West African Examination Council (WAEC) and the National Examinations Council (NECO) have not been measured with other science subjects such as chemistry and physics. Yet Biology has the highest enrolments and not too well results over the years among the science subjects. It is against this background that the study seeks to determine the availability and utilization of laboratory facilities and secondary school students' academic achievement in Biology in Calabar Education Zone, Cross River State.

Literature review

Biology is a subject that cannot be effectively taught without the students making use of laboratory facilities. Bathsheba, Damak, Wajim and Akwayamai (2020) carried out a study on the influence of the availability of laboratory facilities on academic achievement of biology students in Jalingo Local Government Area of Taraba State, Nigeria. Two research questions guided the study. Descriptive survey research design was employed. The population of the study was seventy-six (76) teachers which also serve as the sample for the study. The instrument used for data collection was a questionnaire tagged Availability of Laboratory Facilities and Academic achievement of Biology (ALFAPQ). The questionnaire has sixty (60) items. Descriptive statistics and mean were used to answer research questions. From the findings, it was revealed that most of the facilities are not available in the study area. The result of the finding also showed that the use of biology laboratory facilities is directly linked to students' academic achievement. When students are exposed to the use of these facilities, they tend to perform better than they would have done without these facilities.

Pareek (2021) conducted a study on the assessment of availability and utilization of laboratory facilities for teaching science at secondary level. The sample technique of the study was stratified random sampling. In the first stage, 3 districts (Jaipur, Ajmer and Nagaur districts) out of the 33 districts of Rajasthan were randomly selected in consultation with the Rashtriya Madhyamik Shiksha Abhiyan (RMSA) programme of Rajasthan. In the second stage, from each of the districts, seven (7) government secondary schools were selected. The study adopted a survey design in which primary data was collected from the principals, teachers, and students belonging to the 21 government secondary schools located in the Jaipur, Nagaur, and Ajmer districts of Rajasthan State using questionnaires and focus group discussions (FGDs). A structured FGDs was held in all the schools separately for classes IX and X students (students aged 14–15 years old). The finding showed that laboratory facilities are highly inadequate, far below the expectation, and in most of the schools, science experiments are not being conducted. This study also revealed that it is important that resources are made available for establishing laboratories with adequate facilities in schools. It recommended that immediate steps to equip/set up science laboratories for the effective teaching and learning of science.

In a study by Mukagihana, Nsanganwimana and Aurah (2020) on biology instructional resources availability and extent of their utilization in teaching pre-service biology teachers, the study used a descriptive survey research design and was conducted in three (3) private universities selected from those offering education in Rwanda. Eighty- two (82) pre-service biology teachers and five (5) biology lecturers participated in the study. The study used observational checklist of biology instructional resources and questionnaires as instruments for data collection. Data collected was analyzed using frequency counts and percentages. The result showed that there is low-level use of available instructional resources, which may be linked to various factors which include the insufficiency of available biology instructional resources. The implication is that some biology concepts may be delivered in abstract, and teaching in abstract may decrease students' incentive for learning. The finding of the study also revealed that even the available resources are not adequately utilized.

Etiubon and Udo (2020) conducted a study on availability and utilization of laboratory facilities for teaching carbohydrates in senior secondary schools in Uyo education zone, Akwa Ibom State investigated the availability, utilization of laboratory instructional facilities and problems encountered by biology and chemistry teachers on the concept of carbohydrates. The study adopted the descriptive survey research design. Three research questions and three research hypotheses were formulated to guide the study. The sample size for the study was two hundred and fifteen (215) biology and chemistry teachers from the population of two hundred and eighteen (218) biology and chemistry teachers in 2018/2019 academic session.

The study used purposive sampling technique. A structured questionnaire on the availability, utilization of laboratory instructional facilities and problems encountered by biology and chemistry teachers during the teaching of carbohydrates in Uyo Education Zone served as instrument for data collection. Split half method was used to determine the reliability with coefficient of 0.88. Data was analyzed using mean, standard deviation and independent t-test. The findings showed that few laboratory facilities are available but rarely utilized by biology and chemistry teachers. The study recommended among others that; biology and chemistry teachers should make use of laboratory facilities available for the teaching of carbohydrates in public senior secondary schools in Uyo Education Zone and school administrators should help reduce problems encountered by biology and chemistry teachers in the utilization of laboratory facilities.

Sekegor and Agadaigho (2020) carried out a study on influence of availability and utilization of laboratory facilities on students' performance in biology in Ethiope-West Local Government Area of Delta State. Four hypotheses were formulated to guide the study. The sample of the study comprised of 56 SSII students getting prepared for the West African Senior Certificate Examination (WASSCE) and Seven (7) biology teachers teaching the selected SSII classes. The sample was obtained using the systematic sampling technique. A self-prepared checklist extracted from the West African Secondary Certificate Examinations was used for the study. The data was analyzed using chi-square goodness of fit test and Pearson-Product Moment Correlation. The findings of the study showed inadequate biology laboratory facilities in the local government area since only one school had the facilities and materials; non utilization as a result of teacher's qualification; teachers' qualification is an asset for proper utilization of the laboratory. It was therefore recommended that the Government, parents, teachers and all concerned bodies make effort to provide secondary schools with laboratory facilities, materials (specimens) and equipment, in addition to increase in the number of practical classes per week and students' participation to enhance scientific manipulative skills.

Statement of problem

The problem of non-availability and utilization of laboratory facilities for effective teaching and learning of biology in secondary school has persisted for a long time. Many secondary schools claim to offer science subjects, but a visit to these schools reveals that some

of them only offer science subjects but they have no functional laboratories not to talk of laboratory facilities. In some cases, where these laboratory facilities are available, improper utilization was observed.

On the other hand, it has also been observed that the achievement of students in both Senior Secondary School Certificate Examination (SSCE) and the General Certificate in Education (GCE) has been consistently poor for some years now. This poor achievement has been attributed to students' inability to tackle biology practical questions. which is what has prompted the researcher to seeks to investigate the availability and utilization of laboratory facilities and secondary school students' academic achievement in Biology in Calabar education zone.

Research questions
This study was guided by the following research questions:
1.   How does availability of laboratory facilities influence the mean achievement academic of students in Biology?
2.   How does utilization of laboratory facilities influence the academic achievement of students in Biology?

Hypotheses
The following null hypotheses were formulated, at 0.05 significant level, to guide the study.
Ho1 – There is no significant influence of availability of laboratory facilities on students' academic achievement in Biology.
Ho2 – There is no significant influence of utilization of laboratory facilities on students' academic achievement in Biology

Methodology
The study area was Calabar Education Zone of Cross River State, Nigeria. Which consist of 7 local government area namely: Akamkpa, Akpabuyo, Bakassi, Biase, Calabar Municipality, Calabar South and Odukpani local Government Areas. The research design used for this study was the ex-post facto design. The researchers used this design because the independent variables which are availability and utilization of laboratory facilities were variables that had occurred already and the researcher had no direct control over them. The population for the study consisted of all the senior secondary school Il (SSS 1l) Biology students in the study area. There are ninety-four (94) public secondary schools and two thousand, nine hundred and ninety-two (2992) SSS 1l biology students.

Stratified and Simple random sampling techniques were used in selecting the required sample for the study. Stratified sampling was used to obtain three local governments for the study and one school each from the selected local government. Simple random sampling technique was considered appropriate to select 300 SS11 student as sample representing 10% of the student population. The instruments used for data collection was the questionnaire titled "Availability and utilization of laboratory facilities" and students' achievement test in Biology.

The questionnaire was constructed by the researcher on three (3) options rating scale; for the availability of laboratory facilities, the responses were based on adequate (A), inadequate (IA) and none existence (NE) while utilization of laboratory facilities responses were based on always (A), sometime (S) and not at all (NAA). Biology Achievement Test comprising twenty items constructed by the researchers with help of two experts in Biology education. The items were constructed based on SS1I Biology syllabus with four options A, B, C, D. A correct answer attracts 5 marks given the total of 100% for all correct while incorrect answer attracts 0 mark. The instruments were face-validated by two experts in Measurement and Evaluation and two Biology Educators, both from the University of Calabar. Corrections were pointed out by the experts and adjusted by the researcher and the document were considered valid.

The reliability of the questionnaire after a trial testing with 30 SS11 who were not part of the sample for the study using Cronbach gave 0.82 for availability of laboratory facilities and .84 for utilization of laboratory facilities while the reliability estimate of the Biology achievement test was established through Kuder Richardson formula K-R20 which gave 0.87. Since the index is above .50, estimates were considered high. The two hypotheses were tested using simple linear regression.

Results

The result of the analysis was presented on tables 1and 2. The hypotheses were tested at .05 significant level.

Hypothesis one

There is no significant influence of availability of laboratory facilities on students' academic achievement in biology. The independent variable in this hypothesis is availability of laboratory facilities while the dependent variable is students' academic achievement in Biology.

To test this hypothesis, simple linear regression was applied with availability of laboratory facilities as the independent variable and students' academic achievement in Biology as the dependent variable. The F-ratio test was used to test for the significance of the overall prediction model, while t-test was used to test for the significance of the contribution of the regression constant and coefficient (which represents the predictive power of the independent variable) in the prediction model. The results are given in Table 1.

Table 1

Regression analysis on the influence of availability laboratory facilities on students' academic achievement in biology

R-value = .407				Adjusted R-squared = .163	
R-squared = .165				Standard error = 4.29953	
Source of variation	Sum of squares	Df	Mean square	F-value	R-value
Regression	1091.430	1	1091.430	59.041*	.000
Residual	5508.820	298	18.486		
Total	6600.250	299			
Predictor variable	Unstandardized coefficient		Std coeff	t-value	p-value
	B	Std.error			
Constant	87.421	1.900		46.020*	.000
Availability of facilities	-.250	.033	-.093	-7.684*	.000

- Significant at .05 level. P< .05

The results in Table 1 show that the R-value of .407 was obtained, resulting in an R-squared value of .165 This means that the variation in availability of laboratory facilities accounted for about 16.5% of the total variation in students' academic achievement in Biology. The p-value (.000) associated with the computed F-value (59.049) was less than .05. As a result, the null hypothesis was rejected. This means that the availability of laboratory facilities significantly influence students' academic achievement in Biology, with both the regression constant (87.421) and coefficient (-.250) contributing significantly in the prediction model (t=46.020 & -7.684 respectively, p=.000 & .000< .05).

Hypothesis two

         There is no significant influence of utilization of laboratory facilities on students' academic achievement in biology. The independent variable in this hypothesis is utilization of laboratory facilities   while the dependent variable is students' academic achievement in Biology.

         To test this hypothesis, simple linear regression was applied with utilization of laboratory facilities as the independent variable and students' academic achievement in Biology. as the dependent variable. The F-ratio test was used to test for the significance of the overall prediction model, while t-test was used to test for the significance of the contribution of the regression constant and coefficient (which represents the predictive power of the independent variable) in the prediction model. The results are given in Table 2.

Table 2

Regression analysis on the influence of utilization laboratory facilities on students' academic achievement in biology

| R-value = .317 | | | Adjusted R-squared = .098 | | |
| R-squared = .101 | | | Standard error = 4.46323 | | |

Source of variation	Sum of squares	Df	Mean square	F-value	R-value
Regression	663.974	1	663.974	33.331*	.000
Residual	5936.276	298	19.920		
Total	6600.250	299			

Predictor variable	Unstandardized coefficient		Std coeff	t-value	p-value
	B	Std.error			
Constant	87.280	2.495		34.975*	.000
Utilization of facilities	-.245	.042	-.317	-5.773*	.000

- Significant at .05 level. P< .05

         The results in Table 1 show that the R-value of .317 was obtained, resulting in an R-squared value of .101. This means that the variation in utilization of laboratory facilities accounted for about 10.1% of the total variation in students' academic achievement in Biology. The p-value (.000) associated with the computed F-value (33.331) was less than .05. As a result, the null hypothesis was rejected. This means that the utilization of laboratory facilities significantly influence students' academic achievement in Biology, with both the regression constant (87.280) and coefficient (-.245) contributing significantly in the prediction model (t=34.975 & -5.773 respectively, p=.000 & .000< .05).

Discussion of findings

         The result of the first hypothesis revealed that availability of laboratory facilities significantly influences students' academic achievement in Biology. The finding is supported by Adebule and Ayoola (2016) who affirmed that instructional resources use in teaching raises students' level of discovery and stimulates students to learn more as they see what they are

taught. The finding also agreed with the finding of Pareek (2021) who conducted a study on the assessment of availability and utilization of laboratory facilities for teaching science at secondary level and found a significant influence of laboratory facilities on students' academic achievement.

The result of the second hypothesis revealed that utilization of laboratory facilities significantly influences students' academic achievement in Biology. The finding agreed with Etiubon and Udo (2020) who study on availability and utilization of laboratory facilities for teaching carbohydrates in senior secondary schools in Uyo education zone, Akwa Ibom State revealed a significant influence of utilization of laboratory facilities on students' academic achievement. The finding also agreed with Sekegor (2020) who carried out a study on influence of availability and utilization of laboratory facilities on students' performance in biology in Ethiope-West Local Government Area of Delta State and found utilization laboratory facilities significantly influence students' academic achievement. The finding also agreed with the study of Waigera et al (2020).

Conclusion

Availability and the use of laboratory facility could influence students' academic achievement in biology either positively or negatively. Based on the finding of the study, it was concluded that availability and utilization of laboratory facilities significantly influence students' academic achievement in biology. Therefore, availability and utilization of laboratory facilities are the very important factors and should be considered in order to enhance students' academic achievement in biology.

Recommendations

Based on the findings of this study, the following recommendations were made:

   i.   Government and educational stakeholders should endeavour to provide laboratory facilities so as to improve students' academic achievement in biology.
   ii. Teachers should be encouraged to improve their teaching competence through attending conferences, seminars and workshops of stakeholders in biology and science education to enhance students' academic achievements.
   iii. Biology teachers should as a matter of fact develop the habit of using laboratory facilities in the teaching and learning of biology in order to arouse students' interest and enhance their academic achievements in biology topics.

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