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Surveying Influence Of Availability Of Biology Laboratories On Students' Achievement In Bosso Local Government Area, Niger State, Nigeria

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ABSTRACT
This study investigated influence of availability of well-equipped science laboratory on Biology students' achievement in Bosso local Government area, Niger State. A descriptive survey design was employed for the study. The population for the study was 2385 Biology students and the sample size was 343 students. Three research questions were asked and three hypotheses formulated and tested at 0.05level of significance. A researcher made questionnaire titled "Questionnaire on Influence of Availability of Biology laboratories on Academic achievement of Biology Students ((SIABLAABS)) which was dully validated by three experts in science education and reliability index determined to be 0.88, was used for data collection and correlated against Niger State Ministry of Education Biology Mock Examination Results (NSMEBMER) of 2023/2024 academic session which served as the achievement test of the respondents, Data was analyzed using Pearson Product-Moment Correlation Coefficient formula to test the relationship between science laboratory and academic achievement of Biology students at 0.05 level of significance. The findings of the study revealed that there is a significant relationship between availability of Biology laboratories and academic achievement of Biology students. Based on the findings, three recommendations were made among which is that The Government through state ministry of education and well- meaning citizens should ensure that there is provision of adequate number of Biology and other Science laboratories in all secondary schools in Niger state and beyond.
Keywords: Influence, Availability, Biology Laboratories, Academic Achievement

INTRODUCTION

Biology as a science subject contains many abstract concepts, proper teaching of these abstract concepts for effective understanding is a very challenging task to Biology teachers. Teachers always try to explain everything in detail as dictated by the curriculum and many students cannot connect the topics to each other and comprehend the knowledge (Nkok, 2019). For effective teaching and learning of abstract concepts to take place, Biology teachers are always encouraged to employ hands on learning strategies which can be achieved through effective utilization of instructional materials and laboratories equipment. Biology is one of the three main science subjects that is majorly learnt through practical work as it provides science students with opportunities of engaging in the processes of investigation and inquiry. Effective learning of Biology can only take place when students are involved in observing, classifying measuring, hypothesizing, experimenting, interpreting data and making inference in laboratories, this method of learning helps promote students interest in learning (NERDC, 2013). According to Hager, (1974). Experimental learning makes learning more concrete, and may improve academic achievements of students during external examinations as it is believed

that constant practice leads to proficiency in what the learner learns during classroom instruction; hence, the dictum "practice makes perfect". Rich benefits in learning Biology accrue from using laboratory activities. Biology laboratories should provide a learning environment in which students develop their understanding of scientific concepts, inquiry skills and the general perception of Biology. Science laboratories are special rooms stocked with learning equipment to facilitate learning of science concepts. Piaget noted that, when concrete materials are used by students they are able to solve problems which they are naturally limited to solve and can enable students improve on their academic achievements (Ogunkunle 2020). Effective utilization of science laboratories may be capable of captivating students' interest; stimulating desires in learning and make them take responsibility of their own learning process. The emphases on teaching and learning of Biology through the use of Biology laboratories is for ensuring that teachers not only teach the processes of science but also enable sensory learners to learn scientific concepts through hands - on learning processes. By this, the "hands" and "minds" of leaners must be on scientific activities such that learners will be able to learn actively and thereby participate in knowledge construction (Ausubel, 1963 in Nkok 2019). Irrespective of the type and location of school, Biology and other science subjects should be handled in the laboratories in such a way that students feel encouraged to learn. The core business of any school system is to deliver quality education and to ensure that students maximize their potentials, and practical work is a unique source of teaching and learning in any science subject because science students should be able to observe and manipulate materials to demonstrate certain aspects of the subject matter which has been learnt in class through lectures, discussions and textbooks (Adeogun and Osifila, 2008). According to Hofstein and Lunetta, (2004) Science laboratory work is an important medium for enhancing students' attitudes, stimulating interest and motivating students to learn. The quality of teaching and learning experience depends on the extent of the availability and adequacy of laboratory facilities in secondary schools and the teacher's effectiveness in the use of laboratory facilities with the aim of facilitating and providing meaningful learning experiences. The availability and adequacy of laboratory facilities for science teaching, teachers' utilization and students' engagement in laboratory practical may influence students' achievement in science subjects like Chemistry, Physics and Biology. Therefore, science laboratory is a very important educational resource for learning scientific knowledge and skills and requires proper attention by the school management. It is the responsibility of the school managers to ensure adequate provision, effective and efficient utilization of educational resources to meet the objectives of their institution (Okumbe, 2001). Literature has shown that availability and effective management of laboratory facilities leads to optimum utilization of resources and may enhance the teaching and learning process and academic achievement (Lunenburg, 2010). School managers should therefore ensure that science equipment/instruments and reagents are adequately provided for schools as this may reduce variation in test results and ensures high level of performance (Akani, 2012). An evaluation by Morgan (2009) showed that the condition, adequacy and effective management of educational facilities had a stronger effect on the overall performance of students than the combined influences of the family background, socio-economic status, school attendance and behaviour. There have been frequent reports of poor achievement of Biology students in external examinations by researchers, West African Examination Council (WAEC 2023) Chief Examiner's report on Biology results indicates that students' performance in Biology in the Senior Secondary Certificate examination (SSCE) was not encouraging. This was attributed to unfamiliarity with the use of simple laboratory equipment, inadequate exposure to laboratory techniques, lack of observational skills, omission of units in calculated values, inability to draw and label diagrams correctly, inability to spell some Biology terms correctly, among other factors (Nkok, 2022). Academic achievement depicts the level of educational attainment of an individual. It differentiates one with high knowledge content from others with lower and lesser cognitive ability. According to (Duruji, Azuh and Olarenwaju, 2014, Lawrence and Tar 2018) Academic achievement of students in practical based subjects like (Physics, Chemistry, Biology and Agriculture) has witnessed a deplorable trend in the past decade at all levels in Nigerian secondary schools and tertiary institution which may be caused by several factors such as lack of laboratories, inadequate science facilities in the laboratories, lack of practical works, poor teaching methods among other factors. Biology and other science concepts are better taught as processes but not as bodies of knowledge (NPE, 2013). This type of teachings can only take place when students are allowed and encouraged to take active participation in the learning process. Hence, hands-on learning in the laboratory may be the best method of learning and may

stimulate students' interest, which may result to better understanding and retention with improved academic achievement of students. The effect of using laboratories in teaching and learning of sciences in general is that students tend to understand and recall what they see than what they hear or were told. However, many studies have established that physical and material resources in most secondary schools in Nigeria particularly in Niger State are inadequate. In Bosso local government area, the situation is that students interest and enrolment in science subject at the senior secondary school appears to be declining year after year, a situation which if not checked can mar the scientific and technological development of the area. Most secondary schools in Bosso L.G.A do not have well- equipped Biology laboratories (Niger State Ministry of Education, 2023), which might be the reason most Biology students under achieve in Ministry of education mock/promotion Examinations to senior secondary three, the rise and fall in the percentage of students who had credit and above in Biology from 2020 until 2023 fell between 0.35% and 33.70% in 2023 across Bosso Local Government Area (Niger State Ministry of Education, 2023). Though more than 50% of the students passed at credit level in each year, the trend was declining right from 2021 up to 2023. The percentage of students that passed Biology at credit level and above was 50.79%; and that of failure was 49.21% (Niger State Ministry of Education, 2023). If this trend of failure is not reversed, the implication is that most students will not be qualified to enroll for WAEC Examinations and subsequently, admission into science and technology related courses in higher institutions. Since science and technology is the bedrock of the society, the society will suffer from shortage of manpower in science related professions and technological advancements. In view of the above, it became imperative to investigate the causes of the poor performance of Biology students in Ministry of Education Mock/ qualifying examinations for promotion to senior secondary three (SSIII) with a view of proffering solutions, hence, this study investigated the influence of availability of laboratories on Biology Secondary Schools students' performance in Bosso local government area of Niger State. Nigeria

Objective of the Study

The main objective of this study was to determine the influence of science laboratory on academic performance of secondary school Biology students. Other objectives are:

1. To determine the influence of availability of Biology laboratories on academic performance of Biology Students.
2. To determine the influence of availability of Biology laboratory equipment on academic performance of Biology Students.
3. To determine the influence of availability of laboratory practical materials on academic performance of Biology Students.

Research Questions

The following research questions were asked:

1. What is the relationship between the availability of Biology laboratories and academic performance of Biology Students in Bosso L.G.A.?
2. What is the relationship between availability of Biology laboratories equipment and academic performance of Biology Students in Bosso L.G.A.?
3. What is the relationship between availability of laboratory practical materials and academic performance of Biology Students in Bosso L.G.A.?

Hypotheses for the Study

The following hypotheses were formulated and tested at 0.05 level of significance.

1. There is no significant relationship between availability of Biology laboratory and academic performance of Biology Students in Bosso L.G.A.
2. There is no significant relationship between availability of Biology laboratories equipment and academic performance of Biology Students in Bosso L.G.A.
3. There is no significant relationship between availability of Biology laboratory practical materials and academic performance of Biology Students in Bosso L.G.A.

METHODOLOGY

A descriptive survey design was used for this study, the target population for the study comprised of all the secondary school Biology students in Bosso local government area. The accessible population was all SS II

Biology students in six public secondary schools in Bosso local government area. There were 2385 Biology students (Field work, 2023). The study used a sample size of 343 SSII Biology students, the sample size was determined through the use of the Slovenes formula (1978). Stratified random sampling technique was used in selecting the 343 students from six purportedly selected senior secondary schools in Bosso Local Government Area. Three of the six purportedly selected schools were picked based on the availability of well –equipped science laboratories, and the other three schools were selected based on unavailability of well-equipped science laboratories. Therefore, the six schools formed the sampled schools for the study. Questionnaire on surveying Influence of availability of Biology laboratories on Academic Achievement of Biology Students (SIABLAABS) was constructed by the researcher and dully validated by a Psychologists, an expert in measurement and evaluation and three senior science educators. Their expert views were sought so as to determine the validity of the questionnaire and to also ascertain the relevance of the instrument to the study. Some of the features of the questionnaire were; section A: demographic information of the respondents, section B: Influence of the availability of well-equipped Biology laboratories, section C: Influence of availability of Biology laboratories' equipment and section D: Influence of availability of Biology laboratory practical materials on Academic Achievement of Biology Students. The responses were measured using 4 point Likert scale of SA: Strongly Agreed; A: Agreed; D: Disagreed; SD: Strongly Disagreed; The questionnaire was used to obtain factual data and opinions (students' perspective of the influence of Biology laboratories on Biology Achievement) in a structured framework from the respondents. Niger State Ministry of Education Biology Mock Examination Results (NSMEBMER) of 2023/2024 academic session of the respondents were collected from the examination offices of the sampled schools and used as achievement test for the study**.** Pearson Product-Moment Correlation Coefficient formula was used to calculate the Correlation Co-efficient in which: the (X) values were the data points that were generated from the number of respondents of corresponding questions for the first trial and the (Y) values were the data points obtained in the second trial. A correlation coefficient of 0.78 was obtained which indicated a perfect relationship between the first and the second results.

FINDINGS OF THE STUDY

$H0_1$: There is no significant relationship between availability of Biology laboratory and academic performance of Biology Students in Bosso LGA. The results were presented in the table below:

Table 1: Correlation Result of Influence of availability of Biology Laboratories on Academic Achievement of Biology Students

Variables	Mean	Std. Deviation	N	Df	R	Sig. (2-tailed) p-value	Decision
Availability of Biology laboratories	**2.701**	**1.077**	324	48	6.868	.000	Significant
Academic achievement	**55.75**	**3.22**	324				

Table 1 above shows the correlation results for the first hypothesis. The analysis reveals that there is a significant relationship between the availability Biology laboratories (x̄2.701, SD 1.077) and academic performance (x̄55.75, SD 3.22), while r(48)= 6.868, p-value= 0.000. Therefore, going by the decision rule, since the p-value (0.000) is < (less than) the significance level (0.05), the null hypothesis (HO_1) is rejected. This suggests the acceptance of the alternative hypothesis (Ha) which states that there is a significant relationship between availability of Biology laboratories and academic achievement of Biology Students in Bosso LGA.

$H0_2$: There is no significant relationship between availability of Biology laboratories equipment and academic achievement of Biology Students in Bosso L.G.A.

TABLE 2: Correlation Result of Influence of availability of Biology Laboratories equipment on Academic Achievement of Biology Students in Bosso L.G.A.

Variables	Mean	Std. Deviation	N	Df	R	Sig. (2-tailed)/ p-value	Decision
Availability of Biology laboratories equipment	**2.301**	**1.037**	324	48	6.868	.000	Significant
Academic achievement	**55.75**	**3.22**	324				

Table 2 above shows the correlation results for the first hypothesis. The analysis reveals that there is a significance relationship between Biology laboratories' equipment (x̄2.301, SD 1.037) and academic achievement (x̄55.75, SD 3.22), while r(48)= 6.868, p-value= 0.000. Therefore, going by the decision rule, since the p-value (0.000) is < (less than) the significance level (0.05), the null hypothesis (HO_2) is rejected. This suggests the acceptance of the alternative hypothesis (Ha) which states that there is a significant relationship between availability of Biology laboratories' equipment and academic achievement of Biology Students in Bosso L.G. A. Niger State.

$H0_3$ There is no significant relationship between availability of Biology laboratory practical materials and academic achievement of Biology Students in Bosso L.G.A

TABLE 3: Correlation Result of influence of Biology Laboratory practical materials on Academic achievement of Biology Students in Bosso L.G.A

Variables	Mean	Std. Deviation	N	Df	R	p-value	Decision
Laboratory practical materials	**2.321**	**1.036**	324	48	5.775	.000	Significant
Academic achievement	**55.75**	**3.22**	324				

The table 3, above shows the correlation results for the third hypothesis. The analysis reveals that there is a significant relationship between availability of laboratory practical materials (x̄2.321, SD 1.036) and academic achievement (x̄55.75, SD 3.522), while r (48) = 5.775, p-value= 0.000. Therefore, going by the decision rule, since the p-value (0.000) is < (less than) the significance level (0.05), the null hypothesis (HO_2) is rejected. This suggests the acceptance of the alternative hypothesis (Ha) which states that there is a significant relationship between laboratories practical materials and academic achievement of Biology Students in Bosso L.G.A.

DISCUSSION OF FINDINGS

The findings on the relationship between the availability of Biology laboratories and academic performance of Biology Students in Bosso L.G.A. revealed that, there is a significant relationship between availability of Biology laboratories and academic achievement of Biology Students in Bosso LGA. Students of selected schools with available Biology laboratories had higher scores in their mock Biology examination results than their counterparts in other schools without Biology laboratories. This finding is in tandem with that of Agu and Iniodu (2017) which concluded that absence or lack of laboratories and materials contributes to students' poor achievement in physics. It also collaborates the findings of Okam, & Zakari (2022) which concluded that there is relationship between availability of science laboratories and the performance of students in Upper Basic Schools in Kwara State, Nigeria. The findings of Ogunkunle and Akinsola, (2020) also showed that simulated laboratory (SL) and enriched laboratory guide material (ELGM) experiments, affected the achievement in basic science of male and female students with different future career interests in science. However, the findings of this study disagrees with that of okoroma and Orike (2019) which asserted that provision of laboratories and workshop would not make students more involved in practical work and does not enhance academic achievement of students. The difference in performance could be caused by the fact that students consciously or unconsciously get exposed to the Biology laboratory facilities, and procedures for scientific studies while students in schools without Biology laboratories did not have such privileges

The findings on the relationship between availability of Biology laboratories equipment and academic achievement revealed a significant relationship between availability of laboratories' equipment and academic achievement of Biology students. Sampled schools with Biology laboratories equipment performed better in their mock examination than students in other schools without Biology laboratories' equipment. The finding is supported by Adair and Swinton (2021) which found that availability of laboratories equipment in schools benefits the student in related examination performance, (Matz, et'al., 2012 in Abraham 2019) also reported that availability of laboratory equipment and utilization positively influences (1) the odds of retention in the lecture by 2.2 times on average and (2) final lecture grades by up to 0.19 grade points on a 4.0 scale for the lowest-scoring students according to university-level mathematics and chemistry placement exam scores. The study also revealed that there is a relationship between availability of Biology laboratories' practical materials and academic performance of Biology Students in Bosso L.G.A. The difference in academic achievement could be as a result of learning experiences acquired by the students who may be consciously or other-wise exposed to the available laboratories' practical materials which makes the learning more concrete, enhanced retention and caused better achievements. The finding is in-line with that of Muhammad and Ahmad (2023) which showed that availability and utilization of well- equipped science laboratories provided an opportunity for students to revisit concepts initially presented in the traditional classroom setting and to actively engage in applying these concepts to case-based scenarios. Also the finding supported Adams & Lunga (2022). Which indicated that providing laboratory experimental study materials in schools enhanced students' achievements through hands-on experiment (SHE) or a teacher-based demonstration experiment (TBDE) approaches significantly improved academic performance of students. Biology Students whose schools had well-equipped Biology laboratories performed better because, they may have directly or indirectly utilized the laboratory facilities which gave them the privilege of understanding Biology concepts better than their counterparts in other schools without well - equipped laboratories. The students perhaps were exposed to the laboratories or practical works not just restricted to normal class lessons which made them had better scores than their counterparts whose schools were without such facilities. This implies that provision of school facilities and study materials stimulate learners' interest, leading to better understanding and retention which might result to high academic achievements.

RECOMMENDATIONS

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

1. The Government through state ministry of education and well- meaning citizens should ensure that there is provision of adequate number of Biology and other Science laboratories in all secondary schools in Niger state and beyond.
2. The Government and Parents Teachers' associations in secondary schools should ensure that available Biology and other science laboratories are equipped with modern electronic laboratory resources like incubator, drying oven, projector, refrigerator, autoclave among other necessary laboratories equipment.
3. The state government, parent teachers' association and educational managers should always ensure that both Biology and other science laboratories are regularly equipped with the needed practical reagents and other learning materials for practical works in Bosso LGA and Niger state at large

CONCLUSION

From the findings of the study, it is concluded that Availability of well- equipped science laboratories play a pivotal role in academic achievements of science students, while lack of well- equipped science laboratories in senior secondary schools and other science related institutions have adverse effects on students' overall performance in science subjects

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