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LEVEL OF AVAILABILITY AND UTILIZATION OF SCIENCE LABORATORY EQUIPMENT AS PERCEIVED BY SECONDARY SCHOOL SCIENCE TEACHERS AND STUDENTS IN BOSSO METROPOLIS, NIGER STATE

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Abstract

This study investigated the level of availability and utilization of science laboratory equipment in secondary schools in Bosso Metropolis of Niger State. A research question was raised to guide the study. The research design used for the study was a descriptive survey design. The instrument used for the study was the Availability and Utilization of Science Laboratory Equipment Questionnaire (AUSLEQ). Reliability of the instrument was determined and reliability coefficient of 0.84 was obtained. One hundred and eighty science students (180) and twenty science teachers (20) totaling two hundred (200) made up the population of the study. The responses of the students and teachers to the instrument were collected and analyzed using mean and standard deviation. The result of this study revealed that, there are no adequate science laboratory equipment for effective teaching and learning of sciences in majority of secondary schools in Bosso metropolis of Niger State. Even the little that are available are not well equipped non effectively utilized by science teachers during teaching and learning process. The study recommends that individual science teachers should improvise as much as possible any equipment that can aid effective teaching and learning of sciences in their schools. Government and other stake holders in education should properly equip the science laboratories at secondary school level of our education. In addition to the foregoing, Government should employ more science teachers and develop them through capacity training through Workshop Seminars and Conferences.

Key words: Equipment, Laboratory, Science, Students and Teachers

Introduction

Science has been of great importance globally for sustainable and socio-economic development as well as for technological advancement of nations. Knowledge of science and technology is therefore a requirement for individual as well as national development as it provides solution to challenges faced by mankind. These challenges include emergences of new drug resistance disease, dangers of nuclear war, explosions and global warming among others (Omosewo, 2011). Effective application of knowledge of science had resulted to rapid changes taking place in medicine, industry, communication and agriculture. Science as an agent of development plays an important role in bringing about these changes through technological advancement, national wealth enhancement, health improvement and industrialization. This is why scientific and technological breakthrough is usually the goal of any developing nation like Nigeria (Arthur, 2010).

In spite the importance of science to national development, secondary school science students' learning outcomes has not been encouraging, it has been observed that Secondary School science students have been exhibiting dwindling interest in the study of science over the past few years (Ehinder, 2014). This among other reasons explains the reported low enrolment and consistent poor learning outcome in sciences by Secondary School Students (Omosewo, 2011). The reason for the negative attitude of the students towards the science subjects which is

responsible for their low learning outcomes may not be unconnected with the teaching style adopted by science teachers which often times is rote learning and memorization of formulas as opposed to the more effective practical and hands-on approach. This ineffective approach is often blamed on the paucity of relevant and effective science equipment (Nwagbo, 2014).

The negative trend spells doom for our National Development as science is believed to be the bedrock of technological development of any Nation. To further compound the problem, science subjects are generally seen as the most difficult subjects in the school curriculum as asserted by Isola (2010). This results to ineffective teaching and learning of science. Ineffective teaching and learning of sciences as well as consistent students' poor learning outcomes has become a major concern to all stakeholders in the educational sector. The only remedy to this national embarrassment and the way out of this predicament may be for teachers to embrace an effective instructional strategy. Effective instructional strategies without relevant and effective laboratory equipment cannot in any way address this challenge (Aina, 2012). The most effective approach to science teaching therefore, is to support theoretical explanations with actual practices in the laboratory by using science laboratory equipment (Ojediran, Oludipe & Ehindero, 2014).

A study conducted by Bello (2012) on the level of availability and utilization of science laboratory equipment on Students' Academic Achievement in Senior Secondary School Science showed that the use of appropriate teaching equipment and teaching method is critical to the successful teaching and learning of science. Taale and Antwi (2012) also reported that inadequate exposure of science students to science laboratory work at the secondary school level has been a major cause of first year University students' inability to comprehend and apply scientific knowledge.

A professional qualified Science Teacher, no matter how well trained, he or she would be unable to put his ideas, opinions and experiences into practice if the school lacks laboratory equipment necessary for him or her to translate his competence into reality in the classroom. In order to attract and retain good students in science classes, the learning environment must be made more student-friendly and this can only be achieved by supplying the relevant and effective laboratory equipment and encouraging teachers to utilize them in order to enhance the students' learning outcomes (Taale & Antwi, 2012). Practical work at senior secondary schools requires availability of functional laboratory experiment, science teachers' ability to demonstrate to the students how to carry out the practical exercises as well as the availability of the equipment for students to conduct the practical exercises on their own either individually or in small groups. This is because laboratory practical teaching can only be said to have taken place when students actively participate in the learning experience rather than sit as passive learners.

Laboratory practical teaching involves the use of equipment or apparatus in teaching such that, teaching and learning activities is based on real life experience. Availability and utilization of laboratory equipment and apparatus helps learner to transform scientific knowledge or information into their personal knowledge which they can apply in different situations. It also enables the students to acquire manipulative skills of science laboratory equipment.

Effective utilization of laboratory science equipment also help students to construct mental models that prepares them for higher order performance such as applied problem solving and ability to transfer knowledge and scientific skills from one field of study to another. In

laboratory practical class, teacher serves as a facilitator, motivator, guide or a coach but not as a sage on a stage (Akuezillo, 2005).

Statement of the Research Problem

Despite the importance of the knowledge of science to humanity in particular and society in general, students' learning outcomes in sciences has been below expectation (Taale & Artwi, 2012). This implies that science students are performing poorly at their final SSCE examinations. There is therefore, the need for a research study to find out whether there are enough laboratory science equipment for science teaching and learning at our secondary school level of education. Not only that, but to also find out if the available laboratory science equipment are effectively utilized by the science teachers at secondary school level. This is the major reason why this study is aimed at assessing the level of availability and usage of science laboratory equipment on learning outcome of secondary school science students in Bosso Local Government Area of Niger State.

Objective of the Study

The specific objective of this study was to determine:

1. Level of availability of laboratory science equipment and the extent to which science teachers utilizes them for the teaching and learning of sciences subjects as perceived by science teachers and students in senior secondary schools Bosso Local Government Area of Niger State

Research Question

The following research question was raised and answered using mean and standard deviation during the study.

1. What is the level of availability and utilization of science laboratory equipment for the teaching and learning of sciences as perceived by science teachers and students in secondary schools in Bosso metropolis of Niger State?

Methodology

This study employed the descriptive survey design involving the use of questionnaires to collect data from the subjects. The population of this study consist all the one thousand and two hundred (1,200) science students and one hundred and fifty (150) science teachers in Bosso metropolis of Niger State. The sample size of this study is two hundred (180 science students and 20 science teachers). Four secondary schools were randomly selected from Bosso metropolis for the study. From each of the four selected schools, one intact science class was also randomly selected with cumulative student population of one hundred and eighty (180) science students. Science teachers of the four schools totaling twenty (20) were used for the study.

The research instrument used for data collection was carefully structured by the researchers to obtain the various personal views of the science teachers and students on the level of availability and utilization of science laboratory equipment in Bosso metropolis of Niger State. The questionnaire contains two sections A and B. Section (A) concerns the Bio data of the respondents while section (B) contain items or statement for obtaining the respondents' views about the level of availability and utilization of science laboratory equipment in their schools. The instrument was validated by three science teachers and three science laboratory technologists. Their suggestions, observations and recommendations guided the production of

the final copy of the Instrument. Pilot study was conducted and a reliability coefficient of 0.84 was obtained.

A 5 – scale (Likert type) of. Strongly agree (SA), Agreed (A), Undecided (UD), Disagreed (D) and Strongly Disagree (SD) was used. The scoring was SA=5mks, A=4mks, U=3mks, D=2mks, and SD=1mk. The decision rule is 3. This is because, $5+4+3+2+1=15$. Therefore, $15/5=3$ and any score above 3 is accepted (agree) while any score less than 3 is rejected (disagree).

The researchers visited the selected schools and were granted permission to use the respondents (science teachers and students of the schools) for the study. Thereafter, they were introduced to both the science teachers and students of the schools and they were given orientation on the purpose of research. In each of the schools used for the study, one intact SS2 class was randomly selected and used for the study. This implies that one class of SS2 science students was used in each of the four schools. All the science teachers of the selected schools were also used for the study. The researchers went to each class of SS2 to administer the instrument. The questionnaires were distributed to both science teachers and SS2 students of the schools. The respondents were not allowed to communicate with one another when they were responding to the questionnaires. The questionnaires answered were collected back from the respondents after they have been properly filled. One hundred percent (100%) returns rate was recorded for both students and teachers. Data collected were analyzed using mean and standard deviation

RESULTS

Research Question

What is the level of availability and utilization of science laboratory equipment for the teaching and learning of sciences as perceived by science teachers and students in secondary schools in Bosso metropolis of Niger State?

Table 1: Mean and Standard Deviation on the level of availability and utilization of science laboratory equipment for the teaching and learning of sciences as perceived by science teachers and students in secondary schools in Bosso metropolis of Niger State

S/N	ITEMS	N	MEAN	SD	DECISION
1	Science laboratories are available for science teaching and learning in my school	200	4.40	1.01	Agree
2	Only multipurpose science laboratory is available for science teaching and learning in my school	200	3.55	0.15	Agree
3	There is enough science laboratory equipment for every science practical class in my school	200	2.43	0.08	Disagree

4	All the available science laboratory equipment in my school are in good standard	200	2.70	0.09	Disagree
5	The available science laboratory equipments are handled carelessly by science teachers in my school.	200	3.53	0.13	Agree
6	Science laboratories are effectively utilized by science teachers during teaching in my school	200	2.37	0.07	Disagree
7	Available science laboratory equipment are not accessible by science teachers during teaching and learning process.	200	3.28	0.10	Agree
8	There are qualified science laboratory attendants in my school	200	2.29	0.05	Disagree
9	Science students do not know the location science laboratories in my school	200	3.69	0.14	Agree
10	Non availability of science laboratory equipment has negative effects on science students.	200	3.76	0.16	Agree

Table 1 shows the mean and standard deviation of the level of availability and utilization of science laboratory equipment for the teaching and learning of sciences as perceived by science teachers and students in secondary schools in Bosso metropolis of Niger State and the table reveals the followings:

ITEM 1:

On whether Science laboratories are available for science teaching and learning in my school, the table reveals the mean score of 4.4 (with standard deviation of 1.01) which is higher than the decision mean of 3.00. This indicates that, most Secondary Schools in Bosso Metropolis of Niger State have science laboratories for science teaching and learning.

ITEM 2:

On whether it is only multipurpose science laboratory that is available for science teaching and learning in my school, the table reveals the mean score of 3.55 (with standard deviation of 0.15) which is higher than the decision mean of 3.00. This indicates that, most Secondary Schools in Bosso Metropolis of Niger State have only multipurpose science laboratories for science teaching and learning. Implicitly they do not have separate laboratories for Biology, Chemistry and Physics which is supposed to be the case under normal circumstances.

ITEAM 3:

On whether there is enough science laboratory equipment for every science practical class in my school, the table reveals the mean score of 2.43 (with standard deviation of 0.08) which is less than the decision mean of 3.00. This indicates that, neither science laboratories nor multipurpose science laboratories in most Secondary Schools in Bosso Metropolis of Niger State lack the pre-requisite equipment for science teaching and learning.

ITEAM 4:

On whether the available science laboratory equipment in my school are in good standard, the table reveals the mean score of 2.70 (with standard deviation of 0.09) which is less than the decision mean of 3.00. This indicates that, even the few available equipment in multipurpose science laboratories in most Secondary Schools in Bosso Metropolis of Niger State are not in good standard.

ITEAM 5:

On whether the available science laboratory equipment are handled carelessly by science teachers in my school, the table reveals the mean score of 3.53 (with standard deviation of 0.13) which is higher than the decision mean of 3.00. This indicates that, most Secondary Schools science teachers in Bosso Metropolis of Niger State cannot handle the few available science equipment in their laboratories. This may be as a result of the fact that most science teachers are not qualified and are not exposed to any kind of Professional Career Development Program to improve their subject content knowledge.

ITEAM 6:

On whether Science laboratories are effectively utilized by science teachers during teaching in my school, the table reveals the mean score of 2.37 (with standard deviation of 0.07) which is less than the decision mean of 3.00. This indicates that, even the multipurpose science laboratories in most Secondary Schools in Bosso Metropolis of Niger State are not properly utilized. This may be as result of lack of equipment in them,

ITEAM 7:

On whether even the available science laboratory equipment are not accessible by science teachers during teaching and learning process, the table reveals the mean score of 3.28 (with standard deviation of 0.10) which is higher than the decision mean of 3.00. This indicates that, science teachers do not have access to laboratory mainly because there are no equipment in so-called science laboratories.

ITEAM 8:

On whether there are qualified science laboratory attendants in my school, the table reveals the mean score of 2.29 (with standard deviation of 0.5) which is less than the decision mean of 3.00. This indicates that, most Secondary Schools in Bosso Metropolis of Niger State do not even have trained science laboratory Technologist. This indicates lack of functional science laboratory the schools.

ITEAM 9:

On whether Science students know the location science laboratories in my school, the table reveals the mean score of 3.69 (with standard deviation of 0.14) which is higher than the decision mean of 3.00. This indicates that, science students do not know where their school

laboratory is located simply because there are no equipment the laboratory of most Secondary Schools in Bosso metropolis of Niger State.

ITEAM 10:

On whether non availability of science laboratory equipment has negative effects on science students, the table reveals the mean score of 3.76 (with standard deviation of 0.16) which is higher than the decision mean of 3.00. This attest to the fact that, science students are performing poorly at their final SSCE examinations because lack of laboratory in their school negatively affect the teaching and learning process of sciences in their schools.

Discussion

Findings on the Items 1, 2, 7 & 9 is in line with finding of Omoosewo(2011), Bello(2012) and Aina (2014) who reported that most secondary schools do not have functional laboratory for effective teaching and learning of science.

Findings on the Items 3, 4 & 5 is also in line with the findings of Ehindero (2014), Isola (2010) and Nwagbo & Uzoma(2014).Who all opined that science laboratory in most of our secondary schools are not well equipped.

Findings on the Items 6, 7 & 10 is in line with that of Taale & Antwi (2012) and Nwagbo & Uzoma (2014) that most science laboratories are not effectively utilized for science teaching and learning either because of lack of qualified science teachers or lack of qualified science laboratory technologists

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