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Assessment of Availability and Utilization Level of Mathematics Laboratory Equipment by Mathematics Lecturers and Students of Colleges of Education in the North East, Nigeria

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Abstract
This study put into consideration the assessment of availability and utilization level of Mathematics laboratory equipment by Mathematics lecturers and students of Colleges of Education in the North East, Nigeria using a research question to guide the study. Descriptive survey design with instrument the Availability and Utilization of Mathematics Laboratory Equipment Questionnaire (AULMLEQ) with determined reliability coefficient of 0.84 was used for the study. Data collected from forty (40) Mathematics lecturers and two hundred (200) Mathematics students from four (4) Colleges of Education in the North-East, randomly and purposively selected were analyzed using means and standard deviation to answer the postulated research question using the items on the questionnaire. From the study, it was shown among others that, most Colleges of Education in the North-East have adequate Mathematics laboratories; most of the lecturers and students make use of the Mathematics laboratory equipment; Mathematics laboratory equipment does not enhance understanding of Mathematics concepts; Mathematics laboratories are not effectively utilized by lecturers and students; there are insufficient Mathematics laboratory equipment for all the students in institution, the Mathematics laboratory equipment are no enough for the use of both lecturers and students; and there are enough Mathematics laboratory equipment technologists in the school who attend to lecturers and students in the laboratory. Based on the findings of the study, it was recommended among others that individual Mathematics lecturer should improvise as much as possible and utilize equipment that can aid effective teaching and learning of the subject in their institutions

Key words: availability, utilization, equipment, laboratory, Mathematics

Introduction

Mathematics involves the study of science and numbers which crosses across other school subjects, hence, for any nation to be scientifically and technologically developed, there is

need for adequate teaching and learning of science subjects in all level of her education, with high level of availability and utilization of Mathematics laboratory equipment. Mathematics has been of great importance globally for sustainable and socio-economic development as well as for technological improvement of nations (Abdullahi, 2016). Knowledge of science subjects and technology Mathematics inclusive 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 Mathematics had resulted to rapid changes taking place in technology medicine, industry, communication and agriculture. Mathematics as an agent of development plays an important role in bringing about these changes through technological advancement, national wealth enhancement, health improvement and industrialization and nuclear development. This is why scientific and technological breakthrough is usually the goal of any developing nation like Nigeria (Arthur, 2010).

In spite the importance of Mathematics knowledge to national development, postsecondary school Mathematics learning of student's outcomes has not been encouraging, it has been observed that Post-Secondary School Mathematics students have been exhibiting dwindling interest in the study of the subject over the past few years (Ehindero, 2014). This among other reasons explains the reported low enrolment and consistent poor learning outcome in Mathematics by Post-Secondary School Students (Omosewo, 2011). The reason for the negative attitude of the students towards the subject which is responsible for their low learning outcomes may not be unconnected with the teaching style adopted by the lecturers which often times is rote learning and memorization of formulae as opposed to the more effective practical and hands-on approach. This ineffective approach is often blamed on the paucity of relevant, non-availability, low level and non-effective Mathematics laboratory equipment in various institutions of learning (Nwagbo, 2014).

The negative trend spells doom for our National Development as science particularly Mathematics is believed to be the bedrock of technological development of any Nation. To further compound the problem, Mathematics is generally seen as the most difficult in the school curriculum as asserted by Isola (2010). This is as a result of ineffective teaching and learning of the subject as well as consistent poor learning outcomes of students has become a major concern to all stakeholders in the educational sector. The only remedy to this

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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 utilization cannot in any way address this challenge (Aina, 2012). The most effective approach to Mathematics 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 Mathematics laboratory equipment on Students' Academic Achievement in Senior Secondary School showed that the use of appropriate teaching equipment and teaching method is critical to the successful teaching and learning of science subjects. Taale and Antwi (2012) also reported that inadequate exposure of Mathematics students to practical and laboratory work at the secondary school level has been a major cause of first year University students' inability to comprehend and apply scientific knowledge and cope with the level of education easily.

A professional qualified Mathematics 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 mathematics 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 good learning outcomes of the students (Taale & Antwi, 2012). Practical work in higher institution requires availability of functional laboratory experiment, lecturers' 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 in the learning processes.

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.

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Effective utilization of laboratory Mathematics equipment also helps 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 Problem

Despite the importance of the knowledge of Mathematics to humanity in particular and society in general, students' learning outcomes in Mathematics has been below expectation (Taale & Antwi, 2012). This implies that the students are performing below the expectations at their final examinations. There is therefore, the need for a research study to find out whether there is enough laboratory equipment for Mathematics teaching and learning at our Colleges of Education in the North East. Not only that, but to also find out if the available Mathematics laboratory equipment is effectively utilized by both the students and lecturers at this level of education. This is the major reason why this study is aimed at assessing the level of availability and usage of Mathematics laboratory equipment on learning outcome of Colleges of Education students in the North East, Nigeria.

Purpose of the Study

The specific purpose of this study was to determine:

Level of availability of Mathematics laboratory equipment and the extent to which lecturers utilize them for the teaching and learning of the subject as perceived by lecturers and students in the colleges in the North East.

Research Question

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

What is the level of availability and utilization of science laboratory equipment for the teaching and learning of Mathematics as perceived by lecturers and students in the Colleges of Education in the North East?

Methodology

This study employed the descriptive survey design involving the use of constructed questionnaire to collect data from the subjects. The population of this study consist all the Mathematics lecturers and students in the North East. However, forty (40) lecturer and two hundred (200) students from four (4) Colleges of Education Mathematics department in the North East randomly and purposively selected were used for the study. The sample size of

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this study is two hundred and forty (240) of forty (40) Mathematics teachers and two hundred (200) students.

Instrumentation

The research instrument used for data collection was carefully structured questionnaire by the researchers to obtain the various personal views of the Mathematics lecturers and students on the level of availability and utilization of Mathematics laboratory equipment in the North East, The questionnaire contains two sections A and B. Section (A) consists of Bio data of the respondents while section (B) contains items or statement for obtaining the respondents' views about the level of availability and utilization of science laboratory equipment in their Colleges of Education.

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 was 3. This is because, $\frac{5+4+3+2+1}{5} = \frac{15}{5}$ 15 =3, therefore, any score above 3 was accepted (agree) while any score less than 3 was rejected (disagree).

The researchers visited the selected schools seeking for permission to be granted to use the respondents (Mathematics lecturers and students of the schools) for the study. In each of the schools used for the study, one intact NCE III students were selected and used for the study. The researchers and the research assistants went to each class of NCE III to administer the instrument. The questionnaires were distributed to both Mathematics lecturers NCE III students of the schools. The respondents were not allowed to communicate with one another when they are responding to the questionnaires. The questionnaires when answered were collected back from the respondents after they have been properly filled. One hundred percent (100%) returns rate were recorded for both students and lecturers.

Validation and Reliability of the Instrument

The instrument was validated by three Mathematics lecturers and three science laboratory technologists. Their suggestions, observations and recommendations were used to guide the production of the final copy of the instrument. Pilot study was conducted and a reliability coefficient of 0.85 was obtained before the instrument was used for the study.

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Method of Data Analysis

After the questionnaire have been administered to the respondents by the researchers with the help of the research assistants, data collected was analyzed using frequency mean and standard deviation to answer the postulated research question of the study.

Results

The only research question consists of ten (10) items which was giving to each of the respondents and their responses were collected and analyzed using frequency counts, mean and standard deviation and any item with mean of 3.00 and above was accepted (agreed) while any item with less than 3.00 mean was rejected (disagreed) in treating the only research question of the study.

Research Question

What is the level of availability and utilization of Mathematics laboratory equipment for the teaching and learning of Mathematics as perceived by Mathematics lecturers and students in College of Education in the North East, Nigeria?

Table 1: Mean Responses on the Mathematics Laboratory Equipment Level of Availability and Utilization by Colleges of Education Mathematics Lecturers and Students in the North East, Nigeria

S/N	ITEMS	N	MEAN	SD	DECISION
1	Mathematics laboratory equipment is adequately available in my school	250	3.40	1.11	Accepted
2	I am proficient in using Mathematics laboratory equipment for teaching and learning Mathematics	250	3.66	0.18	Accepted
3	Mathematics laboratory equipment enhances understanding of Mathematics concepts.	250	2.67	0.15	Rejected
4	I regularly use Mathematics laboratory equipment in Teaching/Learning Mathematics.	250	2.82	0.14	Rejected
5	The institution provides adequate training on the use of Mathematics laboratory equipment.	250	3.66	0.18	Accepted
6	Mathematics laboratory equipment is effectively utilized in teaching/learning Mathematics in my institution.	250	2.45	0.16	Rejected
7	The use of Mathematics laboratory equipment improves students' engagement in Mathematics class.	250	3.47	0.11	Accepted

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8	There are sufficient Mathematics laboratory equipment for all the students in my school	250	2.35	0.16	Rejected
9	I face challenges in using Mathematics laboratory equipment for teaching/ learning Mathematics.	250	2.35	0.16	Rejected
10	There are enough Mathematics laboratory equipment technologists who attend to lecturers and students during teaching/learning Mathematics.	250	3.58	0.18	Accepted

Source: Field Study 2026.

From the above Table I, the mean responses on the level of Mathematics laboratory equipment are adequately available in my institution for the teaching and learning as perceived by Mathematics lecturers and students in Colleges of Education in the North-East can be seen. From the above table 1, the mean responses of both lecturers and students in the first item with mean 3.40 and meets the mean criterion of 3.00, therefore the item was accepted, hence there is availability of Mathematics laboratory with equipment for teaching and learning in the school. This indicates that, most Colleges of Education in the North-East have Mathematics laboratories for learning.

From the item 2 responses, on I am proficient in using Mathematics laboratory teaching and learning Mathematics in my school, the table reveals the mean score of 3.66 which is higher than the criterion mean score of 3.00. Therefore, most of the lecturers and students make use of the Mathematics laboratory equipment in Colleges of Education in North-East.

The item 3 that investigated that Mathematics laboratory equipment enhances understanding of Mathematics concepts. As can be seen from the table, the mean score of 2.67 which is less than the criterion mean score of 3.00. This shows that, the item Mathematics laboratory equipment enhances understanding of Mathematics concepts is rejected, Mathematics laboratory equipment enhances understanding of Mathematics concepts is hereby rejected since both the lecturers and the students disagreed.

To find out the lecturers and students regular use of Mathematics laboratory equipment in teaching and learning in the Colleges of Education in North-East, the result from item 4 of the table reveals the mean score of 2.82 which is less than the criterion mean score of 3.00. Hence, it can be concluded that, both the lecturers and students are not regular in using Mathematics laboratory in the teaching and learning Mathematics in Colleges of Education in the North-East.

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In order to find out whether the institution provides adequate training on the use Mathematics laboratory equipment, responses from item 5 of the table reveals the mean score of 3.66 which is greater than the criterion mean score of 3.00. It can be seen that; the institution provides adequate training on the use Mathematics laboratory equipment for both lectures and students in teaching and learning of Mathematics in Colleges of Education in the North-East.

The item 6 that looked into whether Mathematics laboratories are effectively utilized by lecturers and students in teaching/learning mathematics in my institution, the responses show the mean score of 2.45 which is less than the criterion mean score of 3.00. It can be seen that, Mathematics laboratories are not effectively utilized by lecturers and students in teaching/learning mathematics in Colleges of Education in the North-East.

As it can be observed from item 7 on the table that looked into the use of Mathematics laboratory equipment by Mathematics lecturers and students improve students' engagement in Mathematics classes, the response mean score of 3.47 which is higher than the criterion mean score of 3.00 was shown. It can be concluded that, the use of Mathematics laboratory equipment by Mathematics lecturers and students improves students' engagement in Mathematics classes.

Looking at the item 8 that find out whether there are sufficient Mathematics laboratory equipment for all the students in institution, the table reveals the mean score of 2.35 which is less than the criterion mean score of 3.00. It has been indicated that, there are insufficient Mathematics laboratory equipment for all the students in institution, the Mathematics laboratory equipment are no enough for the use of both lecturers and students.

Observing the item 9 that put into consideration whether I face challenges in using Mathematics laboratory equipment for teaching/learning Mathematics, the mean score of 3.87 was shown and is higher than the criterion mean score of 3.00. Hence, Mathematics lecturers and students are facing challenges in using Mathematics laboratory equipment in Colleges of Education in the Nort-East.

From the last item 10 on the table that looks into whether there are enough Mathematics laboratory equipment technologists in the school who attend to lecturers and students in the laboratory. The table reveals the mean score of 3.58 which is higher than the criterion mean score of 3.00. This shows that, there are enough Mathematics laboratory equipment technologists in the school who attend to lecturers and students in the laboratory.

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Discussion

Results from the study revealed that, Most Colleges of Education in the North-East have adequate Mathematics laboratories for learning. Most of the lecturers and students make use of the Mathematics laboratory equipment in Colleges of Education in North-East. Mathematics laboratory equipment do not enhances understanding of Mathematics concepts.

The findings are is in line with those of Omosewo (2011), Bello (2012) and Aina (2014), who reported that most schools have adequate, standard and functional laboratory for effective teaching and learning of science subjects.

In addition, it was shown from the findings that, Both the lecturers and students are not regular in using Mathematics laboratory in the teaching and learning Mathematics in Colleges of Education in the North-East. The institution provides adequate training on the use Mathematics laboratory equipment for both lectures and students in teaching and learning of Mathematics in Colleges of Education in the North-East. Mathematics laboratories are not effectively utilized by lecturers and students in teaching/learning mathematics in Colleges of Education in the North-East. These findings are in line with those of Ehindero (2014), Isola (2010) and Nwagbo & Uzoma (2014), all opined that, availability of well-equipped science laboratory equipment have effect on the performance of secondary school students since they will be able to put into practice rather than learning theoretically the science subjects in the school.

Lastly as it can be seen from the findings that, the use of Mathematics laboratory equipment by Mathematics lecturers and students improves students' engagement in Mathematics classes, there are insufficient Mathematics laboratory equipment for all the students in institution, the Mathematics lecturers and students are facing challenges in using Mathematics laboratory equipment in Colleges of Education in the Nort-East, and there are enough Mathematics laboratory equipment technologists in the school who attend to lecturers and students in the laboratory.

These are similar to the findings 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 to put the science biolaboratory equipment in order and appropriate place for effective utilization.

Summary of the Findings

Most Colleges of Education in the North-East have adequate Mathematics laboratories for teaching/learning of Mathematics.

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Most of the lecturers and students make use of the Mathematics laboratory equipment in Colleges of Education in North-East for Mathematics teaching/learning.

Mathematics laboratory equipment does not enhance understanding of Mathematics concepts in Colleges of Education in the North-East.

Both the lecturers and students are not regular in using Mathematics laboratory in the teaching and learning Mathematics in Colleges of Education in the North-East.

The institutions provide adequate training on the use Mathematics laboratory equipment for both lecturers and students in teaching and learning of Mathematics in Colleges of Education in the North-East.

Mathematics laboratories are not effectively utilized by lecturers and students in teaching/learning Mathematics in Colleges of Education in the North-East.

The use of Mathematics laboratory equipment by Mathematics lecturers and students improves students' engagement in Mathematics classes.

There are insufficient Mathematics laboratory equipment for all the students in institution, the Mathematics laboratory equipment are no enough for the use of both lecturers and students.

Mathematics lecturers and students are facing challenges in using Mathematics laboratory equipment in Colleges of Education in the Nort-East.

There are enough Mathematics laboratory equipment technologists in the school who attend to lecturers and students in the laboratory.

Recommendations

Based on the findings of the study, the following recommendations were given: -

1. Individual Mathematics lecturer should improvise as much as possible and utilize equipment that can aid effective teaching and learning of the subject in their institutions.
2. Government and other stake holders in education should properly equip Mathematics and other science subjects at all levels of education.
3. Various schools should employ more science teachers, science technologists and develop them through capacity training and attendance of workshops, seminars and conferences in their various areas of specializations to improve the performance of Colleges of Education students.
4. Parents and other stakeholders in Education should assist the school by providing Mathematics and other science laboratory equipment to provide enough conducive teaching and learning of Mathematics and other science subjects in schools to prepare them for challenges ahead after graduation.

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