Global Advanced Research Journal of Educational Research and Review (ISSN: 2315-5132) Vol. 4(3) pp. 048-054, March, 2015
Available online http://garj.org/garjerr/index.htm


*Full Length Research Paper*

# Effect of some teacher factors on the conduct of effective biology practical lesson

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Accepted 16 March, 2015

**The study focuses on the effects of some teacher factors on the conduct of effective biology practical lesson. The study answered two research questions. The population of the study comprised of 32 senior secondary schools with 93 biology teachers and 87,426 students. Twelve (12) secondary schools were randomly selected with 34 Biology teachers as sampled teachers. The study used an instrument titled Laboratory Equipment Utilisation Assessment Inventory (LEUAI) with reliability coefficient of 0.71. Data obtained from the field were analyzed using simple descriptive statistic of mean. The findings revealed that teacher qualification and experience affect his or her ability to use laboratory equipment in biology practical work. It is recommended that government and school proprietors should provide adequate laboratory equipment to their schools and also employ more qualified biology teachers.**

**Keywords:** Teacher Factors, Conduct, Effective Biology, Lesson, Schools, Laboratory.

## INTRODUCTION

The importance of teacher in the success of any educational program has been well articulated in the National policy on education for the federal republic of Nigeria (NPE, 2004). The ultimate goal of any instructional activity is to facilitate effective teaching and learning. The teacher is responsible for translation and implementation of educational policies, curriculum and instructional materials package. It is therefore certain that no curriculum can achieve the desired results unless teachers are appropriately trained. Nwankwo (1987) stated the importance of teacher, according to him no educational system could be better than the teacher within it. He believed there is high relationship between teacher factor and pupils learning. Tsui (1998) says, "What teacher knows and can do is the most important influence on what student learned. Recruiting, preparing and retaining good teacher is the central strategy for improving our schools". In general a teacher imparts knowledge to students and thereby effects changes in the students. The teacher is therefore one of the most crucial variables in the teaching-learning process, the teacher is meant to help a child acquire new knowledge, attitudes, values and materials (Lobo-popoola, 2003). Shuaibu and Mari (2008) citing Nwoke (1998) pointed out that the quality of education available in any given society cannot be better than its teachers. This implies that no matter how well planned curriculum is, its success or effectiveness depends on how prepared the teachers are in both ability and willingness to have students experienced all the activities enshrined in the curriculum. The teacher therefore determines the kind of experience students are exposed to in the classroom.

The teacher qualification and type of training he received during his teacher training programme determine his ability to effect teaching-learning process. Olaofe (2000) in a paper titled Enhancing Language Teaching at Primary School for the Success of UBE Programme in Nigeria reported that 24.9% of teachers in northern Nigeria were qualified while 54.2% of their counterparts in the south are qualified. Thus according to him there were more qualified teachers in southern Nigeria than in the north. On the contrary, kamar (2007) revealed that 90% of teacher in his study had a minimum of first degree in science or science education. He added that lack of experience with equipment or with the procedure of conducting experiment were not constraining factors in the conduct of laboratory practical work to 43% and 50% of teachers respectively. Idoko (2008) revealed that unprofessional and in experienced Agricultural science teachers using inappropriate teaching method in conveying practical skills to students are responsible for lack of interest and poor performance of students in Agricultural science practical. This indicates teacher qualification and inadequate skills in conveying practical skills are among factors affecting performance of students in sciences. Use of laboratory equipment during laboratory practical require experience and qualified teacher, adetayo (2008) observed that teachers' use of available instructional or laboratory equipment depend significantly on their qualifications. Considering the importance of teacher in the success of instruction and curriculum in general, there is the need provide answer for this question: How does teacher qualification and experience affect his/her ability to conduct successful biology practical work?

According to oduwaye (2004), one of the major factors that contribute to poor performance of teachers is the work itself. He added that unlike other profession who can measure performance of staff, measure of teacher performance is very difficult because of the extended period of the return investment in education. That individual teacher contribution cannot be measured, because it is accumulative effort of many teachers by the time academic achievement of a pupil is measured at the end of the programmed. As a result there is the need to find out ways of assessing individual teachers, hence the need for this research.

For all kinds of scientific experiments, whether in a research laboratory in schools or colleges, there is the need for various laboratory apparatus and laboratory equipment. Laboratory apparatus are tools and equipments used by scientists, researchers and students to perform their tasks. The laboratory apparatus differ from laboratory to laboratory, from subject to subject. The apparatus and equipments found in any given laboratory will vary depending on the field of research, nature of study and level of the researchers, like high school, or professional. The various fields of science are complex and very wide. There are certain general purpose laboratory apparatus, which are just a few of laboratory apparatus used by scientists today. Ciroma and Bakori (2010) asserted that working in science laboratory can only be possible if there are sufficient pieces of equipment for experiment. Laboratory equipments are the key to any practical work, which promotes long term memory in students, enhances pupils development of the ethical dimension of science, instills the spirit of collaboration and active participation among learners, exposes learners to scientific experiences that could ultimately help them in developing scientific attitudes and skills and inculcate in the students the spirit of inquiry and scientific mode of thinking.

According to Shaibu and Mari (2000), laboratory activities stimulate the acquisition of both manipulative and cognitive skills by learners. They observed that laboratory activities in most schools, do not allow learners to carry out investigation that involve designing, experiments, making observation, collecting and interpreting data, to think and evolve solution to problem. Bajah (1984) noted that there is abundant research evidence to support the view that when science is taught through the medium of practical work, a lot of enjoyable learning took place. Recall of information has been found to be easier when the information to be recalled had initially been presented through a practical approach.

Ughamadu (1992) stated that creative use of equipment in teaching science increases the probability that students will learn and improve their performance that they are to develop. Abimbade (1999) attested that instructional or laboratory materials when appropriately used, enhance learning, improve the competence of teachers and make learning more meaningful to learners. He added that on the other hand when these materials are misused sequel to lack of knowledge on how to use them, science teaching and learning process may be adversely affected. Jatau (2008) reported that when instructional equipment are appropriately utilized, they bring about more effectiveness in teaching and learning process, but this depends on teachers ability to use them efficiently. Edet (2008) revealed that student taught with ecological garden (outdoor laboratory) performed better than those taught without ecological garden. This is because students were taught directly from natural objects with the help of equipments of ecological studies.

**Statement of the problem**

The importance of practical in the development and performance of students in science cannot be over emphasized. Several researches stated earlier indicate the need for effective practical lesson using appropriate equipment. Yet many science teachers tend to avoid organizing practical lesson to their students. Some of the

reasons for poor performance of students in examinations include poor science teaching due to teacher's incompetence. Furthermore, most secondary schools teachers of sciences concentrate on meeting the demand of West African Examination Council (WAEC) practical examinations. This has drawn the attention of concerned individuals on the genesis or causes of the situation.

**Aims of the study**

This study set to investigate the effect of some teacher factors on the conduct of effective biology practical lesson. In an attempt to do so, this study also intends to find out:

1. If teacher qualifications affect his/her ability to use laboratory equipment in biology practical work.
2. If teacher experience affect his/her ability to use laboratory equipment in biology practical work.

**Research questions**

In the process of investigating the effect of some teacher factor (qualification and experience) on the conduct of practical lesson, the following research questions were raised.

1. Does teacher qualification affect his ability to use laboratory equipment in biology practical work?
2. Does teacher experience affect his ability to use laboratory equipment in biology practical work?

**METHODOLOGY**

**Study design**

The research design used in this study is sample survey research design. The researcher chooses this method because survey research is useful in describing the characteristics of a large population; very large samples are feasible, making the results statistically significant even when analyzing multiple variables.

**Population**

The population of this study comprises of 32 senior secondary schools in Sokoto metropolis. This includes schools from science and technical education board, Arabic and Islamic education board, teachers' service board, federal ministry of education and those owned by private organizations and individuals. The schools have a population of 93 biology teachers and 87,426 students.

**Sample**

The researcher selects twelve (12) secondary schools out of the whole population in Sokoto metropolis using random sampling techniques. This represents 37. 5 percent of the populations, 34 biology teachers from the selected schools were chosen to represent the population of teachers, which represents 39.8 percent of teachers' population.

**Instrumentation**

The instrument used in this study is Laboratory Equipment Utilization Assessment Inventory (LEUAI); it's designed for biology teachers of the selected schools. The aim of the instrument is to assess teacher ability to use laboratory equipment in any practical work. The instrument has two sections, A and B. Section A inquire about general information of the respondent including qualification and years of teaching experience. While section B consist of six items with four rating scales which measures utilization of laboratory equipment (i.e poor, good very good and excellent, scored 0, 1, 2, and 3 respectively). The reliability index of Laboratory Equipment Utilisation Assessment Inventory (LEUAI) was obtained using test-retest method, after a pilot study with six teachers. The reliability index 0.71 was obtained.

**Analysis of data**

Data collected were analysed using simple descriptive statistics of mean. In the analysis any mean score between 1.5 and above is considered "good" while mean score below 1.5 is considered "poor".

**RESULTS AND DISCUSSION**

The descriptive statistic in table 1 shows the mean score of teachers in relation to their ability to handle laboratory equipment. The table shows that teachers with M Sc./M. ed and those with B.Sc./B.Sc. Ed had mean scores of 2.0 and 1.6, respectively which means they are good in handling laboratory equipment. On the other hand, teachers with HND and NCE had the mean scores of 0.5 and 1.4 respectively which fall below the cut–off point 1.5 and therefore confirmed that they are poor in handling the equipment.

From the analysis on table 2 below, it can be seen that only teachers with NCE had mean score 1.2 which is less than the cut-off point, meaning they are poor in assembling laboratory equipment during the conduct of practical work. Other teachers with MSc / M ed,

**Table 1** Teacher Qualification and Handling of Laboratory Equipment before and after practical work

| S/No. | Qualification | LEUAI Scores | No of Teachers | Mean | Decision |
|---|---|---|---|---|---|
| 1. | M.Sc./M Ed. | 6 | 3 | 2.0 | Good |
| 2. | B.Sc./ B.Sc. Ed. | 40 | 24 | 1.6 | Good |
| 3. | HND | 1 | 2 | 0.5 | Poor |
| 4. | NCE | 7 | 5 | 1.4 | Poor |

**Table 2** Teacher Qualification and Assembling Laboratory Equipment during practical work

| S/No. | Qualification | LEUAI Scores | No of Teachers | Mean | Decision |
|---|---|---|---|---|---|
| 1. | MSc./M Ed. | 8 | 3 | 2.7 | Good |
| 2. | BSc./ BSc. Ed. | 45 | 24 | 1.9 | Good |
| 3. | HND | 3 | 2 | 1.5 | Good |
| 4. | NCE | 6 | 5 | 1.2 | Poor |

**Table 3** Teacher Qualification and Integration of Experiment during practical work

| S/No. | Qualification | LEUAI Scores | No of Teachers | Mean | Decision |
|---|---|---|---|---|---|
| 1. | MSc./M Ed. | 7 | 3 | 2.3 | Good |
| 2. | BSc./ BSc. Ed. | 36 | 24 | 1.5 | Good |
| 3. | HND | 2 | 2 | 1.0 | Poor |
| 4. | NCE | 6 | 5 | 1.2 | Poor |

**Table 04** Teacher Qualification and Positioning Laboratory Equipment during Practical work

| S/No. | Qualification | LEUAI Scores | No of Teachers | Mean | Decision |
|---|---|---|---|---|---|
| 1. | MSc./M Ed. | 6 | 3 | 2.0 | Good |
| 2. | BSc./ BSc. Ed. | 30 | 24 | 1.2 | Poor |
| 3. | HND | 2 | 2 | 1.0 | Poor |
| 4. | NCE | 7 | 5 | 1.4 | Poor |

**Table 5** Teacher Qualification and Cleaning/Arrangement Equipment after Utilization

| S/No. | Qualification | LEUAI Scores | No of Teachers | Mean | Decision |
|---|---|---|---|---|---|
| 1. | MSc./M Ed. | 3 | 3 | 1.0 | Poor |
| 2. | BSc./ BSc. Ed. | 25 | 24 | 1.0 | Poor |
| 3. | HND | 2 | 2 | 1.0 | Poor |
| 4. | NCE | 5 | 5 | 1.0 | Poor |

B.Sc./B.Sc. Ed and HND had mean scores of 2.7, 1.9 and 1.5 respectively, which means they are good in assembling laboratory equipment for the conduct of practical work.

The analysis on Table 3 shows that teachers with M Sc./M. Ed had the highest mean 2.3, followed by those with B. Sc./B. Sc. Ed with a mean score 1.5, while those with HND and NCE had mean scores 1.0 and 1.2 respectively. This means that teachers with M. Sc./M. Sc. Ed and B. Sc./B. Sc. Ed are good in integrating experiment during practical work while those with HND and NCE are poor in integrating experiment during practical work.

In Table 4, it was found that only teachers with M. Sc./M. Sc. Ed are good in positioning laboratory equipment during practical work, while other teachers had mean scores less than 1.5 which means they are poor in positioning laboratory equipment during practical work.

The analysis from Table 5 shows that all the four categories of teachers had poor attitude to cleaning and arranging laboratory equipment after utilization. This

**Table 6** Teacher Qualification and Safety Measures

| S/No. | Qualification | LEUAI Scores | No of Teachers | Mean | Decision |
|---|---|---|---|---|---|
| 1. | MSc./M Ed. | 4 | 8 | 1.3 | Poor |
| 2. | BSc./ BSc. Ed. | 28 | 24 | 1.2 | Poor |
| 3. | HND | 1 | 2 | 0.5 | Poor |
| 4. | NCE | 6 | 5 | 1.2 | Poor |

**Table 7** Teacher Experience and Handling of Laboratory Equipment before and after practical work

| S/No. | Years of Experience | LEUAI Scores | No of Teachers | Mean | Decision |
|---|---|---|---|---|---|
| 1. | 0 – 1 | 9 | 8 | 1.1 | Poor |
| 2. | 2 – 4 | 23 | 16 | 1.5 | Good |
| 3. | 5 and above | 20 | 10 | 2.0 | Good |

**Table 8** Experience and Assembling Laboratory Equipment during practical work

| S/No. | Years of Experience | LEUAI Scores | No of Teachers | Mean | Decision |
|---|---|---|---|---|---|
| 1. | 0 – 1 | 7 | 8 | 0.9 | Poor |
| 2. | 2 – 4 | 25 | 16 | 1.6 | Good |
| 3. | 5 and above | 23 | 10 | 2.3 | Good |

**Table 9** Experience and integration of Equipment during practical work

| S/No. | Years of Experience | LEUAI Scores | No of Teachers | Mean | Decision |
|---|---|---|---|---|---|
| 1. | 0 – 1 | 14 | 8 | 1.75 | Good |
| 2. | 2 – 4 | 34 | 16 | 2.1 | Good |
| 3. | 5 and above | 25 | 10 | 2.5 | Good |

**Table 10** Experience and Positioning of Laboratory Equipment during Practical Work

| S/No. | Years of Experience | LEUAI Scores | No of Teachers | Mean | Decision |
|---|---|---|---|---|---|
| 1. | 0 – 1 | 13 | 8 | 1.6 | Good |
| 2. | 2 – 4 | 26 | 16 | 1.6 | Good |
| 3. | 5 and above | 21 | 10 | 2.1 | Good |

means their mean score is less the cut-off point (1.5).

As it can be seen in Table 6 above, teachers with M. Sc./M. Sc. Ed had mean score 1.3 while other teachers with B. Sc./B. Sc. Ed, HND and NCE had mean scores 1.1, 0.5 and 1.2 respectively. This means all the four categories of teachers score less than the cut-off point mean and therefore had poor attitude to using/taking safety measures during laboratory practical work.

From the analysis on Table 7 above, it can be seen that teachers with experience between 2 – 4 and 5 years and above had mean scores of 1.5 and 2.0 respectively which means they are good in handling laboratory equipment. On the other hand, teachers with less than two years experience are poor in handling laboratory equipment. Their mean scores 1.1 which is less than 1.5

The analysis from table 8 shows that mean of teachers with one year experience and below is 0.9 which means they are poor in assembling laboratory equipment. On the contrary teachers with experience between 2 - 4 and those between 5 years and above are good in handling laboratory equipment with the mean scores of 1.5 and 2.3 respectively. From table 9 it can be seen that the mean score of teachers with experience is between 5 years and above is 2.5 which is higher than 2.1 for teachers between 2 – 4 years experience then followed by 1.7 for teachers with one experience and below. This means all the three categories of teacher are good in integrating equipment during practical work. The only difference is

**Table 11** Experience and to Cleaning and Arrangement of Equipment after Utilization

| S/No. | Years of Experience | LEUAI Scores | No of Teachers | Mean | Decision |
|---|---|---|---|---|---|
| 1. | 0 – 1 | 5 | 8 | 0.6 | Poor |
| 2. | 2 – 4 | 9 | 16 | 0.5 | Poor |
| 3. | 5 and above | 7 | 10 | 0.7 | Poor |

**Table 12** Experience and Safety Measures

| S/No. | Years of Experience | LEUAI Scores | No of Teachers | Mean | Decision |
|---|---|---|---|---|---|
| 1. | 0 – 1 | 10 | 8 | 1.2 | Poor |
| 2. | 2 – 4 | 22 | 16 | 1.4 | Poor |
| 3. | 5 and above | 17 | 10 | 1.7 | Poor |

that teachers with 5 years above are better than those between 2 -4 and one year and below in integrating equipment during practical work.

Table 10 shows the two categories of teachers, that is 0 – 1 and 2 – 4 years of experience score the same mean 1.6 while those between 5 years and above had 2.1. This means the mean scores of all the three categories of teachers is higher than cut-off point and implies they are good in positioning laboratory equipment during laboratory practical work. The descriptive statistic on table 11 above shows that none of the three categories of teachers scored a mean of 1.5 and above which means they had poor attitude to cleaning and arrangement of laboratory equipment after the conduct of practical work.

The mean scores on table 12 shows that teachers with 0 – 1 and 2 – 4 years experience had mean scores less than 1.5 which means the two categories of teachers had poor attitude to safety measures during practical work. On the other hand teachers with experience between 5 years and above had mean of 1.7 and as such they are said to have good attitude to safety measures during laboratory practical work.

## Teacher Qualification and Utilization of Laboratory Equipment

Evidence from statistical analysis in tables 1 to 4 revealed that teachers with M. Sc./M. Ed are good in handling, assembling, positioning of laboratory equipment and conduct of experiment with equipment during practical work. The analysis also showed that teachers with Bsc./Bsc. Ed are good in handling and assembling laboratory equipment as well as conducting experiment with the equipment during laboratory practical work. The tables also revealed that teachers with HND are only good in assembling laboratory equipment for the conduct practical work while those with NCE are found to be poor in handling, assembling, positioning laboratory equipment and conduct of experiment with the equipment during practical work. Furthermore, the findings from tables 5 and 6 showed that all the four categories of teachers had poor attitude to cleaning and arrangement of laboratory equipment after utilisation and also to taking safety measures during laboratory practical work.

In a nut shell, the findings from tables 1 to 6 revealed that teachers with M. Sc./M. Ed are better than those with B. Sc./B. Sc. Ed, who are found to better than those with HND and NCE in using laboratory equipment in laboratory practical work. This answered research question 1 and the finding is in line with Alaofe (2000) and Adetayo (2008). It is well known fact that behind every successful lesson is a good teacher. Effective teaching implies productive, result-oriented, purposeful, quantitative, meaningful and realistic teaching. The essence of being an effective teacher according to Amoo (2000) lies in knowing what to do to foster students learning. This implies that an effective teacher develops ideas and skills in students so that they can be used for personal needs, further study and for everyday life. Biology teachers with lower qualification should therefore endeavour to further their knowledge to enable them influence teaching and learning positively by acquiring more skills in dealing with and using laboratory equipment. This will help greatly in the conduct of biology practical work. Practical work according to Gangoli and Gerrard (1995) promotes long term memory in students, enhances pupils developments of the ethical dimension of science, instills the spirit of collaboration and active participation among learners, exposes learners to scientific experience that could ultimately help them in developing scientific attitude and skills.

## Teacher Experience and use of Laboratory Equipment

From the result in table 7 to 12, teachers with 2 years experience and above are found to be good in handling and assembling laboratory equipment, while those with less than 2 years experience are poor in handling and

assembling laboratory equipment. Similarly the findings from tables 9 and 10 revealed that all the three categories of teachers are good in conducting experiment with equipment and positioning of laboratory equipment during practical work. The mean score shows that teachers with 5 years experience and above had the highest mean, as a result they are said to be better than those with less than five years experience. The analysis from Table 11 shows that all the three categories of teachers had poor attitude to cleaning and arrangement of laboratory equipment after the conduct of practical work, while analysis from Table 12 also revealed that teachers with 5 years experience and above had good attitude to taking safety measures during the conduct of laboratory practical work, while other teachers with less than 5 years experience had poor attitude using safety measures during laboratory practical work.

In brief, analysis from Tables 7 to 12 revealed that teachers with 5 years experience and above had the highest mean in all the six items measured and are found to be good in using laboratory equipment during practical work. On the other hand, teachers with less than 2 years experience are found to be poor in using laboratory equipment. This provides answer for research question 2. The finding disagree with Kamar (2007) who reported that lack of experience with equipment is not constraining factor in the conduct of laboratory practical according to 50% of teachers. Teachers experience provides him with the familiarity with many laboratory equipment needed and procedures for conducting various practical works.

## RECOMMENDATIONS

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

1. Ministry of education and school proprietors should endeavour to employ more qualified biology teachers and retain the existing ones especially experienced teachers.
2. Biology teachers should intensify effort to conduct practical works regularly, so that students can be familiar with many procedures and equipment needed for conducting biology practical works. This will help students in answering many questions correctly in SSCE biology practical
3. The inspectorate department of federal and state ministry of education should supervise secondary schools regularly to ensure that science teachers are using laboratory equipment/materials in conducting practical works.

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