

STATUS OF BIOLOGY PRACTICAL IN SENIOR SECONDARY SCHOOLS IN EDATI LOCAL GOVERNMENT AREA OF NIGER STATE

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Abstract

The study investigated the status of practical biology in secondary schools in Edati Local Government Area of Niger state. The sample of the study consisted of 27 biology teachers and 120 SSIII students randomly selected from the six schools. The instrument used for data collection was a survey questionnaire named Status of Biology practical work Questionnaire (SBPWQ) constructed by the researchers. Two research questions and two null hypotheses were formulated to guide the study. The research questions were answered using mean and standard deviation, while the null hypotheses were tested at 0.05 level of significance using t-test. The results showed that the status of practical biology in the schools used for the study was so poor and insufficiently carried out. Facilities for practical biology are inadequate, for instance, there are poorly-equipped laboratories & libraries, inadequate laboratory staff etc. It also revealed that teachers often use lecture method during biology practical instead of practical oriented methods and there was no active and constant participation of students in practical classes. It was recommended among others that the government and other stakeholders in education should provide facilities and equipment for biology practical. Conferences, workshops and seminars should be constantly organized by the government and schools for biology teachers as to update their knowledge and skills in practical biology, which in turn will improve teaching and learning of practical biology in secondary schools. This could go a long way in reducing the epidemic poor performance in WAEC and NECO examinations.

Keywords: Biology, Practical work, Practical biology, science process skills

Introduction

The teaching of science is incomplete without practical works. Practical works enable students to be exposed to science process skills which include observing, experimenting, measuring, communicating, manipulating, questioning, predicting, controlling variables, inferring etc. These science process skills are fundamentals in the teaching and learning of sciences such as biology, without which, effective teaching and learning of sciences can never be enhanced (Ugwu, 2005). Some of the areas in which biology is important include its position as the science of life which enables man to know more about himself. It also contributes to socio-economic development of man, society and the nation as it is applied in plants and animals breeding to raise improved breeds. It is also applied in food processing, food conservation, storage, development of drugs and vaccines for curing and preventing diseases (Ramalingam, 2000). The subject offers wide range of career choices for secondary students at tertiary level of education which include medicine, pharmacy, nursing, bio-technology, zoology, botany, micro-biology, biochemistry among others (Larku, 2011).

Practical work is any teaching and learning activities that involve students in observing or manipulating real objects and materials. Isa (2007) described practical work as observable skills, knowledge and attitudes. Practical work can take place in the laboratory, workshop or in the field where students do exercise with real or improvised materials. In the laboratories and workshops, students interact with tools and materials in order to put theoretical work into practice for proper understanding of science subjects of which biology is one. It helps students to link between the domains of knowledge comprising of the domains of objects, observable properties and events as well as the domain of ideas. Isa (2007) states that some possible intended learning outcomes include: helping students to identify objects and phenomena and become familiar with them, learn facts and concepts, relationships, theories and models from the foregoing observations.

Biology is an important science subject which by the nature of its concepts needs to be studied in details through practical work experience. Ango (2000) stated that biology comes alive when students are engaged in practical work. Danmole (2012) asserted that teaching of biology is only effective with practical work and also learning and retention of its concepts are impossible without exposure to practical work. Biology therefore, is a pure practical science, thus, appropriate biology practical is the key to enhanced learning classification and consolidation of theories.

However, biology practical can be sabotaged by some factors, for example, Dan-Ologe and Shittu(2013) highlighted some factors hindering learning of biology which include poor biology laboratory condition or status, inadequate staffing and non-availability of laboratory materials. Aganga (1998) reported that students in schools with adequately equipped laboratories performed better than those in poorly equipped laboratory schools. This signals success in students performance in biology S.S.C.E. if laboratories are to be well equipped as reported and in addition, if practical biology is well carried out in senior secondary schools.

Statement of the Problem

It has been revealed that there has been consistent massive failure in biology in senior secondary School Certificate Examinations over the years in Nigeria. (WAEC, 2000-2010). Reasons attributed to that among others is non-availability and utilization of instructional materials (Shehu, 2006). However, Nwachukwu and Nwosu (2005) reported that students' poor performance in practical biology examination was in part, due to inadequate exposure to practical biology and their non- acquisition of relevant skills. Isa (2005) stated that science teachers use lecture method in teaching science instead of using the activity oriented methods. However,biology is a science subject that relies heavily on practical work activities for greater understanding of its concepts (Ango,2000;).This ofcourse, by implication, reveals that if biology practical is hindered by any factor, the whole biology teaching and learning activities are also prone to be affected. This prompts the emergent need for checking the condition of biology practical activities in secondary schools to have a clear picture of its efficiency and quality.

Purpose of the Study

The main purpose of this study was to investigate the status of teaching and learning of practical biology in the secondary schools in Edati Local Government Area, Niger state. Specifically, this study sought to:-

- (i) Determine the availability and adequacy of resources for practical biology in secondary schools.
- (ii) Determine the adequacy of resources for practical biology in the secondary schools.
- (iii) Determine other factors that hinders smooth learning of practical biology in the secondary schools

Research Questions

This study tended to provide answers to the following research questions:

- (i) How available and adequate are the resources for teaching and learning biology in the secondary schools?
- (ii) What are the facts hindering smooth teaching and learning of practical biology in the schools?

Research hypotheses

The following null hypotheses were formulated to guide the study and was tested at 0.05 level of significance:

- Ho₁: There is no significant difference between the mean responses of biology teachers and students on the availability and adequacy of practical biology in Secondary schools in Edati local Government.

Ho₂: There is no significant difference between the mean responses of less-experienced and more experienced biology teachers on the factors hindering teaching and learning of biology practical.

Research Method

The design of this study was a survey research. The population of the study comprises of all 27 biology teachers and Senior Ssecondary class III (SSIII) students (2,260) from the six secondary schools in Edati Local Government, Niger state. Purposive sampling technique was used to select all biology teachers from the schools as they are few in number. Among the teachers, ten teachers have less than five years of teaching experience and are called less-experienced teachers, and twelve of them have worked for more than five years and were called more experienced teachers. Stratified random techniques was used to select 120 S.S.III students, 20 students each from the six secondary schools in the local government. The instrument used for the data collection was questionnaire constructed by the researchers and designated as status of Biology practical work Questionnaire (SBPWQ) constructed by the researchers. The SBPWQ consists of four sections namely: Section A comprises biodata, section B contains status of teaching and learning of practical biology items; while section C contains items on adequacy of resourses for biology practicals. Five Likert scale was used to assess the responses of biology teachers and students. The data collected was analyzed using mean, standard deviation and t-test analyses. To establish the validity of the instrument for the study, the instrument was subjected to both face and content validation by the experts in the science education department, Federal University of Technology, Minna. The questionnaire was pilot tested using samples other than those used for the study. Cronbach Alpha of 0.75 was obtained as reliability coefficient.

Results

Table 1: Number and percentage of teachers and their years of teaching experience

| Biology teaching experience in years. | No of teachers | Percentage | Remark |
|---------------------------------------|----------------|------------|------------------|
| <5 years | 12 | 44.4 | Less-experienced |
| ≥5 years | 15 | 55.6 | More-Experienced |
| Total | 27 | 100 | |

Table 1: shows that 44.4% of the biology teachers used for the study were less experienced while 55.6% were more- experienced.

Research Question One: What is the quality of biology practical in the secondary schools of Edati Local government?

Table 2: Mean responses of teachers on the quality of practical biology

| S/No | Questionnaire Items (Teachers) | Mean | SD | Remark |
|------|---|------|------|-----------|
| 1 | Biology practical is always carried Out in my school | 2.04 | 0.58 | Not Agree |
| 2 | Enough biology practical is carried Out in my school | 2.13 | 0.72 | |
| 3 | Biology teachers engage more in Lectures than practical during practical Biology | 2.43 | 1.22 | Not Agree |
| 4 | Verification experiments are always Carried out during practical biology | 3.14 | 0.49 | Agreed |
| 5 | Practical works done in my school enable students to solve past WAEC Practical biology questions. | 3.02 | 0.94 | Agreed |
| 6 | Investigation experiments are often Carried out during practical biology in My school | 2.23 | 0.92 | Not Agree |
| 7 | The quality of practical work in Biology in my school is satisfactory. | 2.41 | 0.73 | Not Agree |
| 8 | Practical work in biology in my School is made | 3.11 | 6.66 | Agree |

| | | | | |
|-------------------|---|-------------|-------------|-----------|
| 9 | interesting. Group work is encouraged during Practical biology in my school. | 2.16 | 1.12 | Not Agree |
| 10 | There is active participation of Students during practical biology. | 2.22 | 0.71 | Not Agree |
| Grand mean | | 2.30 | 0.81 | |

Table 2: shows the mean responses of teachers on the quality of practical biology in the schools under study. The grand mean of all responses fall below 3.00 which is the criterion. This means almost all teachers are dissatisfied with the quality and quantity of practical biology in the schools. Meanwhile, as indicated in item 5, they agreed that the little biology practical carried out enable the students to solve some past questions of WAEC and NECO biology practical. Also only verification experiment is the major practical events not experimentation

Table 3: Mean responses of students on the quality of biology practical.

| S/No | Questionnaire Items (Sudents) | Mean (N=27) | SD | Remark |
|-------------------|---|----------------|-------------|-----------|
| 1 | Biology practical is always carried Out in my school | 1.92 | 0.56 | Not Agree |
| 2 | Enough biology practicals are carried Out in my school | 1.87 | 0.59 | Not Agree |
| 3 | Biology teachers engage more in Lectures than practical during practical Biology | 3.25 | 1.92 | Agree |
| 4 | Verification experiments are always Carried out during practical biology | 2.72 | 0.57 | Agreed |
| 5 | Practical works done in my school enable students to solve past WAEC Practical biology questions. | 2.02 | 0.67 | Not Agree |
| 6 | Investigation experiments are often Carried out during practical biology in My school | 1.94 | 0.61 | Not Agree |
| 7 | The quality of practical work in Biology in my school is satisfactory. | 2.06 | 0.68 | Not Agree |
| 8 | Practical work in biology in my School is made interesting. | 2.04 | 0.64 | Not Agree |
| 9 | Group work is encouraged during Practical biology in my school. | 1.96 | 0.63 | Not Agree |
| 10 | There is active participation of Students during practical biology. | 1.82 | 0.62 | Not Agree |
| Grand mean | | 2.12 | 0.65 | |

Table 3 shows the mean responses of students on the adequacy of resources for practical work in biology. The grand mean of the responses is 2.12 which is far below the average of 3.00. Almost all the items fall below the criterion except item 3. This means that they are all dissatisfied with the quantity and quality of biology practical in the schools. On the other hand they agreed that teachers talk more in practical class than engaging fully in practical activities.

Research Question Two: How adequate are the resources for smooth teaching and learning of practical biology in the schools?

Table 4: Mean responses of Less-experienced teachers on adequacy of resources for biology Practical

| S/No | Questionnaire Items (Less-Exp.) | Mean (N=27) | SD | Remark |
|------|---|----------------|------|-----------|
| 1 | Equipments and chemicals for biology Practical in my School are adequate. | 2.06 | 0.49 | Not Agree |
| 2 | There is a well equipped library in my school. | 2.15 | 0.52 | Not Agree |

| | | | | |
|-------------------|---|-------------|-------------|-----------|
| 3 | There are enough qualified laboratory Personnel in my school. | 2.31 | 0.61 | Agree |
| 4 | There are enough professional biology Teachers in my school. | 2.26 | 0.76 | Not Agree |
| 5 | Practical works done in my school enable students to solve past WAEC Practical biology questions. | 1.86 | 0.66 | Not Agree |
| 6 | There is enough space in biology laboratory in my school. | 1.92 | 0.63 | Not Agree |
| 7 | Biology practical work in my school is allocated enough time in the time table. | 2.31 | 0.79 | Agreed |
| 8 | Seminars, workshops and in-service training are always organized for our teachers. | 1.62 | 0.43 | Not Agree |
| 9 | Biology practical text books are abundant and cover biology syllabus in my school. | 2.52 | 0.78 | Agreed |
| 10 | There is constant,electric & water supplies and enough security gadgets in biology lab | 2.48 | 0.76 | Not Agree |
| Grand mean | | 2.06 | 0.76 | |

Table 4 illustrates mean responses of less-experienced teachers on the adequacy of resources for biology practical. The grand mean of all responses is 2.06 which is below 3.00. This indicates that biology practical resources ranging from lighting, water, electricity, chemicals and equipments among others are unsatisfactory and inadequate.

Table 5: Mean response of more-experienced teachers on adequacy of resources for biology practical

| S/No | Questionnaire Items (More-Exp.) | Mean (N=27) | SD | Remark |
|-------------------|---|----------------|-------------|-----------|
| 1 | Equipments and chemicals for biology Practical in my school are adequate. | 1.98 | 0.48 | Not Agree |
| 2 | There is a well equipped library in my school. | 2.01 | 0.55 | Not Agree |
| 3 | There are enough qualified laboratory Personnel in my school. | 1.87 | 0.72 | Agree |
| 4 | There are enough professional biology Teachers in my school. | 2.21 | 0.69 | Agreed |
| 5 | Practical works done in my school enable students to solve past WAEC Practical biology questions. | 1.52 | 0.64 | Not Agree |
| 6 | There is enough space in biology laboratory in my school. | 1.71 | 0.59 | Not Agree |
| 7 | Biology practical work in my school is allocated enough time in the time table. | 2.24 | 0.81 | Not Agree |
| 8 | Seminars, workshops and in-service training are always organized for our teachers. | 1.60 | 0.39 | Not Agree |
| 9 | Biology practical text books are abundant and cover biology syllabus in my school. | 2.57 | 0.82 | Not Agree |
| 10 | There is constant,electric & water supplies and enough security gadgets in biology lab | 3.01 | 0.72 | Not Agree |
| Grand mean | | 2.15 | 0.72 | |

Table 5 shows the mean responses of more-experienced teachers on the adequacy of resources for biology practical in the schools. The grand mean of responses however, fall below 3.00 indicating dissatisfaction of the respondents on the adequacy of such resources. They only agreed with item 10, which means lighting water and electric supplies as well as security gadgets are available and adequate.

Hypothesis One

HO1: There is no significant difference between the mean responses of biology teachers and students on the quality of practical biology in Secondary schools in Edati local Government.

Table 6: Independent t-test results of teachers and students' responses on quality of practical Biology

| Group | N | df | Mean | SD | t-cal | Sig. (2-tailed) |
|----------|-----|-----|-------|------|-------|---------------------|
| Teachers | 27 | 145 | 17.78 | 0.81 | 1.15 | 0.196 ^{ns} |
| Students | 120 | | 11.08 | 0.66 | | |

ns= Not significant at 0.05 level

Data in table 6 shows the t-test result of teachers and students' responses on the quality of practical biology. $t(1.15), df = 145, p < 0.05$. This implies that there is no significant difference between the responses of teachers and students on the quality of practical biology. The null hypothesis is therefore not rejected.

Hypothesis Two

HO₂: There is no significant difference between the mean responses of less-experienced and more experienced biology teachers on the adequacy of resources for teaching and learning of practical biology in Edati secondary schools.

Table 7: Independent t-test comparison of responses of more-experienced and less-experienced teachers on adequacy of resources for practical biology.

| Group | N | df | Mean | SD | t-cal | Sig. (2-tailed) |
|-----------|----|----|-------|------|-------|---------------------|
| More-Exp. | 15 | 25 | 17.78 | 2.06 | 0.315 | 0.160 ^{ns} |
| Less-Exp. | 12 | | 11.08 | 2.15 | | |

ns =Not significant at 0.05 level

Table 7 shows t-test result of less-experienced and more-experienced biology teachers on the adequacy of resources for practical biology. $t(0.315), df = 25, p < 0.05$. This implies that there is no significant difference between the responses of less-experienced and more-experienced teachers. Therefore, the null hypothesis is not rejected.

Discussion of Findings

The study was to survey the status of practical biology in secondary schools in Edati Local Government of Niger State. From the results, table 1 reported the proportion of teachers base on their years of experience in teaching profession. Out of 27, 12 teachers (44%) spent less than five years in teaching, while, 15 teachers (56%) spent five years and above. Experience is regarded as effective in practical techniques, work and management (Egbunomu & okeke, 2005).

Table two reported teachers' responses on the quality of practical in the schools studied. It revealed that almost all teachers are not contented with the quality, frequency and nature of the biology practical activities in the schools. The grand mean was 2.30 and SD = 0.81, which is below 3.00 scale average. The results corroborate the position of Nwachukwu and Nwosu (2005) who posit that students' poor performance in practical biology was in part due to inadequate exposure to practical biology and non-acquisition of relevant skills. Indeed the situation is devastating as biology comes alive only if students are engaged fully in practical work, as it heavily relies on practical activities for greater understanding of its concepts (Ango, 2000).

Table 3 revealed that the grand mean of students' responses was 2.12, SD = 0.65 which is below 3.00. This shows that they are of the opinion that practical biology activities are not well carried out in the schools. In other words, the quality, quantity and nature of biology practical activities are not satisfactory. This situation is a great nuisance to the teaching and learning of biology, as it can never be effectively learnt without practical biology (Ango, 2000; Nwachukwu & Nwosu, 2005). The students revealed that teachers talk more than doing practical activities during biology practical. This supports the assertion of Ali (1984) and Isa (2005) who revealed that science teachers use lecture method in teaching sciences instead of activity oriented methods. Science process skills can never be effectively acquired through lecture method, and they are pre-requisites for effective teaching and learning of sciences (biology inclusive) (Ugwu, 2005).

Table 4 reported the responses of less-experienced teachers on the adequacy of resources for biology practical. The grand mean was 2.6, SD = 0.76 which indicated that they disagreed with the adequacy of the resources for biology practical in the schools. These resources range from equipment, chemicals, spacious laboratories, professional biology teachers, lab staff, libraries, among others. They also agreed that there are available security gadgets, water and electricity supplies in the laboratories. Water, electricity supplies and security gadgets are necessary in any standard laboratory, but of no avail if other resources are inadequate or even lacking. Among the factors that hinders learning of biology are poor biology laboratories, inadequate staffing, and non-availability of laboratory materials (Dan-Olege & Shittu, 2013).

Table 5 revealed the responses of more-experienced teachers on the adequacy of resources for biology practical. The grand mean was 2.15, SD = 0.72, indicating that they were dissatisfied with the adequacy of all the resources for biology practical in the schools. But, in their responses, they agreed that water, electricity and security gadgets are available and adequate

Table 6 reported t-test results of teachers and students' responses on the quality of practical biology in the schools. It revealed that there was no significant difference between the opinion of teachers and students on the quality of practical biology in the schools, $t(1.15)$, $df = 145$, $p < 0.05$, hence, the null hypothesis is not rejected. Obviously, both teachers and students are not satisfied with the way biology practicals are carried out.

Table 7 reported the t-test results of the opinions of more-experienced and less-experienced teachers on the adequacy of resources for practical biology. where, $t(0.315)$, $df = 25$, $p < 0.05$, indicating that there was no significant difference between the responses of more experienced teachers and less-experienced teachers on the adequacy of resources for biology practical, hence, the null hypothesis is not rejected. This simply shows that the old teachers and new teachers have the same opinion on the subject matter. It simply indicates that these problems have been there for a long time in the schools.

Conclusion

Biology is an important science subject which offers wide range of career choices for students at tertiary level that benefit humanity. The importance and relevance of studying biology both theoretically and practically can never be over-emphasized. Practical biology enables students to acquire science process skills which are important in scientific investigation to arrive at knowledge. From this study, it is obvious that the quality of biology practical activities are declining in secondary schools and urgently needs to be given more attention in order to arrest the situation. Students are not well engaged in practical activities and as well, the resources for practical biology are not adequate in the schools. For students to acquire science process skills which will enhance their performances in biology WAEC and NECO examinations, they should be well engaged in practical activities in well equipped laboratories.

Recommendations

The following recommendations were made based on the findings of this study.

- (i) Facilities or resources for biology practical should be adequately supplied to schools by the government and other stakeholders in education so that students can be actively engaged during practical.
- (ii) Enough funds should be provided to schools to purchase needed materials for biology practical.
- (iii) Teachers should ensure that the biology practical they organize can enable students solve past WAEC biology practical questions. This will make their work purposeful and realistic and will also make the students have confidence that they are learning.
- (iv) Teachers should not use the period of biology practical for lecture. They should ensure that they teach biology as an enquiry and not as theory only.
- (v) Teachers should ensure that investigative experiments are carried out instead of frequently carrying out verification practicals.

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