

Availability and Utilization of Equipment/Materials in Senior Secondary Schools Biology Practical Activities in Ekiti State, Nigeria

Dr. FATOBA; Joseph Oba; Mr. ABIDAKUN; Ojo Titus

Abstract

This study assessed availability and utilization of biology equipment/materials in Ekiti State Senior Secondary School Biology lessons. The study specifically examined the extent to which school location affects the availability and utilization of Biology laboratory materials for practical activities.

The study adopted the descriptive research design of the survey type. The population of the study comprised of 19,603 Senior Secondary School II (S.S.S2) students and 378 Biology teachers in all 189 Public Secondary Schools in Ekiti State. The sample for this study were 490 respondents, comprising 450 Students and 40 teachers randomly selected from 18 secondary schools using multi-stage sampling technique. Three set of instruments tagged 'Biology Teacher Activities Questionnaire (BTAQ)', 'Biology Student Activities Questionnaire (BSAQ)' and 'Biology Equipment/Materials Checklist (BEC)' were used for the study. The three instruments BTAQ, BSAQ and BEC were validated by experts. Also the reliability of the three instruments BTAQ, BSAQ and BEC yielded reliability coefficients of 0.87, 0.79 and 0.68 respectively. The data were analysed using descriptive and inferential statistics. The descriptive statistics of frequency counts, percentages and means were used to answer research questions while the inferential statistics involving t-test statistics was used to test the hypothesis, the hypothesis was tested at 0.05 level of significance.

The findings of the study showed that facilities for Biology practical activities were available in schools moderately. It was also found that the utilization of available facilities for Biology practical activities in schools was moderate. It was found that there was no significant difference between availability and utilization of materials for practical activities in rural and urban schools.

Based on the findings of the study, it was recommended that government in collaboration with Non-Governmental Organizations (NGOs) should ensure that resources are provided in the laboratory for effective teaching- learning process. Also, periodic seminars and workshops should be organized for Biology teachers in order to enhance their effective utilization of facilities for Biology practical.

Keyword: Availability, Utilization, Equipment, Materials, Practical activities.

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Dr. FATOBA, Joseph Oba & Mr. ABIDAKUN, Ojo Titus

Department of Science Education, Faculty of Education

Ekiti State University Ado –Ekiti, Nigeria

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Based on the findings of the study, it was recommended that government in collaboration with Non-Governmental Organizations (NGOs) should ensure that resources are provided in the laboratory for effective teaching- learning process. Also, periodic seminars and workshops should be organized for Biology teachers in order to enhance their effective utilization of facilities for Biology practical.

Key words: Availability, Utilization, Equipment, Materials, Practical activities.

1. Introduction

Biology as a branch of Science subject deals with the study of living things, it is one of the pre-requisite subject in the field of learning that contributes immensely to the technological growth of the nation, for example the knowledge of Biology is useful in the following areas, medicine, manufacturing and processing industry, food production, pharmaceuticals, biotechnology among others.

According to Nwakonobi (2008), the recent advances recorded in the field of Biochemistry, Physiology, Ecology, Genetics, and Molecular Biology are due to biological knowledge and application. The inclusion of Biology as a core subject for science students in senior secondary school calls for the need to teach it effectively using practical activities. Its objectives as contained in the National Policy on Education (FRN, 2013) include among others to equip learners with meaningful and relevant knowledge of Biology, adequate laboratory and field skills. It is only through availability and utilization of materials for Biology practical activities in and outside the laboratory that the above objectives and goals can be achieved. Nzewi (2008) defined practical activities as a strategy that could be adopted to make teaching more real to the students as opposed to abstract or theoretical presentation of facts, principles and concepts of subject matters.

According to Score (2013), practical activities in science education are learning activities in which students observe, investigate and develop an understanding of the world around them, through direct often hand-on experiment of phenomenon or manipulating real objects and materials. Also practical activities can be defined to be any science teaching and learning activity which involves student's working individually or in small groups, manipulating and /or observing real objects and materials as opposed to the virtual world (Science Community Representing Education, Score, 2008). Millar and Abraham (2009) reported that the main objective of the practical activities is to help students develop their knowledge of the world and their understanding of some of the main ideas, theories and models that science uses to explain it. Therefore the need to acquire new skills, new attitudes and new values for effective teaching of Biology in secondary schools cannot be over-emphasized, skills should be developed on how to handle practical activities in Biology.

Availability and utilization of materials for practical activities improve students' skills in observation and creative thinking, successfully integrating practical activities with classroom lessons and field investigations will make the learning experience richer and more meaningful to students. Practical activities help develop students' understanding of scientific concepts. It aids memory and stimulates interest. Science practical activities are the aspect of science learning which is retained after cognitive knowledge has been forgotten, this concurs to a popular saying that 'what I handled I remember' because it has been established by researchers that an object handled impresses itself more firmly on the mind than the object merely seen from a distance in an illustration. Experimentation thus gives room for better attainment of lesson objectives. Practical activities both in the classroom and outdoors are absolutely an essential component of effective science teaching, it enhances students' experience, understanding skills and enjoyment of science. It is often argued that practical activities are central to teaching and learning in science and that good quality practical activities help develop students' understanding of scientific concepts. Therefore Biology teachers should imbibe the tradition of using biological materials for practical activities in school science and value field work because the majority of the topics in Biology cannot be considered as complete without including some practical lessons as it forms an essential part of the learning experience for Biology students.

Many students tend to see Biology as abstract and irrelevant to their lives due to the fact that most teachers are not engaging the students in classroom practical activities and field work which aids the understanding of difficult concepts in the curriculum, it is believed that learners can achieve more if given the opportunity to carry out laboratory practical on what they have been taught in the classroom. Experimentation thus

gives room for better attainment of lesson objectives, since it depends on the availability and utilization of laboratory materials for proper learning, where it is impossible to procure adequate equipment/materials for teaching and learning, therefore Biology teachers need to wake-up to their responsibility by improvising when necessary.

The researcher's personal experience has shown that lack of necessary laboratory materials for the teaching of Biology in schools has resulted in making some aspects of Biology difficult for the students to comprehend, hence make the teaching of the main concept difficult. Students often times develop negative attitude towards the subject and this may lead to poor performance in Biology practical examinations and invariably affect the overall result of students in Biology subject during external examinations. Also it was observed that most Biology teachers defer practical activities until few weeks before external examination when students will be taught practical based on instruction to practical examination received from the examining body. Despite the fact that Biology curriculum stipulated that practical activities should be taught under each concept. Sometimes, the materials needed for these practical activities may be provided by the teachers or the students without any financial cost yet, they complained of lack of facilities as excuse for not doing practical Biology activities.

Taking parts in practical activities is an integral and essential part of learning sciences. It provides experience through which students can develop their understanding, enabling them make the link between subject contents and the physical, as well as doing works by experiencing and observing phenomena. Practical activities teach techniques and skills for handling equipment and materials safely, as well as promoting the development of scientific reasoning so that students can understand through direct experience. Interest of students in Biology as a subject could be aroused through practical activities or exposing students into laboratory activities.

Researchers such as Aladejana & Aderibigbe (2007) and Watts (2013) have established that achievement and skills improved when students are taught science using practical activities. However, the researcher observed that practical activities is not done in some schools in Ekiti State due to inadequate resources, lack of practical skills among others.

Location of schools could also be a factor that affects Biology practical activities. Location is a particular place in relation to other areas. School location refers to the part of the state where schools are sited. It could be in an urban area where essential amenities are present for use or in rural where essential amenities may not be present for use. The students in urban areas are more likely to be exposed to practical activities in Biology than their rural area counterparts. Those schools located in urban towns are more likely to have better laboratories facilities, trained Biology teachers as well as more practical activities classes. This study therefore made an assessment of Biology practical activities in Ekiti State senior secondary schools considering availability and utilization of laboratory materials, and school location.

2. Statement of the Problem

Practical activities have been given a central and distinctive role in Science education. Despite the effectiveness of practical activities in teaching and learning process, it appears as if most teachers do not teach the students using practical activities, they complained lack of facilities as excuses for not doing

practical in Biology. Oftentimes, the materials needed for practical activities may be provided by the teacher or the students in form of specimens without any financial cost yet they give excuses of lack of facilities. Perhaps, the teacher concerned do not possess the skills or as a result of laziness, some even delay practical activities lessons until few weeks before external examination when practical activities will be based on instruction to practical examination received from examining body that is West African Examination Council (WAEC) and National Examination Council (NECO). The researcher's personal experience has shown that lack of necessary laboratory materials for the teaching of Biology in schools has resulted in making some aspects of Biology difficult for the students to comprehend, hence making the teaching of the main concept difficult. Students tend to develop negative attitude towards the subject and this may lead to poor performance in Biology practical examinations and invariably affect the overall result of students in Biology subject at various external examinations. This study therefore assessed Biology practical activities in some selected schools vis-à-vis the availability and utilization of laboratory facilities, and school location.

3. Purpose of the Study

The aim of this study is to investigate the availability and utilization of biology equipment/materials for practical activities in senior secondary school in Ekiti State, Nigeria. Specifically the study:

- i. examined the level of availability and utilization of facilities for Biology practical activities in schools;
- ii. examined the difference in the availability Biology laboratory materials between schools located in urban and rural areas
- iii. examined the difference in the utilization of Biology laboratory materials in rural and urban schools

4. Research Questions

1. Are there available facilities for Biology practical activities in schools?
2. Do teachers utilize available facilities for Biology practical activities in schools?

5. Research Hypothesis

1. There is no significant difference between availability and utilization of biology laboratory materials for practical activities in rural and urban schools

6. Research Design

The research design for this study was descriptive research design of the survey type. This research design is considered appropriate because it describes the existing situation as regard Biology practical activities in Ekiti State public Senior Secondary Schools. The research is also a survey type because it covered a large area from which some schools were considered to be representatives of the entire group.

7. Population

The population for the study consisted of all year two Senior Secondary School students (SS2) and all the senior secondary Biology teachers in all 189 public secondary schools in Ekiti State.

8. Sample and Sampling Techniques

The sample for this study was 490 respondents with 450 students and 40 Biology teachers selected from 18 randomly selected Senior Secondary Schools in Ekiti State, using multistage sampling procedure. Stage one involved selection of three Local Government Areas from each senatorial districts using simple random sampling by balloting. Stage two involved selection of two public senior secondary school from each of the Local Government Area using stratified sampling technique. Stage three involved the use of purposive selection of science class in each school due to the fact that Biology as a subject is offered by students in science class. At stage four, Biology intact class was used from each school making a total of 450 students and 40 teachers used for the study.

9. Instruments

The study made use of three response instruments namely, 'Biology Teacher Activities Questionnaire (BTAQ)', 'Biology Student Activities Questionnaire (BSAQ)' and 'Biology Equipment Checklist (BEC)'.

10. Data Analysis

The data collected were analysed, using both descriptive and inferential statistics. The research questions were answered using frequency counts, percentages and mean scores. The research hypothesis was tested using t-test. The hypothesis was tested at 0.05 level of significance.

10.1 Results

Question 1

Are there facilities for Biology practical activities in schools?

Table 1: Availability of Facilities for Biology Practical in Schools

S/N	ITEMS	AVAILABLE		NOT AVAILABLE		MEAN	REMARK
		F	%	F	%		
1.	Microscope	12	66.7	6	33.3	1.67	NA
2.	Hand lens	17	94.4	1	5.5	1.94	A
3.	Flat Bottom Flask	12	66.7	6	33.3	1.67	NA
4.	Prepared slides	8	44.4	10	55.6	1.44	NA
5.	Trough	10	55.6	8	44.4	1.56	NA
6.	Thermometer	16	88.9	2	11.1	1.89	A

7.	Dissecting board	10	55.6	8	44.4	1.56	NA
8.	Beakers	17	94.4	1	5.6	1.94	A
9.	Bell jars	11	61.1	7	38.9	1.61	NA
10.	Tripod Stand	18	100.0	-	-	2.00	A
11.	Slides	16	88.9	2	11.1	1.89	A
12.	Bunsen Burner	12	66.7	6	33.3	1.67	NA
13.	Insect bottle	12	66.7	6	33.3	1.67	NA
14.	Desiccators	7	38.9	11	61.1	1.39	NA
15.	Funnel	17	94.4	1	5.6	1.94	A
16.	Million's reagent	17	94.4	1	5.6	1.94	A
17.	Petri dishes	16	88.9	2	11.1	1.89	A
18.	Stop watches	10	55.6	8	44.4	1.56	NA
19.	Test tube	17	94.4	1	5.6	1.94	A
20.	Storage bottle	11	61.1	7	38.9	1.61	NA
21.	Sudan III solution	18	100.0	-	-	2.00	A
22.	Fehling solution	16	88.9	2	11.1	1.89	A
23.	Iodine solution	14	77.8	4	22.2	1.78	A
24.	Aquarium	6	33.3	12	66.7	1.33	NA
25.	Dissecting Kit	11	61.1	7	38.9	1.61	NA
26.	Forceps	11	61.1	7	38.9	1.61	NA
27.	Botanical garden	7	38.9	11	61.1	1.39	NA
28.	Dropping bottle	13	72.2	5	27.8	1.72	A
29.	Filter Papers	16	88.9	2	11.1	1.89	A
30.	Quadrat	15	83.3	3	16.7	1.83	A
31.	Charts	16	88.9	2	11.1	1.89	A
32.	Insect Nets	16	88.9	2	11.1	1.89	A
33.	Dried fruits/ seeds	13	72.2	5	27.8	1.72	A
34.	Formalin	13	72.2	5	27.8	1.72	A
35.	Animal specimens	16	88.9	2	11.1	1.89	A
36.	Measuring cylinder	14	77.8	4	22.2	1.78	A
37.	Human Model	7	38.9	11	61.1	1.39	NA
38.	Skeleton	9	50.0	9	50.0	1.50	NA
39.	Cobalt chloride paper	7	38.9	11	61.1	1.39	NA
40.	Plant models	4	22.2	14	77.8	1.22	NA

A= Available, NA= Not Available

Table 1 presents the availability of facilities for Biology practical activities in schools. Using a grand mean of 1.70 for the rating scale, the result shows that 21 out of the items listed were available while 19 were not

available. This is an indication that Biology practical facilities in Ekiti State schools were moderately available.

Question 2

Do teachers utilize available facilities for Biology practical activities in schools

Table 2: Utilization of Available Facilities for Biology Practical Activities in Schools

S/N	ITEMS	Frequently used		Moderately used		Not used		MEAN	REMARK
		F	%	f	%	F	%		
1	Microscope	-	-	11	61.1	7	38.9	1.61	NU
2	Hand lens	-	-	16	88.9	2	11.1	1.89	MU
3	Flat Bottom Flask	-	-	12	66.7	6	33.3	1.67	MU
4	Prepared slides	-	-	8	44.4	10	55.6	1.44	NU
5	Trough	-	-	10	55.6	8	44.4	1.56	NU
6	Thermometer	-	-	15	83.3	3	16.7	1.83	MU
7	Dissecting board	-	-	9	50.0	9	50.0	1.50	NU
8	Beakers	-	-	16	88.9	2	11.1	1.89	MU
9	Bell jars	-	-	8	44.4	10	55.6	1.44	NU
10	Tripod Stand	-	-	15	83.3	3	16.7	1.83	MU
11	Slides	-	-	8	44.4	10	55.6	1.44	NU
12	Bunsen Burner	-	-	7	38.9	11	61.1	1.39	NU
13	Insect bottle	-	-	9	50.0	9	50.0	1.50	NU
14	Desiccators	-	-	10	55.6	8	44.4	1.56	NU
15	Funnel	-	-	13	72.2	5	27.8	1.72	MU
16	Million's reagent	-	-	15	83.3	3	16.7	1.83	MU
17	Petri dishes	-	-	14	77.8	4	22.2	1.78	MU
18	Stop watches	-	-	12	66.7	6	33.3	1.67	MU
19	Test tube	1	5.6	11	61.1	6	33.3	1.72	MU
20	Storage bottle	1	5.6	13	72.2	4	22.2	1.83	MU
21	Sudan III solution	1	5.6	13	72.2	4	22.2	1.83	MU
22	Fehling solution	1	5.6	14	77.8	3	16.7	1.89	MU
23	Iodine solution	1	5.6	12	66.7	5	27.8	1.78	MU
24	Aquarium	-	-	5	27.8	13	72.2	1.28	NU
25	Dissecting Kit	-	-	9	50.0	9	50.0	1.50	NU
26	Forceps	-	-	10	55.6	8	44.4	1.56	NU
27	Botanical garden	-	-	8	44.4	10	55.6	1.44	NU
28	Dropping bottle	-	-	12	66.7	6	33.3	1.67	MU
29	Filter Papers	-	-	14	77.8	4	22.2	1.78	MU
30	Quadrat	1	5.6	14	77.8	3	16.7	1.89	MU

31	Charts	1	5.6	11	61.1	6	33.3	1.72	MU
32	Insect Nets	-	-	14	77.8	4	22.2	1.78	MU
33	Dried fruits/ seeds	-	-	14	77.8	4	22.2	1.78	MU
34	Formalin	-	-	12	66.7	6	33.3	1.67	MU
35	Animal specimens	-	-	11	61.1	7	38.9	1.61	NU
36	Measuring cylinder	-	-	11	61.1	7	38.9	1.61	NU
37	Human Model	-	-	4	22.2	14	77.8	1.22	NU
38	Skeleton	-	-	7	38.9	11	61.1	1.39	NU
39	Cobalt chloride paper	-	-	1	5.6	17	94.4	1.06	NU
40	Plant models	-	-	3	16.7	15	83.3	1.17	NU

MU= Moderately Used, NU= Not Used

Table 2 presents the utilization of available facilities for Biology practical activities in schools. Using a grand mean of 1.62 for the rating scale, the result shows that 21 out of the items listed were moderately utilized while 19 were not utilized. This is an indication that the utilization of Biology practical facilities in Ekiti State schools was moderate. Items that were not utilized are not available. Therefore teachers need to improvise them in the schools.

10.2 Hypothesis 1

There is no significant difference between availability and utilization of Biology laboratory materials in rural and urban schools.

In order to test the hypothesis, scores relating to availability and utilization of Biology laboratory materials in rural and urban schools were computed using Items 1-20 in Section B of "Biology Teacher Activities Questionnaire (BTAQ)" and compared for statistical significance using t-test statistics at 0.05 level. The result is presented in table 3

Table 3: t-test of Biology Teachers' Conducting of Biology Practical Lesson by School Location

Variable	No of teachers	Mean	SD	t	p
Rural	15	33.73	4.53	0.010	0.992
Urban	25	33.72	3.90		

p>0.05

Table 3 shows that there was no significant difference between practical activities in rural and urban schools ($t=0.010$, $p>0.05$). The null hypothesis is not rejected, therefore this implies that there was no significant difference between availability and utilization of materials for practical activities in rural and urban schools

11. Discussion

The result of the study showed that there were available facilities (though moderately) for Biology practical activities in schools. This corroborated the findings of Uyoata (2006) which state that availability of

resources makes the work of the teacher easy; it makes the lessons to be concrete simultaneously and helps to enhance the achievement of students. However, this negates the submission of Oludare, Abiodun & Ajayi (2006) that Biology laboratory physical structure as well as equipment is inadequate and Adesoji (2006) which stated that there are inadequate resources for teaching and learning of Science subjects in public secondary school in Nigeria. However those facilities that were not available may be improvised, The teacher should try to improvise instructional materials and encourage students to do the same this gives student enough understanding of Biology concepts as the students' local environment will be used to source the materials.

Biology as a school subject is very important in scientific and technological development of a nation, Its objective as contained in the national policy on Education FRN (2013) include among others, to equip learners with meaningful and relevant knowledge of biology, adequate laboratory and field skills. The use of equipment/materials in teaching biology is subject to its availability therefore materials/equipment must be available in order to make the objectives come to reality. Alebiosu and Michael (2018) opined that, certain facilities are most essential if school science laboratory is to be functional, relevant and productive. Apart from the adequacy of the laboratory human and material resources, there are required specifications for design of each of physics, chemistry, biology or any other science subject's laboratory. Laboratory facilities are needed in all its ramification for the purpose of achieving specific goals, and aid or facilities can be used for instructional process and development. It is therefore imperative for teachers' to use instructional materials to make their teaching more interesting, effective, arrest and sustain more attention of the students for effective learning to take place. It is common knowledge that students do better through personal observation of objects or phenomena than hearing from a teacher alone, the laboratory practice is one of the best and most important instructional media for effective learning because it make real what is abstract in this wise ,students prefer experiments as it enable them to observe, classify and interpret result from concrete data laboratory practice, therefore practical activities is very important in biology lessons. The study showed that the utilization of available facilities for Biology practical activities in schools was moderate. The finding does not agrees with the study of Muhammad(2017) which showed that most schools emphasis is more on the memorization of facts with a view to passing examination and less on the method of finding out the facts and learning to apply them. The findings also corroborated the assertion of Ihiegbulem (2006) which stated that resource materials utilization during practical lessons inculcates in the students the spirit of careful observation manipulative skills and creativity in the learners. When students are exposed to the use of equipment/materials by their teachers during teaching and learning process they tend to perform better than when they are taught without using laboratory facilities, to support this assertion the findings of Ihejiamazu & Ochui (2016) posited that the involvement of learner with laboratory equipment will eliminate abstraction of the concept learned, as learner are involved in laboratory activities they manipulate the equipment, conduct experiment, record scientific observation, this way basic scientific skills and attitudes are acquired that will help them both in performance and in future application of concept in ever day life. Teaching learning facilities improves the quality of teaching and make learning content meaningful, biology teachers make best use of available facilities to enable learners make use of more than one senses in learning for better retention of knowledge. However, the use of equipment/materials in the teaching of biology is subject to its availability.

The finding showed that there was no significant difference between availability and utilization of laboratory materials in rural and urban schools. The finding is at variance with the findings of Ojaawo in Owoeye & Yara (2011) who posited that school location is one of the potent factors that can influence students' performance and distribution of educational resources. Also the findings was at variance with the opinion of Ayeni (2016), which stated that rural schools in Nigeria are generally regarded as schools located where the essential amenities may or may not be present for use on the other hand, urban schools are located where essential amenities are present for use.

12. Conclusion

This study has been able to establish the fact that equipment/facilities for Biology practical activities were available moderately inschools and these materials were moderately utilized in public secondary schools in Ekiti State. Also, availability of laboratory equipment/materials is not influenced by school location.

13. Recommendations

Biology teachers should be encouraged to improvise instructional materials for the teaching of Biology practical when and where necessary.

School Principals' in conjunction with Area Education Officers in the Ministry of Education should regularly supervise teachers' practical activities and students practical activities as stipulated in the Biology curriculum.

Periodic and appropriate seminars and workshops should be organized for Biology teachers to enhance their effective utilization and improvisation of facilities for Biology practical.

Government in collaboration with Non-Governmental Organizations (NGOs), Parents, Philanthropist, Old Students Association, should ensure that biology materials or resources are provided in quality and quantity in the laboratory for effective teaching and learning process.

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