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¹OLADIPUPO Popoola Oluwasegun & ²KAREEM Adeyinka Oluwaseun

Department of Science and Technology Education,

Obafemi Awolowo University, Ile-Ife

Email id: ¹oluwasegunpopoola@yahoo.com; segpopson@gmail.com & ²adeyinkareem@gmail.com

Tel: ¹08133898443 & ²07033306453

Abstract

The study examined the availability and accessibility of laboratory equipment in Colleges of Education in Osun State. The study adopted descriptive survey research design. The population consisted of all the biology lecturers and students in the Colleges of Education in Osun State. The study sample comprised Biology lecturers and students (NCE II) of the two public Colleges of Education selected using total enumeration technique, and two private Colleges of Education selected using simple random sampling technique. Total enumeration sampling technique was used to select 31 and 29 students from the two private Colleges of Education, while Simple random sampling technique was used to select 120 students from each of the public Colleges of Education. Three Biology lecturers were selected from each of the four selected Colleges of Education using simple random sampling technique, making a total of 12 lecturers. Biology Practical Resources Observation Checklist (BPROC) and interview were used to gather data for the study. Results revealed that the availability of laboratory equipment was high (81.3%) and accessibility was high (78.7%). Lecturers in both private and public Colleges made use of the available and accessible equipment, but standard laboratories were lacking in private Colleges.

Keywords: Science Education, Basic Education, Laboratory equipment, Biology Curriculum, Biology Practical, NCCE Benchmark/Minimum Standard

Introduction

Science is the key to technological growth and has played an important role in improving the lives of mankind through medicine, agriculture, communication, transportation, engineering and economy (Olutola, Daramola, & Bamidele, 2016). For the developing countries to match up

with developed nations, the patterns of scientific and technological development of science must be stepped up beyond acquisition of knowledge from schools and colleges of education to utilization of scientific knowledge in the logical understanding and doing of what science entails (Olajide, Adebisi, & Tewogbade, 2017). The intelligent comprehension of what science education implies is fundamentally contemplated in the laboratory. Subsequently, this emphasizes the significance of laboratory activities to the appreciation of the reality of science.

Science Education is critical in the improvement of a country by enhancing the economy of the country and has been considered an instrument for accomplishing national advancement. As indicated by Oloyede (2009), science education means securing of information about the structure and conduct of the normal and physical world in light of the certainties that can be demonstrated or confirmed, particularly by experiments. Science Education is the procuring of adequate information about nature through the actions that can be demonstrated or substantiated particularly through experiments (Oloyede, 2009). Science is a systematic process organized in a sequential manner which includes, identification, Observation, making assumptions (intelligence guessing), experimentation, testing and validation of assumptions, and conclusion. Science education is absolutely necessary in any developing country in order to fight and conquer the future problems such as economy, social, technological and political blindness, as well as poverty.

Science Education has never failed in the business of raising elegant leaders because of the scientific and technological approach to solving problems. Edem (2005) affirmed that science education and technology advancement is

expected to dissipate ignorance, poor social practices and convictions in the Nigerian culture. The best way to tackle the nations' problem is through the use of scientific and technological concept in the right proportion. Though, the major challenge to this approach in solving the world's problem is corruption, because corruption is highly endemic to major countries in the world and it has to be dealt with if the exertion of science educationist is to get rid of impoverishing life, nullify terrorism, elevate affluence and so on (Sustainable Development Goals, 2016).

According to National Policy on Education (NPE) 2011 and Federal Ministry of Education (2021), science education shall emphasize the teaching and learning of science process and principles. This will lead to fundamental and applied research in the sciences at all levels of education.

The goals of science education shall be to:

- cultivate inquiring, knowing and rational mind for the conduct of a good life and democracy;
- produce scientists for national development;
- service students in technology and the cause of technological development; and provide knowledge and understanding of the complexity of the physical world, the forms and the conduct of life. Special provisions and incentives shall be made for the study of sciences at each level of national education system. For this purpose, the functions of all agencies involved in promotion of the study of sciences shall be adequately supported by Government. Government shall popularize the study of sciences and the production of adequate number of scientists to inspire and support national development.

A lot of nations are not preparing their youths for better tomorrow as a result of corruption by not putting together the resources that will be needed in making them better citizen and glorious leaders in the future. Instead, they kept on telling their young folks "they are the leaders of tomorrow" without a practical method of getting the right equipment that will engage them for the

betterment of tomorrow and that is why some nations that have been known to be developing countries for years are still known as developing nations today such as Nigeria. Hence, there is no need for nations to keep on telling their youths they are the leaders of tomorrow if what they need to make them effective leaders are not provided by their today's leaders (Yusuf, 2013). Nigeria is one of those nations, that is why Oloyede (2009), categorically stated that Nigerian leaders are debased, so there is the need for a stable political system of government which influence science education training and that in any stable political system, teachers and their instructional system are better care of but the reverse is being experienced in the country (science teachers are not enjoying that in Nigeria rather they are viewed by the government officials as poor persons). Now, it is relevant to ask whether there is any solution for the present science and technology education formative issues that are evidently standing up to this country. He went further by saying that the individuals who made strong stride in delivering the present National Policy on Education (NPE) merit acclaims and regard for their drive and fearlessness. This is a direct result of the huge undertaking they performed by "tearing" Nigeria far from the supreme curriculum set-ups and in this way stopping their "unfriendly" impacts on our culture (Oloyede, 2009). He further suggests the possible solutions to the science education and technological problems in Nigeria that Nigerian culture ought to be initiated to be deductively and mechanically acculturated; such human advancement ought not to be constrained on them. Students in the schools ought to be encouraged to cherish science education by discovering proportionate implications to logical ideas in their first languages. Additionally, ability to compose using science imaginative skills in the Nigerian classroom to produce the innovative cognizance in students ought to be a "managed initiative". The narrative of Nigerian researchers, technologists ought to be instructed as a component of a course that can be labeled "history of Nigerian scientists" and "using "cash" or riches to quantify "significance" or "god father" predominant these days in the Nigerian culture should be intentionally stopped. In the broader sense of science education and particularly science education for growth,

biology education needs to be seen (Teng, 2012). Science (biology), for the development of scientific literacy both in adults and classrooms, should be seen in this wider sense. In this way a science-friendly company promotes fast industrial growth across all industries and promotes domestic production and competitiveness. Science and its concomitant technologies are now so important in our lives in the world that generalized scientific literacy (biology) is necessary to provide a foundation for educated decisions by society (Teng, 2012).

As indicated by the Federal Ministry of Education (FME 2004) and Wokocha (2005), from the setting of the National Policy of Education; the general destinations of showing science in Nigerian elementary schools, post primary schools and higher institutions gives the Nigerian pupil the chance to control and use appropriate equipment and materials with a view to empowering social communication, instead the reality of what was written in paper is yet to manifest. Science (Biology) education should empower the Nigerian kid to watch and investigate nature, controlling, characterizing, imparting, illuminating, estimating, deciphering information (i.e. to decode the information) and detailing models, create useful learning of science ideas and standards. Also, science education is to build up a logical behaviours including interest, basic reflection and objective, apply the aptitudes and information increased through science to understanding ordinary issues in his condition, create self-assurance and independence through critical thinking exercises in science, build up a useful mindfulness as well as deliberateness and excellence in nature (Federal Ministry of Education, Science and Technology, 2006).

Biology is the science which is concerned with the study of living things, as there are certain identifiable qualities in the study of living things, including: movement, breathing, feeding, irritability, development, excretion, breeding, competition, adaptation, lifespan and death (Nakano, 2007). Chukunyeremuwa (2013) has claimed that the biology continues to be one of the fundamental sciences which, if only carried out at the same time by sufficient educational facilities, is considered to be uniformly effective and

effective in teaching and learning. Biology has been fundamental to some human action, including a solution to the issue of food scarcity and wellbeing, sanitation, family life, eradication of hunger, management and conservation. The emphasis is being put on biology, in the field of biochemistry, genetic, physiology and anatomy, ecology, medicine, molecular biology and so on (Olutola and Bamidele, 2016). According to Aina (2013), biological education is essential for every growing economy such as Nigeria. Many biological graduates are self-employed and employers of labour; many own schools where people work and live while others go fishing. Biological literacy has the capacity for unique instruction and leads to students' needs and challenges by immediately applying the learned literacy skills to better their lives. Since ancient times, human civilization has used biological knowledge to generate food and other human survival necessities. Biology is an integrated area of science focused in multiple sciences to achieve and protect the well-being of persons in an ever-developing society. A series of occupations of essential significance for humans in particular human and veterinary medicine, agriculture, breweries and the food industry use the biological values and are the most fundamental issue on earth (Araoye, 2016).

In the Nigerian school curriculum, biological education was not granted appropriateness the way it supposed to be (Okenyi, 2013). The majority of what is learned in schools is introduced from other developing countries (Okenyi 2013), Ahmad, Abubakar, & Sani, 2018). Onasanya and Omosewo (2011) stated that Nigerian secondary schools had insufficient funding for teaching Biology. Chukunyeremuwa (2013) indicated that efficiently teaching biology has cost Nigeria so much that it is unable to afford sufficiently equipped laboratories and sufficient educational materials for biology education at least during this time of economic recession. Owing to the lack of or lack of laboratory equipments, reagents and supplies, many functional courses are not carried out (Ahmad, Abubakar, & Yau, 2018). The standard of education in any society depends on the quality of her teachers and the quality of education in any society (Ibrahim, 2013). Aina (2013) noted that Nigerian schools are dominated

by a lack of scientific (biological) instructors. He also said that the recruitment of biology teachers is no longer dependent on merits; those who qualify for biology are no longer employed, because they have no political/public sponsor and this leads to the hiring of biology teachers to favouritism and nepotism. One of the main education courses in biology is to educate students to observe, calculate, identify, register, examine, interfere, experiment and others in the field of science (Omorogbe & Ewansiha, 2013).

Owing to the shortage of trained biology teachers in most classrooms, most teachers do not require adequate curriculum and knowledge-building techniques for learners. Corruption is the biggest obstacle in Nigeria's advancement of biological education, causing the nation to face several problems (Aina, 2013). It is corruption that makes administrators of schools to mismanage fund meant for buying laboratory equipment and has asked teachers to ensure students still make their papers at all cost (Aina, 2013). Another important problem, especially in practical terms, is the poor financing of the development of biology education in Nigeria. The Nigerian government does not have sufficient funds to provide the atmosphere for efficient teaching and learning, as well as science (Ibrahim, 2013). Biological science requires massive resources and funding. Researchers have discovered in various investigations that Biology education is a panacea to sustainable development through Bio-fermentation, Biofuels, Bioinformatics and Bioremediation (Ahmad et. al., 2018). However, it will remain a problem until Biology practical is adequately implemented since Bio-fermentation, Biofuels, Bioinformatics, Bioremediation, etc. are products of laboratory practical.

Biology is a practical science subject which requests practical exercises of the students in its teaching and learning. High level, proper biology experiments, and investigations are the way to enhance learning, elucidation, and solidification of hypothesis. Biology practical exercises are not simply motivational or fun: they in addition empower students on how to apply and extend their insight and understanding of Biology in novel investigative circumstances, which can stimulate interest and help in learning and

retention. Practical work is a key factor in engaging, enthusing and inspiring students, in this manner stimulating long lasting interest in biology (science). Practical work is any teaching and learning activities that involves the ability of learners to work individually or in little gatherings, manipulating, observing genuine items and materials, instead of the virtual world (SCORE, 2008). Practical activity is a vital aspect of the Curriculum and it involves core activity which is brought into its implementation. In particular, practical work in curriculum implementation gives students an understanding of how natural knowledge is produced by trial and perception. Practical exercises in Biology gives chance for students to figure out to a high level of proficiency (having a great authority of the topic).

Nzewi (2008), on the affirmative, opined that practical exercises can be viewed as a technique that could be received to make the assignment of an instructor all the more genuine to students instead of conceptual or hypothetical introduction of certainties, principles and concepts of topics. Therefore, it is profoundly important to engage students in practical exercises in the teaching of Biology at all levels, whereas each part of the subject in the curriculum has its practical exercises which are to be done after every topic. Implementation of science subject (Basic science, Biology, Chemistry, and Physics) curriculum without practical exercises are viewed as "window dressing" approach (John, 2015). Therefore, teachers' experience and skills need to be followed up for this "window dressing" approach in light of the fact that practical exercises are fundamental to the fruitful accomplishment of desired goals of science in both secondary schools and higher institutions. According to Ifeobu (2014), Nigeria is a developing country with an increasing interest in science based talented labour. The accomplishment of this can begin with the learning and use of science subjects as in Basic Science (Integrated Science), Biology, Chemistry, and Physics at secondary school level.

Apart from the widespread feedback about the existing Nigeria Certificate in Education (NCE) programme which is too narrowed in vision that made the administrators (National Commission

for Colleges of Education, NCCE) to revise and update NCE Minimum Standards, it was discovered that Pre-Service Teacher Education (PSTE) curriculum content in Colleges of Education and the University undergraduate programmes tend to be inadequate for the demands of a knowledge economy (FRN, 2009 & 2012). Meanwhile, NCE graduates obviously become stakeholders that implement basic education curriculum. Consequently, any omission in the knowledge of practical activities of teacher will adversely affect the foundation of students in science at basic education level. Heretofore, the mastery of content knowledge in teaching subjects especially in science (Biology), Mathematics and Technology is poor and emphasis is on content memorization and use of lecture method rather than practical activities (FRN, 2009).

It has been discovered that the teaching and learning equipment to cater for practical activities are yet to be adequate in Colleges of Education and there is little or no skill development in the application of Information Communication and Technology (ICT) and modern media in teaching also (FRN, 2009). Another thing is that, there are variety of delivery modes in Higher Institutions such as Work and Study Programme (WASP), Sandwich Programme, distance learning systems, etc, whereas they are all claiming to be delivering the same stuffs to the Nigerians who are thirsty and willing to acquire education in any form and anywhere. All these distance learning programmes are not equipped with adequate practical classes. Some parents were not able to attend formal education due to various reasons, and such have been struggling to bridge the gap for their children. Failure for their children to get it right at basic education level again could negative impact another generation. For this among other issues to discontinue, effective practical activities must be possessed by the pre-service teachers who are the basic education curriculum implementer in the making.

Furthermore, the new edition of National Commission for Colleges of Education curriculum (2012) gives more thoughtfulness regarding the practical part of science most especially, Biology teaching and learning which

this investigation centers around in light of the fact that, the laboratory practical is a standout factor amongst the best experiences adapted towards the advancement of logical skills in learners (Adebisi, 2014). All the more likewise, one of the basic facts in education is that the nature of education depends to a great extent upon the nature of the educator, and what make an instructor to be qualitative is the sufficient and effective knowledge of practical which make him adroit (having good mastery of the subject matter). This could be the more reason why practical activity is given high premium in NCCE benchmark. However, availability and accessibility of laboratory equipment cannot be left out in the attainment of NCCE minimum standard as touching the premium given to the laboratory practical activities. This is because Laboratory equipment are different devices and equipment utilized by scientists working in a laboratory, whereas biology students need to work with different kinds of equipment while performing diverse experiments.

Concomitantly, researches have shown that Biology education is a solution to sustainable development through Bio-fermentation, Biofuels, Bioinformatics, Bioremediation and so on which are all products of Biology practical (Ahmad et. al., 2018). Also, quality time has to be devoted to the biology laboratory practical activities in order to achieve quality outcomes. Practically much have not been done up-to date as touching the degree at which the objectives of NCCE have been achieved on Biology laboratory practical activities and this study looked at how practical aspect of Biology curriculum is carried out in relation to Nigeria Certificate in Education (NCE) Minimum Standards; hence this study

Objective of the Study

The specific objectives of the study are to:

- ∑ (i) examine the availability of Biology laboratory equipment to Biology lecturers and students in colleges of Education in Osun State; and
- ∑ (ii) determine the level of accessibility of laboratory equipment to Biology lecturers and students in colleges of education in Osun State;

Research Questions

The following research questions were raised to guide the study.

- How available are the Biology laboratory equipment to Biology lecturers and students in colleges of education in Osun state?
- To what extent are the equipment for the teaching of Biology practical in Colleges of Education in the study area accessible to Biology lecturers and students?

Methodology

The population for this study consisted of all the Biology lecturers and students in the Colleges of Education in Osun State. The study sample comprised Biology lecturers and NCE II students of the two public Colleges of Education selected using total enumeration sampling technique. This is because, Osun State has only two state-owned colleges of education as of the time of this

study. Meanwhile, two private Colleges of Education were selected using simple random sampling technique. This is because, private colleges of education in Osun State are more than two. Total enumeration sampling technique was used to select 31 and 29 students from the two private Colleges of Education in their intact class, while simple random sampling technique was used to select 120 students from each of the public Colleges of Education in their intact class. Three Biology lecturers were selected from each of the four selected Colleges of Education using simple random sampling technique, making a total of 12 lecturers because Biology lecturers are more than three in all the selected colleges. Biology Practical Resources Observation Checklist (BPROC) were used to collect data for the study. The research questions raised were answered using frequency counts and percentage.

Table 1: School Selected for the study

S/N	Name of school	No of lecturers	No of students
1.	Osun State College of Education, Ilesa	3	120
2.	Osun State College of Education, Ila-Orangun	3	120
3.	Assanusiyah College of Education, Ode-Omu	3	31
4.	Foreign Links College of Education, Moro	3	29
	Total	9	300

Source: Field survey, 2022

Research Question 1: How available are the biology laboratory equipment in colleges of education in Osun state?

To answer this research question, the researcher visited the Colleges of Education in the study area to observe the number of Colleges of Education that are equipped with the equipment and apparatus specified in the National Commission for Colleges of Education (N. C. C.

E) minimum standards for Nigeria Certificate in Education. Equipment in each of the schools were observed to know their availability. The number of schools that have each of the equipment were then determined in the Table and the expected standard according to N.C.C.E. Certain number of equipment are required by the NCCE curriculum which this study accessed. Once the equipment is available based on the requirement which include the numbers of apparatus, it is said to be available.

Table 2: Availability of Biology Laboratory Equipment in colleges of Education in Osun State

S/N	ITEMS/EQUIPMENT	AVAILABLE F (%)	NOT AVAILABLE F (%)	REMARK
1.	Hand lenses	4(100.0%)	0(0.0%)	Available
2.	Microscopes	4(100.0%)	0(0.0%)	Available
3.	Incubator/Sterilizer	2(50.0%)	2(50%)	Available
4.	Autoclave (Portable)	3(75.0%)	1(25%)	Available

S/N	ITEMS/EQUIPMENT	AVAILABLE F (%)	NOT AVAILABLE F (%)	REMARK
5.	Balances	4(100.0%)	0(0.0%)	Available
6.	Hot Plates	4(100.0%)	0(0.0%)	Available
7.	Refrigerator	2(50%)	2(50%)	Available
8.	Water Filter	2(50%)	2(50%)	Available
9.	Hygrometer	3(75%)	1(25%)	Available
10.	Drying Oven (30°C-120°C)	2(50%)	2(50%)	Available
11.	Microtone	2(50%)	2(50%)	Available
12.	Automatic Tissue Processor	0(0.0%)	4(100.0%)	Not available
13.	Centrifuge	1(25%)	3(75%)	Not available
14.	Herbarium Cabinet	4(100.0%)	0(0.0%)	Available
15.	Herbarium Index Box	3(75%)	1(25%)	Available
16.	Air Pumps	0(0.0%)	4(100.0%)	Not available
17.	Photometer	2(50%)	2(50%)	Available
18.	Kymograph	0(0.0%)	4(100.0%)	Not available
19.	Dissecting Microscopes	0(0.0%)	4(100.0%)	Not available
20.	Insect Light Traps	2(50%)	2(50%)	Available
21.	Insect Box Traps	3(75%)	1(25%)	Available
22.	Slide Projector	3(75%)	1(25%)	Available
23.	Overhead Projector	2(50%)	2(50%)	Available
24.	Steel Frame Aquaria	1(25%)	3(75%)	Not available
25.	Oxygen Meter	1(25%)	3(75%)	Not available
26.	Binocular Microscopes	3(75%)	1(25%)	Available
27.	Embedding Bath	0(0.0%)	4(100.0%)	Not available
28.	Class distiller	4(100.0%)	1(25%)	Available
29.	Water Bath	3(75%)	0(0.0%)	Available
30.	pH Meter	3(75%)	1(25%)	Available
31.	Tissue Grinder	1(25%)	3(75%)	Not available
32.	Calorimeter	1(25%)	3(75%)	Not available
33.	Auxanometer (electric)	0(0.0%)	4(100.0%)	Not available
34.	Soil Agar	3(75%)	1(25%)	Available
35.	Plant Press	3(75%)	1(25%)	Available
36.	Soil Treating Kit	1(25%)	3(75%)	Not available
37.	Wooden Quadrats	4(100.0%)	0(0.0%)	Available
38.	Measuring Tape	4(100.0%)	0(0.0%)	Available
39.	Biological Kit/Dissecting Sets	4(100.0%)	0(0.0%)	Available
40.	Dissecting Boards/Plate stray	4(100.0%)	0(0.0%)	Available
41.	Bunsen Burner	4(100.0%)	0(0.0%)	Available
42.	Giant Gas Cylinder	3(75%)	1(25%)	Available
43.	Prepared and Plane microscope slides (Assorted)	3(75%)	1(25%)	Available
44.	Consumables: a. Glass wares	2(50%)	2(50%)	Available
	b. stains	2(50%)	2(50%)	Available
	c. chemicals (Assorted)	3(75%)	1(25%)	Not available
45.	Test tube rack	3(75%)	1(25%)	Available
46.	Preserved plants and animals' specimens (Assorted)	4(100.0%)	0(0.0%)	Available
47.	Desiccators	1(25%)	3(75%)	Not available
48.	Gloves	4(100.0%)	0(0.0%)	Available

S/N	ITEMS/EQUIPMENT	AVAILABLE F (%)	NOT AVAILABLE F (%)	REMARK
49.	Safety device (assorted)	4(100.0%)	0(0.0%)	Available
50.	General laboratories	4(100.0%)	0(0.0%)	Available
51.	Biological garden	3(75%)	1(25%)	Available
52.	Museum	0(0.0%)	4(100.0%)	Not available
53.	Aquarium	2(50%)	2(50%)	Available
54.	Herbarium	2(50%)	2(50%)	Available
55.	Lecture Hall	4(100.0%)	0(0.0%)	Available
56.	Stock/preparation room	3(75%)	1(25%)	Available
57.	Typical plant cell	2(50%)	2(50%)	Available
58.	Typical animal cell	2(50%)	2(50%)	Available
59.	Euglena	2(50%)	2(50%)	Available
60.	Spirogyra	2(50%)	2(50%)	Available
61.	Paramecium	2(50%)	2(50%)	Available
62.	Amoeba	2(50%)	2(50%)	Available
63.	T.S of monocotyledonous stem	2(50%)	2(50%)	Available
64.	T.S of monocotyledonous root	2(50%)	2(50%)	Available
65.	T.S Dicotyledon stem	2(50%)	2(50%)	Available
66.	T.S Dicotyledon root	2(50%)	2(50%)	Available
67.	T.S of leaf	2(50%)	2(50%)	Available
68.	Blood cells	2(50%)	2(50%)	Available
69.	Skeletal System	4(100.0%)	0(0.0%)	Available
70.	Muscular System	4(100.0%)	0(0.0%)	Available
71.	Brain and Nervous System	3(75%)	1(25%)	Available
72.	Circulatory System	4(100.0%)	0(0.0%)	Available
73.	Digestive system	4(100.0%)	0(0.0%)	Available
74.	Eye and Vision	3(75%)	1(25%)	Available
75.	Ear	4(100.0%)	0(0.0%)	Available
76.	Skin and Excretory Organs	4(100.0%)	0(0.0%)	Available
77.	Genetic Models	4(100.0%)	0(0.0%)	Available
78.	Stage micrometer	2(50%)	2(50%)	Available

Source: field Survey, 2022

Table 2 shows the availability of laboratory equipment in colleges of education in Osun state. The total number of instruments in all the selected Colleges of Education that were tagged to be available were counted and the percentage was determined. The equipment from 50% and above are said to be available according to the NCCE benchmark. It implied that most of the equipment needed to facilitate Biology practical in colleges of education are available to a reasonable degree as shown in the graph in figure 1 where the percentage of the available equipment are 81.3% and 18.7% for the non-available equipment.

Table 2 revealed that all the Colleges of Education in Osun State 4(100%) are equipped with Hand

lenses, Microscopes, Balances, Hot Plates, Herbarium Cabinet, Water Bath, Wooden Quadrats, Measuring Tape, Biological Kit/Dissecting Sets, Dissecting Boards/Plate tray, Bunsen Burner, Preserved plants and animals specimens (Assorted), Gloves, Safety device (assorted), General laboratories, Lecture Hall, Skeletal System, Muscular System, Circulatory System, Digestive system, Ear, Skin and Excretory Organs, and Genetic Models, while 75% have Autoclave (Portable), Hygrometer, Herbarium Index Box, Insect Box Traps, Slide Projector, Binocular Microscopes, Class distiller, pH Meter, Soil Agar, Plant Press, Giant Gas Cylinder, Prepared and Plane

microscope slides (Assorted), chemicals (Assorted), Test tube rack, Biological garden, Stock/preparation room, Brain and Nervous System and Eye and Vision.

Although, the availability of equipment such as Incubator/Sterilizer, Refrigerator, Water Filter, Drying Oven (30°C - 120°C), Microtone, Photometer, Overhead Projector, Consumables (Glass wares and stains), Aquarium, Herbarium, and Stage micrometer are only 50% which are tagged unavailable as 58% is required in the minimum standard for Nigeria Certificate in Education. However, only 25% Colleges of

Education in Osun State have Centrifuge, Steel Frame Aquaria, Oxygen Meter, Tissue Grinder, Calorimeter, Soil Treating Kit, Desiccators, Typical plant cell, Typical animal cell, Euglena, Spirogyra, Paramecium, Amoeba, Transverse section of monocotyledonous stem, Transverse section of monocotyledonous root, Transverse section Dicotyledonous stem, Transverse section Dicotyledonous root, Transverse section of leaf, and Blood cells. Whereas 0% are equipped with Automatic Tissue Processor, Air Pumps, Kymograph, Dissecting Microscopes, Embedding Bath, Auxanometer (electric), and Museum.

Table 3: Availability of Biology laboratory equipment in based on each school

Colleges of Education in the study area	Available Laboratory Equipment f (%)	Non-available Laboratory Equipment f (%)	Decision
School A	64(80.0)	16(20.0)	Available
School B	57(71.3)	23(28.9)	Available
School C	39(48.8)	41(51.3)	Not Available
School D	44(55)	36(45)	Available

Source: field survey, 2022

The total number of available instruments per each school were counted and the percentage was determined. Therefore, any school with 50% equipment and above were considered as those who have available Equipment, but those with equipment below 50% were said to be unavailable because they did not meet up with the minimum requirement. The results of the

available equipment in each College of Education in the study area are discussed in the table 3.

From table 3, it could be deduced that laboratory equipment from three schools out of the four selected Colleges are available, but not in the fourth one.

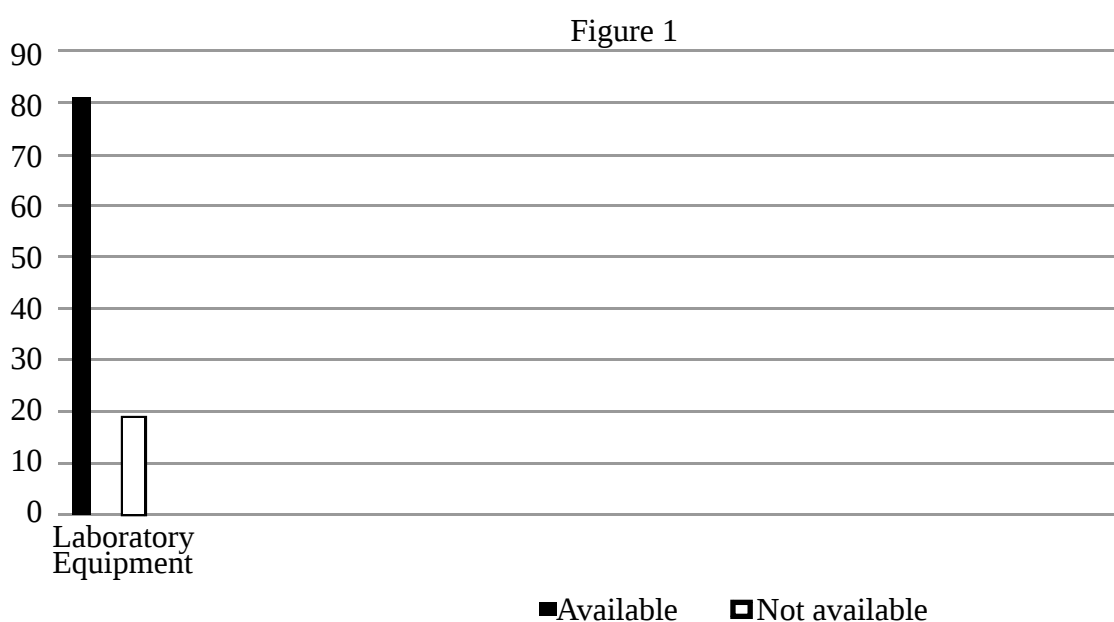


Figure 2

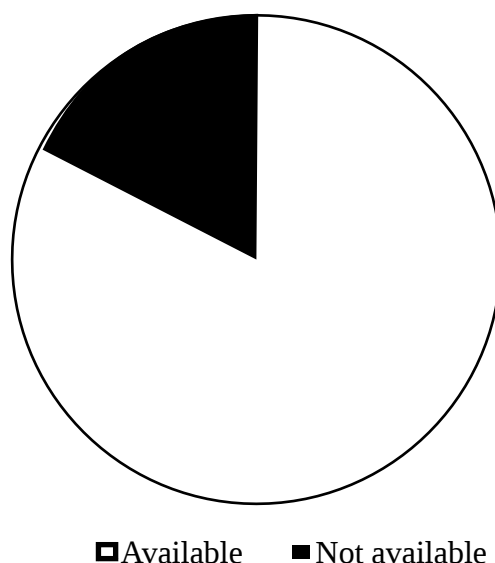


Figure 1 and 2: Summary of availability of Biology laboratory equipment in colleges of Education in Osun State

The summary of the available laboratory Equipment in the Colleges of Education in Osun State is given as chart in the figure 1. From the figures 1 and 2, it could be deduced that availability of laboratory equipment was high

(81.3%). Thus, the equipment is said to be greatly available (81.3%).

Research Question 2: To what extent are the equipment accessible?

To answer this question, the result was presented in table 2 and the chart in Figure 2 below

Table 4: Accessibility of laboratory equipment to lecturers and students

S/N	ITEMS/EQUIPMENT	ACCESSIBLE	NOT ACCESSIBLE F (%)	REMARK
1.	Hand lenses	4(100.0%)	0(0.0%)	Accessible
2.	Microscopes	4(100.0%)	0(0.0%)	Accessible
3.	Incubator/Sterilizer	1(25.0%)	3(75.0%)	Not accessible
4.	Autoclave (Portable)	1(25.0%)	3(75.0%)	Not accessible
5.	Balances	4(100%)	0(0.0%)	Accessible
6.	Hot Plates	3(75.0%)	1(25.0%)	Accessible
7.	Refrigerator	1(25.0%)	3(75.0%)	Not accessible
8.	Water Filter	3(75.0%)	1(25.0%)	Accessible
9.	Hygrometer	3(75.0%)	1(25.0%)	Accessible
10.	Drying Oven (30°C-120°C)	2(50.0%)	2(50.0%)	Accessible
11.	Microtone	2(50.0%)	2(50.0%)	Accessible
12.	Automatic Tissue Processor	0(0.00%)	4(100.0%)	Not accessible
13.	Centrifuge	1(25.0%)	3(75.0%)	Not accessible
14.	Herbarium Cabinet	4(100%)	0(0.0%)	Accessible
15.	Herbarium Index Box	3(75.0%)	1(25.0%)	Accessible
16.	Air Pumps	0(0.00%)	4(100.0%)	Not accessible
17.	Photometer	1(25.0%)	3(75.0%)	Not accessible
18.	Kymograph	0(0.00%)	4(100.0%)	Not accessible
19.	Dissecting Microscopes	0(0.00%)	4(100.0%)	Not accessible
20.	Insect Light Traps	2(50.0%)	2(50.0%)	Accessible
21.	Insect Box Traps	3(75.0%)	1(25.0%)	Accessible
22.	Slide Projector	1(25.0%)	3(75.0%)	Not accessible

S/N	ITEMS/EQUIPMENT	AVAILABLE F (%)	NOT AVAILABLE F (%)	REMARK
23.	Overhead Projector	1(25.0%)	3(75.0%)	Not accessible
24.	Steel Frame Aquaria	1(25.0%)	3(75.0%)	Not accessible
25.	Oxygen Meter	1(25.0%)	3(75.0%)	Not accessible
26.	Binocular Microscopes	3(75.0%)	1(25.0%)	Accessible
27.	Embedding Bath	0(0.00%)	4(100.0%)	Not accessible
28.	Class distiller	3(75.0%)	1(25.0%)	Accessible
29.	Water Bath	4(100.0%)	0(0.0%)	Accessible
30.	pH Meter	3(75.0%)	1(25.0%)	Accessible
31.	Tissue Grinder	2(50.0%)	2(50.0%)	Accessible
32.	Calorimeter	2(50.0%)	2(50.0%)	Accessible
33.	Auxanometer (electric)	0(0.00%)	4(100.0%)	Not accessible
34.	Soil Agar	3(75.0%)	1(25.0%)	Accessible
35.	Plant Press	3(75.0%)	1(25.0%)	Accessible
36.	Soil Treating Kit	2(50.0%)	2(50.0%)	Accessible
37.	Wooden Quadrats	4(100.0%)	0(0.0%)	Accessible
38.	Measuring Tape	4(100.0%)	0(0.0%)	Accessible
39.	Biological Kit/Dissecting Sets	4(100.0%)	0(0.0%)	Accessible
40.	Dissecting Boards/Plate stray	4(100.0%)	0(0.0%)	Accessible
41.	Bunsen Burner	4(100.0%)	0(0.0%)	Accessible
42.	Giant Gas Cylinder	3(75.0%)	1(25.0%)	Accessible
43.	Prepared and Plane microscope slides (Assorted)	3(75.0%)	1(25.0%)	Accessible
44.	Consumables: a. Glass wares	3(75.0%)	1(25.0%)	Accessible
	b. stains	4(100.0%)	0(0.0%)	Accessible
	c. chemicals (Assorted)	4(100.0%)	0(0.0%)	Accessible
45.	Test tube rack	4(100.0%)	0(0.0%)	Accessible
46.	Preserved plants and animals' specimens (Assorted)	4(100.0%)	0(0.0%)	Accessible
47.	Desiccators	1(25.0%)	3(75.0%)	Not accessible
48.	Gloves	4(100.0%)	0(0.0%)	Accessible
49.	Safety device (assorted)	4(100.0%)	0(0.0%)	Accessible
50.	General laboratories	4(100.0%)	0(0.0%)	Accessible
51.	Biological garden	3(75.0%)	1(25.0%)	Accessible
52.	Museum	0(0.0%)	4(100.0%)	Not accessible
53.	Aquarium	2(50.0%)	2(50.0%)	Accessible
54.	Herbarium	2(50.0%)	2(50.0%)	Accessible
55.	Lecture Hall	4(100.0%)	0(0.0%)	Accessible
56.	Stock/preparation room	3(75.0%)	1(25.0%)	Accessible
57.	Typical plant cell	2(50.0%)	2(50.0%)	Accessible
58.	Typical animal cell	2(50.0%)	2(50.0%)	Accessible
59.	Euglena	2(50.0%)	2(50.0%)	Accessible
60.	Spirogyra	2(50.0%)	2(50.0%)	Accessible
61.	Paramecium	2(50.0%)	2(50.0%)	Accessible
62.	Amoeba	2(50.0%)	2(50.0%)	Accessible
63.	T.S of monocotyledonous stem	2(50.0%)	2(50.0%)	Accessible
64.	T.S of monocotyledonous root	2(50.0%)	2(50.0%)	Accessible
65.	T.S Dicotyledon stem	2(50.0%)	2(50.0%)	Accessible
66.	T.S Dicotyledon root	2(50.0%)	2(50.0%)	Accessible

S/N	ITEMS/EQUIPMENT	AVAILABLE F (%)	NOT AVAILABLE F (%)	REMARK
67.	T.S of leaf	2(50.0%)	2(50.0%)	Accessible
68.	Blood cells	2(50.0%)	2(50.0%)	Accessible
69.	Skeletal System	4(100.0%)	0(0.0%)	Accessible
70.	Muscular System	4(100.0%)	0(0.0%)	Accessible
71.	Brain and Nervous System	4(100.0%)	0(0.0%)	Accessible
72.	Circulatory System	4(100.0%)	0(0.0%)	Accessible
73.	Digestive system	4(100.0%)	0(0.0%)	Accessible
74.	Eye and Vision	4(100.0%)	0(0.0%)	Accessible
75.	Ear	4(100.0%)	0(0.0%)	Accessible
76.	Skin and Excretory Organs	4(100.0%)	0(0.0%)	Accessible
77.	Genetic Models	4(100.0%)	0(0.0%)	Accessible
78.	Stage micrometer	2(50.0%)	2(50.0%)	Accessible

Source: field survey, 2022

The table 4 above unfolds the level of accessibility of laboratory equipment/apparatus in colleges of education in Osun State. The laboratory equipment/apparatus that is 50% and above are tagged accessible, while the those between 0 - 49% are classified as equipment/apparatus that are not accessible based on the National Commission for Colleges of Education Minimum Standard for Nigeria Certificate in Education. From the figure 3 below, it can be inferred that 78.7% laboratory equipment/apparatus with the frequency of 42 are accessible for usage in the Colleges of Education in Osun State while 21.3% of laboratory resources with the frequency of 38 are not accessible for the practical classes. It was observed that most of the available instruments in the study area are accessible to Lecturers to facilitate their practical activities.

The materials accessible for practical activities in Colleges of Education in Osun State are Hand lenses, Microscopes, Balances, Hot Plates, Water Filter, Hygrometer, Drying Oven (30°C-120°C), Microtone, Herbarium Cabinet, Herbarium Index

Box, Insect Light Traps, Insect Box Traps, Binocular Microscopes, Class distiller, Water Bath, pH Meter, Tissue Grinder, Calorimeter, Soil Agar, Plant Press, Soil Treating Kit, Wooden Quadrats, Measuring Tape, Biological Kit/Dissecting Sets, Dissecting Boards/Plate stray, Bunsen Burner, Giant Gas Cylinder, Prepared and Plane microscope slides (Assorted), Consumables such as Glass wares, stains chemicals (Assorted), Test tube rack, Preserved plants and animals specimens (Assorted), Gloves, Safety device (assorted), General laboratories, Biological garden, Aquarium, Herbarium, Lecture Hall, Stock/preparation room, Typical plant cell, Typical animal cell, Euglena, Spirogyra, Paramecium, Amoeba, Transverse section of monocotyledonous stem, Transverse section of monocotyledonous root, Transverse section of leaf, Blood cells, Skeletal System, Muscular System, Brain and Nervous System, Circulatory System, Digestive system, Eye and Vision, Ear, Skin and Excretory Organs, Genetic Models, Stage micrometer

Table 5: Accessibility of Biology laboratory equipment in based on each school

Colleges of Education in the study area	Accessible Laboratory Resources F (%)	Non-accessible Laboratory Resources F (%)	Decision
School A	64(80.0)	19(23.8)	Accessible
School B	57(71.3)	23(28.9)	Accessible
School C	39(48.8)	42(52.5)	Not Accessible
School D	44(55)	36(45)	Accessible

Source: field survey, 2022

The total number of instruments per each school that were tagged accessible are counted and the percentage was also determined. However, the minimum Equipment and materials that are to be available ought to be accessible also for Biology practical activities in Colleges of Education as stated by the Nigeria Certificate in Education minimum standards, thus 58 instruments at least must be obtainable before the equipment can be tagged accessible. Therefore, any school with 50% and above were considered as those whose

Equipment are accessible to a reasonable degree, but those below 50% were regarded as inaccessible because they were not up to the minimum requirement. The results of the accessible equipment in each College of Education in the study area is discussed in the table 5. It could be deduced that the laboratory equipment/apparatus from three schools out of the four selected Colleges are accessible, while the other one is not.

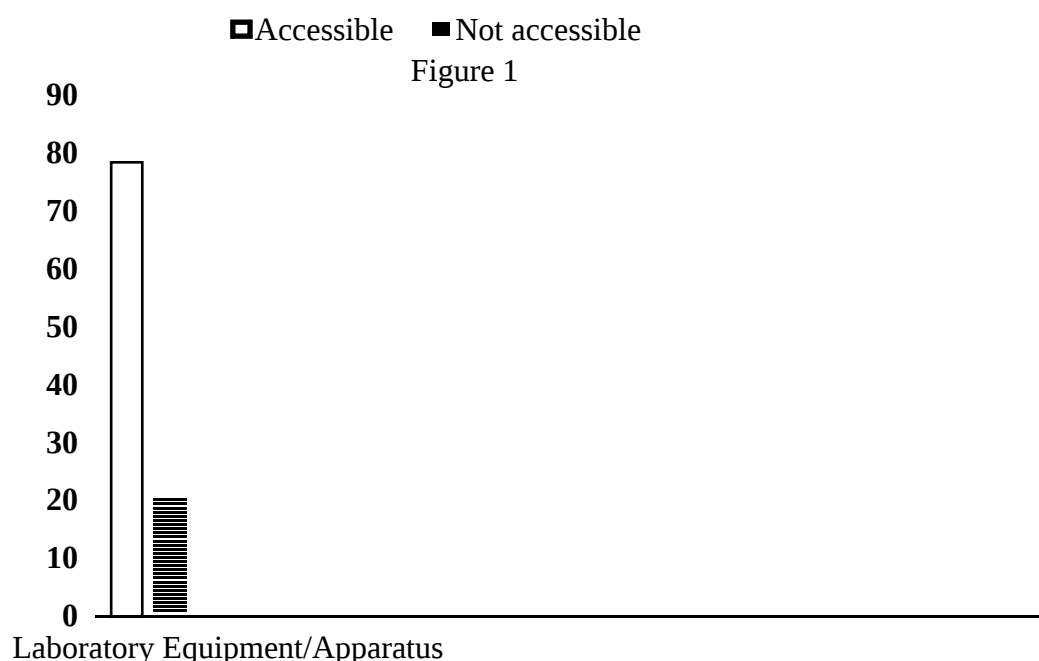


Figure 3 and 4: Accessibility of laboratory equipment/apparatus

The summary of the result of accessibility of laboratory equipment is revealed in figure 3 and 4. From the figures 3 and 4, it was deduced that the accessibility was high (78.7%). Thus, the equipment is said to be widely assessible (78.7%).

Discussion of Findings

The result on the availability of Biology laboratory equipment in colleges of education in Osun State showed that, most of the equipment needed to handle Biology practical classes in Colleges of Education in Osun State are available in most Colleges based on the requirement, except in one school. This is in accordance with Muhammad (2017), which says that the utilization of equipment in teaching is of importance as they help to arouse learners interest

and promote comprehension, though a lot of schools have poor resources and infrastructure in their laboratories and that, provisions of chemicals and reagents for tests are very low in schools.

It was also observed by the researcher that the public Colleges of Education are well equipped with laboratory equipment than the Private colleges, although equipment like Automatic Tissue Processor, Centrifuge, Air Pumps, Kymograph, Dissecting Microscopes, Steel Frame Aquaria, Oxygen Meter, Soil treating Kit, Chemicals (Assorted), Desiccators, Embedding Bath, Auxanometer (electric), and Museum are not available in the whole Colleges of Education (i.e. both public and privates) in the study area. The researcher as well noticed that some available reagents are expired in some of the Colleges (50% private and 50% public). It was

deduced that public and private Colleges of Education makes use of the available equipment in their Biology laboratory effectively. This means that Biology lecturers in colleges of Education in Osun State Engages their students in practical activities. This authenticated with the summation of Katcha and Wushishi (2015) that effective practical activities are subject to the level of furnishing of the laboratory building with pertinent instructional materials and the capacity of the teacher to adequately and productively use them.

The result also showed that the laboratory equipment in the study area are accessible in most of the Colleges, while those instrument are not accessible in one of the Colleges. However, there are some equipment/apparatus that are available but not accessible in some Colleges of education; this could be because certain equipment are locked up for accreditation sake and not being used for the practical classes such as Slide projector, Incubator/sterilizer, Photometer, and Overhead projector. On this note, repelling the students from the laboratory or keeping resources/reagents dependably in the cabinets until the point that the season of definite examination comes frequently prompt break, since students are not familiar with them and not used to dealing with them. Automatic Tissue Processor, Centrifuge, Air Pumps, Kymograph, Dissecting Microscopes, Steel Frame Aquaria, Oxygen Meter, Soil treating Kit, Chemicals (Assorted), Desiccators, Embedding Bath, Auxanometer (electric), and Museum are not accessible in Colleges of Education in the study area. Eventually, the accessible instruments are properly used by the biology lecturers in the study area. In line with Olajide, Adebisi and Tewogbade (2017), there should be orientation programmes through seminars, summits, conferences, workshops etc for teachers, government and ministry of education officials on the relevance of laboratory resources for effective teaching and learning in Nigeria schools.

Conclusion

The result of the study concluded that most Biology laboratory equipment are available and accessible in Colleges of Education in Osun State. Lecturers in both private and public Colleges in

the study area makes use of the available and accessible equipment for Biology practical activities. However, standard laboratories are lacking in private Colleges of education in the study area. The implication of this is that, there would be ineffective implementation of Biology Education Curriculum in the private colleges resulting in imbalance in implementing the curriculum.

Recommendations

It is however recommended that:

- Laboratory equipment should be provided in abundance for the schools in the study area especially the equipment such as Museum, Aquarium, Herbarium, etc which are not available. The equipment can also be improvised by Lecturers and Students.
- The laboratory equipment should be made accessible the more for both lecturers and students to improve the teaching and learning of Biology in Colleges.
- There should be training for the lecturers so that they can improve on their usage of improvised materials where the real materials are not available or available but not enough.
- Pre service teachers of Biology should be given adequate practical training to be able to effectively teach Basic Science in secondary schools, which will give the solid foundation to the students who will later go for science careers.
- More also, solid practical foundation should be laid for the pre service teachers of Biology so as to manifest the experience in the university when proceeding for their degree, and thereby becoming a better teacher of Biology even than their colleagues who did not have NCE background.
- Standard Biology laboratory should be built especially in private Colleges and adequate materials/reagents should be supplied to such institutions.

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