

## **EXAMINATION OF THE AVAILABILITY AND ADEQUACY OF BIOLOGY EDUCATION RESOURCES IN THE CURRICULA OF OPEN AND CONVENTIONAL UNIVERSITIES IN SOUTHWESTERN NIGERIA**

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### **ABSTRACT**

The study determined the availability and adequacy of laboratory resources used in implementing Biology Education Curricula (BEC) in Open and Conventional Universities. This was with a view to providing information about the gap in the implementation of BEC as well as determine the level of implementation of BEC in both University types. The study adopted descriptive survey research design. The population for the study comprised of all Biology Education lecturers and the departments that teach Biology Education courses in both University types in Southwestern Nigeria. All the three Federal Universities that offer Biology Education (except the newly established Federal University in Ekiti State) and the Open University Study Centres in the states where they are located were used for the study. The study sample included all Biology Education lecturers found in the selected schools. One research instrument was used for the study, namely: Biology Education Laboratory Equipment/Resources Observation Checklist (BELEROC). The instrument was validated by curriculum experts in the Faculty of Education in Obafemi Awolowo University and was judged reliable. A reliability of 0.82 for BELEROC was obtained for the instruments using Cronbach Alpha Co-efficient. The data collected were analyzed using the descriptive statistics of frequency and percentages. The results showed that 100% of the Open University Study centres do not have resources of their own but rely on the resources of the neighboring Conventional Universities which indicated that resources are unavailable or inadequate in the Open University Study centres. Results revealed that not all resources were available in the University with the least level of availability having 69.4% and that with the highest has 76% availability. It also revealed that not all the available resources are adequate in the Universities. It was revealed from the study that the Open University Study Centres have a low level of availability of facilitators (lecturers) while the lecturers of the Conventional Universities have a high level of content knowledge and year of experience but low level of pedagogical knowledge. The study also revealed that e learning (100%) is the major form of learning in the Open University Study Centres with a 0.0% usage of other instructional delivery strategies in some of the Study Centres while lecture method(OAU-100%,UI-70%,UNILAG-90%), inquiry method(OAU-90.0%,UI-70%, UNILAG-70%) are the most commonly used strategies in the Conventional Universities. The study concluded that resources are not completely available and most of the BEC lecturers do not have educational qualification to produce trained Biology teachers and this also has an effect on the instructional delivery strategies they use in the Conventional Universities. It also concluded that the Open Universities completely lack resources and quality facilitators to implement BEC which will produce a wide gap in its implementation as compared with Conventional Universities. It concluded that there is a need to integrate teaching strategies employed in both University types as well as make resources available for the Conventional and Open Universities in order to attain a balance in the quality of graduates produced.

## INTRODUCTION

Biology incorporates physical and social sciences. Through it, students can be helped to understand the natural communities of plants and animals which, during the centuries, have shaped their own region for its present human use. Students can moreover be made aware of the impact of man upon these natural communities, and the changes they cause. They will come to realize how the changes produced by man have affected other aspects of life such as his social and economic life. It helps to understand that man faces the task of building a new type of living community if he is to survive. In this community, while man remains the dominant organism, he must be able to make a place for many kinds of plants and animals to function in their proper relationships. He will understand the natural community, not merely as an outworn curiosity, but as in many respects the model for his own communities in the future. (Iyazwo, Idogho & Imonikhe . (2012). Biology is such a broad field covering the study of the minute work of cells to broad scale concepts of ecosystem and global climatic change. Biological studies go as far as studying the intimate details of human, the composition of our genes and even the functioning of our reproductive systems. Studies like the discovery of deoxyribonucleic acids (DNA) have helped in providing information about our more innate capacities as well as certain predisposition towards a form of behaviour and certain illnesses. Modern Biology is a vast and heterogeneous field composed of many branches and sub-disciplines. Biology is defined by the scale at which organisms are studied, the kinds of organisms studied and the methods used to study them. Magner (2002) opined that Biology recognizes that all organisms survive by consuming and transforming energy and by regulating their internal environment to maintain a stable and vital condition.

The importance of biology in our daily lives lies in the fact that biology attempts to find out the unifying principle that exists among diverse organisms having morphological and functional inequalities. The importance of Biology in our daily lives can be considered from the two natural divisions of the science itself; plant life and animal life. Biology has been of great importance as it has provided knowledge and information on agriculture, production of herbs, fertilizers and manure to improve plant growth, production of clothing and timber for making furniture, in supplied raw materials for paper, dyes, etc. Fossils are important in locating underground oil and natural gas reserves. Even coal and mineral oil formed from decomposed plant bodies are important to industrial prosperity. In animal Life, biology has helped in medical advancement. The study of dreaded diseases, their causative agents, cure as well as the actions of drugs are a way of biological enlightenment that strives minimizing human suffering. Biology has also helped in finding and curing hereditary abnormalities. Biology aims in making effort to better human race through eugenics. Biology study has a vital role in controlling environmental pollution and attracted sense of art and beauty. The importance of Biology has even permeated into technology as it is being applied in Biotechnology and DNA fingerprinting. Thus the importance of the study of Biology in schools cannot be overemphasized. In Nigeria, Biology is seen as an important science subject as revealed by its cardinal in the National Policy of education (NPE, 2004). The national policy on Education in the National curriculum for Senior Secondary Schools volume 3 science stated specific objectives to be achieved by each subject curriculum. The cardinal objectives for Biology include:

- (1) Adequate laboratory and field skills in Biology
- (2) Meaningful and relevant knowledge in Biology

- (3) Ability to apply scientific knowledge to everyday life in matters of personal and community health and agriculture; and
- (4) Reasonable and functional scientific attitudes.

The demand for University education has never waned. There has been increased demand for admission into higher education. There has also been an increased demand for working class individuals and Nigerians of all ages to improve their level of education. The remedy therefore seemed to be a type of education that will allow for a study-as-you-work, hence the launching of the National Open University of Nigeria (NOUN) on 22nd July, 1983 as a form for Open and Distant Education. After some years of its closure, the compelling reasons that informed the earlier establishment were still confronting the country that in 2002, the Open University Act of 1983 which had been suspended in 1984 was again resuscitated. Koul (2005) posited that Distance and Open Learning (DOL) educational systems are no longer a mere education in which the teacher and the learner are separated by distance. Teaching materials/aids and community resources are indispensable tools in the hand of the teacher in terms of facilitating students' learning and making teaching/learning process exciting, fun and related to community life styles. UNESCO (2000) stated that materials are important for the actualization of the curriculum.

Learning resources are important in Biology as they help the teacher in passing across the required knowledge and information in an easier and concrete manner to the students. Resources are also important in Biology as it is a concrete subject which deals with everyday life as compared to other science subject with some abstract contents. The importance of Learning resources and its inadequacy in Nigeria education system was emphasized by Olagunju and Abiona (2008) which was backed up by various researchers where they stated that: There are varieties of resources, which the science teacher can readily use to enrich learning. These resources are windvane, rain gauge, metre rule, models, charts and preserved specimens of plants and animals, culturing equipment, herbarium, terrarium, vivarium and microscope. The resources should be provided in quality and quantity in STM classroom for effective teaching-learning process. Adeyanju (2006) stated that learning and remembering effect may increase by 50% than ordinary lectures if resources and instructional materials are highly involved in teaching. He stated that materials are useful in presentation of facts and information. They guide the thinking in the area of transfer of learning. Ayeni and Oladipupo (2009) stated in a release of the Nigerian Educational Research and Development Council (NERDC) titled: "Perspectives of the Qualities in Nigerian Education during the Bagauda Seminar in 1980" that certain variables are essential before good performance can be attained in the school setting. These include:

- i. the creation of adequate physical facilities equipped with all necessary books and teaching aids for the implementation of assigned educational tasks and at appropriate levels.
- ii. the enrichment of learners home and school environment through the provision of well stocked libraries.
- iii. the establishment of guidance and counselling services for students in their intellectual, social and employment pursuits, backed up with remedial, compensatory and testing programmes.
- iv. the provision of extra-curricular and co-curricular activities stimulating life situation in playing learned societies, markets, journals, mass media, etc.
- v. the quality control of education through supervision, inspection, continuous assessment and evaluation of intellectual attainments.
- vi. the fiscal resources allocated to education.

Institutional facilities can be looked at from four perspectives;

- (a) agencies like the West African Examinations Council (WAEC), National Examinations Council (NECO), curriculum, syllabus scheme of work, lesson plan or note;
- (b) laboratory design and practical;
- (c) equipment, apparatus and textbooks;
- (d) instructional aids/media: which include audio aids, visual aids as well audio-visual aids.

However, Imogie (2010) believes that factors hindering the use of instructional resources in Biology include increase in students enrolment into science subjects, lack of skills and competency required for resources used, lack of funds, ignorance on proper use of resources and lack of resources. Lack of ideal resources for science teaching and learning in Nigerian schools has been a major issue of concern. It is a well known fact that the quality of education a student receives largely depends on the quality of teaching/learning resources provided. This was also buttressed by Ogunmade (2006) where he said that due to the fact that majority of schools lack the essential resources for imparting the knowledge of science concepts to students, many students learn little science, learning tends to be by rote and many students find science not interesting and boring. Ogunmade (2006) also made it known that the teacher student interactions in many science classrooms are not healthy because of lack of adequate resources. In most of our schools, there are no facilities for the teachers to demonstrate phenomena, let alone allow the students to have opportunities for finding out things for themselves. Human resources and work force determines the success or failure of the education enterprise. (Adeyemo, 2012).

Consequently, Effective implementation of Biology curriculum needs resources and support. At a time of economic recession such as that which presently exists in Nigeria, the shortage of financial and human resources create more difficulty for the implementation of Biology curriculum at all levels of education. It has been observed over the years that quality and quantity of teachers and their professionalism affected the effective implementation of Biology curriculum and the teachers produced over the years have fallen short of national expectations and needs of the society. Gidado (2001) agreed that quality and number of qualified teacher is another problem facing the implementation of curriculum. According to Okebukola (2009) factors that limit effective curriculum implementation in Nigeria include inadequate planning, syllabus overloading or unrealistic goals, insufficient teachers and lack of adequate resources. Others are lack of in-service training, lack of commitment from both government and teachers, and lack of adequate monitoring and evaluation in the educational system.

Otuka (2001) believed that familiarization with the working of schools in both settings will arm them to guide the students effectively rather than using old training techniques or untested theories on newly emerging problems. He therefore saw that the teacher is important. His belief was that a well-trained and motivated teacher will make the difference in coping with any new curriculum. This shows the importance of teachers in the implementation of the curriculum. The importance of teacher and teacher education have been clearly explained in the National Policy document which states that “no education can rise above the quality of the teacher (FRN,2013). Teachers are largely responsible for the translation and implementation of the curriculum. This stresses the importance of teachers in implementing Science (Biology) curriculum in schools hence the need to focus on Implementation of science (Biology) teachers’ education curriculum in the universities.

The National Policy on education( FGN,2013) also stated the responsibility of tertiary education as;

- a) To contribute to national Development through high level relevant man power training
- b) To develop and inculcate proper value for survival of individual and the society
- c) To develop intellectual capacity of individuals to understand and appreciate their local and external environment
- d) To acquire both physical and intellectual skillswhich will enable individuals to be self-reliant and useful members of the society
- e) To promote and encourage scholarship and community services.
- f) To forge and cement national unity; and
- g) To promote national and international understanding and interaction

Okebukola (2010) noted that by 1948, the colonial administration opened up the first University level institution in the country as a college of the University of London. University College, Ibadan was operated with the academic framework of the University of London including its quality assurance practices. To assure equivalence with London degrees, the delivery and evaluation methods at Ibadan were patterned largely after, and regulated by the University of London. After independence in 1960, Ibadan which later became University of Ibadan maintained the internal quality assurance culture that it imbibed from University of London. At independence in 1960, a handful of institutions including University of Ibadan and University of Nigeria, Nsukka with a total enrolment of less than 2000, made up the higher education system in Nigeria. By 2010, the number of universities had risen to 104 with a pooled student enrolment of about 1.5 million. The establishment of Higher Institutions was to train various crop of people. Nigeria now has a crop of well educated graduates despite the now popularly taunted falling standard. These crops of graduates are readily making contributions in all spheres of the country's development. Nigeria has witnessed a phenomenal growth in the number of Universities from 2 at independence in 1960, to 55 as at November 2004, to 73 in 2012 (Jaja 2013). This number has increased to 147 in 2015 with 46 Federal Universities, 40 state universities and 61 private universities. This number has sky rocketed through the increase in licence given to private universities in Nigeria. It is also worthy to note that some of these universities are specialized universities of agriculture, education and technology and an Open University that specializes in distance learning.

Ogunleye (1999) revealed that there is a high preference for University education in Nigeria. His study showed a high rate of increase in enrolment into the University from 1960-1990. He also revealed that there has been an increase in the number of students offering science subjects from about 9000 in 1981 to up to 40, 068 by 1992 which has also led to a number of increase in science student graduates.

**Table 1: Classification of Federal Universities**

Classification by Age	Locations	Enrolment size	Approved growth rate
1 <sup>st</sup> Generation	Ibadan,Lagos,Nsukka, Zaria, Ife,Benin	16,000-30,000	2.5%

2 <sup>nd</sup> Generation	Jos, Calabar, Kano, Maiduguri, Sokoto, Ilorin, Portharcourt	10000-16000	5%
3 <sup>rd</sup> Generation	Owerri, Akure, Minna, Bauchi, Yola, Abuja, Uyo, AkwaIbom, Minna	Below 10000	10%

Source: Munzali Jibril 1999

The distribution and rate of establishment of universities over the last three decades have created unrealistic aspiration for continued expansion which does not suit the available resources for institutions today. It has also created many problems in University education some of which include;

- i. The demand for University education has increased significantly such that it is far more in excess of available admission quota;
- ii. Poor quality of academic programmes offered;
- iii. Lack of teaching and research equipments;
- iv. Inadequate complement of academic staff;
- v. Overstretched facilities;
- vi. Congested, squalid learning conditions.

Conventional University system of education refers to the face to face mode of instructional delivery in University. It is the mode where the teachers (lecturers) and students are physically present in a classroom setting. Conventional University education last for a minimum of four years or three years for direct entry students. Direct entry students are those who have acquired a particular kind of degree but only want to further their education in getting higher degrees. These kinds of students start from the second year in the University. The Bachelors degree is the degree awarded in the University. For those in Biology education, the degree given is the Bachelor of Science in education (B.Sc.Ed.) or sometimes Bachelor of education (B.Ed.). In Southwestern federal universities in Nigeria, Biology Education degree programme is offered in three universities in this region. This course of study is found in science and technology education department (STE) in Obafemi Awolowo University and University of Lagos while it is found in the Teachers education department in University of Ibadan. These departments in the universities are responsible for training teachers for the teaching of biology in secondary schools. Ajelayemi (2002) explained that recent studies have shown that most of the University graduates in the last 15 years are incompetent as teachers and this affect teaching in secondary schools. He also emphasized that graduate teachers in secondary schools now are incompetent in the knowledge of subject matter (Biology), content as well as teaching and communication skills. They emphasized that the course given to train the student teachers (Biology) are more of theory than practical which as a result lacking in teaching skills acquisition through adequate teaching practice thus concluding that having a bachelor's degree in education does not necessarily make such 'qualified' teachers competent enough to teach at all level.

The National Open University Nigeria (NOUN) which was initially closed down in 1985 after its establishment in 1983 was resuscitated back in 2002 as government saw the need to provide an alternative educational system for those who do not have the privilege to attend Conventional

universities. The major form of educational transaction in this system of education is through the ICT in Nigeria. Kpolovie and Obilor (2014) stated that the idea of an Open University system for Nigeria, as a separate and distinct institution to be organized nation-wide was appropriately reflected in the 2004 National Policy on Education, which stated emphatically and unambiguously that maximum efforts will be made to enable those who can benefit from higher education to be given access to it.

Thus the goal of Open and Distance Education in Nigeria shall be to;

- i) provide more access to quality education and equity in educational opportunities
- ii) meet special needs of employers and employees by mounting special courses for employees at the workplace;
- iii) encourage internalization especially of tertiary education curricula;
- iv) ameliorate the effect of internal and external brain drain in tertiary institutions by utilising Nigerian experts as teachers regardless of their locations or places of work; and
- v) encourage life-long learning opportunities

The National policy on Education further stressed that in pursuant of these goals, the federal government shall;

- a) Ensure that programmes of open/distance education are equivalent in status to those offered by Conventional face-to-face mode of delivery in the appropriate tertiary institution
- b) encourage and regulate open/distance education practice in Nigeria;
- c) strengthen the existing coordinating agencies on open/distance education which shall
  - i. Advise the government on the development and practice of open/distance education.
  - ii. promote open/distance education nationwide in collaboration with federal, states/FCT and local Government Education Authorities.
  - iii. ensure the maintenance of standards for open/distance education programmes in various institutions.
  - iv. encourage tertiary institutional participation in open/distance education among other functions.

The Open University and Conventional universities have still not adequately catered for the lapses in the educational situation in the country. Science teacher education has been one of the major fields that have been affected by this menace. There has constantly been an increased demand for adequate science teacher education in Nigerian tertiary institutions that implement the core curriculum of the science education of which Biology education is a key part. It is clear that this need has not been adequately looked into as regards Biology Education but the extent to which it has defaulted is what is uncertain. Biology Education is a field of study in science education that is essential for a nation's scientific and technological development but it will require a wholesome approach for the much needed technological breakthrough to be achieved. This wholesome approach will include the curriculum content, teaching aids, teacher's knowledge base and experience to implement curriculum content without which the fulfillment of the curriculum goals remain a mirage.

Kpolovie and Obilor (2014) suggested provision of adequate power supply, stable internet facilities, provision of trained personnel, adequate funding, adequate delivery and provision of instructional materials will help NOUN achieve their objectives better.

Jimoh (2013) further highlighted the problem of Open University education in Nigeria to include;

- a) Poor funding

- b) Lack of power supply to adequately access the internet as at when due
- c) Lack of skills in designing course wares
- d) Poor ICT/ internet facility
- e) Poor knowledge of usage of internet as most students do not have the use of ICT incorporated into their secondary/ elementary school curriculum.

It was suggested that government should make efforts to subsidize the cost of education, provide adequate knowledge of the use of the internet and employment of adequate personnel, use of other forms of media such as radio, television etc. will help improve Open University education in Nigeria. Nnabuo, Worlu and Onyido (2013) posited that the availability of infrastructural facilities in NOUN was significant in the area of road network but poor in terms of availability of electricity supply, inadequate access to infrastructural technology as well as inadequate capacity to use the available technology. It was also posited that poor funding which has affected the availability of some physical facilities such as buildings, library and other equipments which without them effective implementation of NOUN programmes will be difficult. It is on this premise that this research is carried out to assess the adequacy and availability of resources of Biology Education curriculum in Open and Conventional universities.

### **Statement of the Research Problem**

The establishment of National Open University of Nigeria (NOUN) was premised on the fact that programmes and curricula in the University will be equivalent in content and quality to those offered by Conventional universities as stipulated in the National Universities Commission (NUC) Benchmarks. However due to post-graduation performance of products of both types of University, there have been doubts as to the extent to which resources necessary for the curricula implementation has been equivalent in the universities especially in Biology Education. It is therefore important to carry out a study to ascertain and compare the adequacy and availability of resources of Biology Education curriculum in Open and Conventional universities.

### **Research Question**

The following research question guided the study;

How available and adequate are the resources for Implementing Biology education curricula in Open and Conventional Universities in Southwestern Nigeria when compared to the NUC benchmark?

### **METHODOLOGY**

The study employed descriptive survey design. The data collected from the responses of the lecturers to the items of the study questionnaires and the researcher's observations were analysed and the result was used to generalize for the study population.

### **Population, Sample and Sampling Technique**

The population of the study comprised of all Biology Education lecturers in Southwestern Nigeria Universities and all the facilitators in the Open University Study Centres in the study area. All the



federal Universities offering Biology Education programme in Southwestern Nigeria (except the newly established Federal University in Oye, Ekiti state) and the study centres in the States where they are located were purposively selected for the study. Also, Biology Education departments and their respective cognitive departments in the selected Universities and Study Centres constituted the sample for the study.

### **Research Instruments**

The study made use of one instrument which is a checklist. The checklist include extract from the National University Commission Benchmark for Minimum Academic Standard (NUCBMAS). The NUCBMAS was used to determine the adequacy of the University Biology Education Curricula resources as compared with NUC standards. The NUCBMAS contains the course code, course title, course description, equipment and resources necessary and the instructional delivery strategies used for the implementation of BEC. The checklist was used to ascertain the availability and adequacy of resources and equipment approved by NUC for the award of Bachelor of Science Education (Biology) in the sampled Universities.

### **Biology Education Laboratory Equipment/ Resources Observation Checklist (BELEROC)**

This instrument was used to check the availability and adequacy of laboratory equipment/ resources that are available for Biology education students. The checklist consists of the list of resources/ equipment available and their adequate use. It was used to generate data for the study. Section A contains items indicating both human and non human resources that measures availability and adequacy of the facilities in line with NUC requirements. A two point likert scale of available and unavailable with a two point likert scale for adequate and not adequate was used to assess the degree of adequacy and availability of the resources. Section B consists of Laboratory equipment for BEC used in the various Universities in Southwestern Nigeria. The section comprised fifty-nine items that measures availability and adequacy of the resources in line with NUC requirements. The availability and adequacy of the resources were determined using the decision rule by Odike (2008), where he stated that a percentage of 60% and above in the response of the respondent to an item can be regarded as appropriate and relevant in taking decision in any task about a research.

### **Validation and Reliability of Instrument**

The research instruments were validated by curriculum evaluation specialists in the Department of Science and Technology Education and One Open University facilitator in the Faculty of Education, Obafemi Awolowo University Ile-Ife for both face and content validity. A reliability score of 0.64 for BELEROC using Cronbach Alpha coefficient.

### **Data Collection Procedure**

The instrument was administered by the researcher by visiting all the sampled Universities and Open University Study Centres to interact with the Head of Departments and Directors of the universities and Open University Study Centres respectively. Copies of Biology Education Laboratory/ Equipment resources Observation checklist, were administered by the researcher to

ascertain the correctness of the answers given. Permission was sought from the Head of Department and Laboratory attendants to gain access to their laboratories. The administration of the instrument lasted for three months between November 2015- January 2016. A month was devoted to each state to be able to effectively observe the implementation of their curricula. The observed situation about the implementation of Biology Education curricula in Open and Conventional Universities as a whole was scored and each score was used for the analysis of the data.

## Data Analysis

The data gathered were analyzed using frequency and percentages to answer the set research questions

## RESULTS

### Research Question 1: How available and adequate are the laboratory resources used in implementing Biology Education Curriculum in Open and Conventional Universities in Southwestern Nigeria?

The listed items provided in the NUC Benchmark for the resources needed to Implement BEC were for 40 students. This was then increased to the average of 60 students found in most universities and study centres using simple ratio. The number required as compared with the number available was used to test the adequacy of resources needed to implement BEC in the University types.

**Table 2: Availability and Adequacy of Laboratory Resources for Implementing BEC in Both University Types**

Universities	AVAILABILITY	ADEQUACY
University of Ibadan	38(76%)	26(65.8%)
University of Lagos	36(72%)	24(66.7%)
Obafemi Awolowo University, Ile-Ife	34(69.4%)	23(65.6%)
National Open University of Nigeria, Osogbo	33(67.3%)	25(75.8%)
National Open University of Nigeria, Ibadan	0(0.0%)	0(0.0%)
National Open University of Nigeria, Lagos	0(0.0%)	0(0.0%)

Source: Research Survey 2016

The findings of the study reveals that the Open University study centres in the study area do not have laboratory facilities or resources of their own but rely on the resources and facilities of neighbouring universities for their practical classes. It is found that National Open University of Nigeria (NOUN), Ibadan study centre relies on the laboratory in the University of Ibadan, NOUN, Lagos study centre relies on the laboratory in the University of Lagos while NOUN, Osogbo study centre relies on Fountain University and Osun State University, Osogbo for their practical classes. It was further revealed that 76% of the resources for teaching Biology were available in University of Ibadan, 72% were available in University of Lagos and 69.4% were available in Obafemi Awolowo University, Ile-Ife. In validating the adequacy of the learning resources for teaching Biology, it was observed that 65.8% of the available 76% in University of Ibadan is adequate,

66.7% of the available 72% in University of Lagos is adequate and 65.6% of the available 69.4% is adequate in Obafemi Awolowo University, Ile-Ife.

Furthermore, the study revealed that the three selected Conventional universities in the study area have resources available for teaching Biology Education Curriculum but the adequacy and availability of the resources are not completely in line with the NUC Benchmark while the Open University study centres do not have their own resources available for teaching BEC but relies on those of the Conventional Universities which in themselves are not completely available and adequate.

**Table 3: List of Resources**

S/N	Resources/Equipment	NUC Standard	Number Found	Adequacy	
				Ad	NAd
1	Hand lenses	40			
2	Microscope	20			
3	Incubator/ Sterilizer	1			
4	Autoclave(portable	3			
5	Balances	1			
6	Hot Plate	1			
7	Refrigerator	1			
8	Water Filter	1			
9	Hygrometer	1			
10	Drying Oven (30°C-120°C)	1			
11	Microtone/Stage micrometer	1			
12	Automatic tissue processor	1			
14	Centrifuge	1			
15	Herbarium Cabinet	9			
16	Herbanium index Boxes	2			
17	Air pumps	6			
18	Photometer	2			
19	Kymograph	10			
20	Dissecting Microscopes	2			
21	Insect Light Traps	1			
22	Insect Box Traps	1			
23	Slide Projectors	1			
24	Overhead Projectors	2			
25	Steel FrameAquaria	1			

26	Oxygen meter	1			
27	Binoculars Microscopes	4			
28	Embedding Bath	5			
29	Class distiller	1			
30	Water Bath	1			
31	pH meter	2			
32	Tissue grinder	4			
33	Calorimeter	6			
34	Auxanometer	4			
35	Soil Agar	2			
36	Plant press	2			
37	Soil Treating kit	1			
38	Wooden Quadrants	10			
39	Measuring tapes	5			
40	Biological kit/dissecting sets	10			
41	Dissecting board	40			
42	Bunsen burner	20			
43	Giant Gas cylinder	2			
44	Prepared/plane microscope slide				
45	Glasswares, stains, chemicals				
46	Test tube rack	10			
47	Preserved plant/ animal specimen				
48	Desiccator	3			
49	Gloves				
50	Safety devices				

## MODELS AND CHARTS

S/N	Resources	(Av)	(NAv)	(Ad)	(NAd)
51	Skeletal system(1)				
52	Muscular system(1)				
53	Brain/ nervous system(1)				
54	Circulatory system(1)				
55	Digestive system(1)				

56	Eye and Vision				
57	Ear				
58	Skin and Excretory				
59	Genetic Modes				

Key: Availability(A = Available, NA = Not Available); Adequate (A = Very Adequate, NA = Not Adequate)

**TABLE 4: List of Unavailable and Inadequate Resources**

Universities	Not Available (Item Number)	Not Adequate (Item Number)
University of Ibadan	11,12,16,17,28,32,34,35,36,37,40,47	1,2,8,9,19,20,29,31,43,35,36,46
University of Lagos	9,11,12,16,18,19,25,26,28,32,33,34	1,2,4,15,27,28,31,34,35,41,42
Obafemi Awolowo University	8,9,11,12,16,17,18,19,21,26,32,33,34,40,43	1,2,4,5,8,9,15,17,20,28,29,

Source: Research Survey 2016 (See Table 3 for names of items)

Based on the NUC Benchmark, it is observed that items 11, 12, 16, 17, 28, 32, 34, 35, 36, 37, 40 and 47 (See Appendix I) are not available in University of Ibadan (which is shared with NOUN Ibadan) while items 1, 2, 8, 9, 19, 20, 29, 31, 43, 46 (See Table 3) are not adequate. In University of Lagos (which is shared with NOUN Lagos), items 9, 11, 12, 16, 18, 19, 25, 26, 28, 32, 33, 34 (See Table 3) are not available while item 8, 9, 11, 12, 16, 17, 18, 19, 21, 26, 32, 33, 34, 40 and 43 (See Appendix I) in Obafemi Awolowo University, Ile-Ife are not available. Concerning the availability and adequacy of the learning resources used by NOUN Oshogbo (which shares the resources of Fountain University, Osogbo), it is discovered that items 9, 12, 17, 19, 20, 21, 22, 25, 26, 28, 29, 32, 34, 37, 45, 48 (See Table 3) are not available and of the available items, items 1, 15, 16, 18, 24, 33, 35 and 42 (See Table 3) were not adequate.

These revealed that there was a moderate level of availability of the resources/equipment needed for implementing BEC in the Conventional universities (O.A.U. – 69.4%, U.I. - 76%, UNILAG - 72%) while the resources shared by NOUN Oshogbo (67.3%) is also moderately available and the study centres in NOUN Ibadan and NOUN Lagos do not have resources of their own but share resources with UI and UNILAG respectively. Also, the available resources are moderately adequate as revealed by the findings of the study.

**Table 5: Availability and Adequacy for Charts and Models for Teaching BEC in Both University Types**

Universities	AVAILABILITY	ADEQUACY
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University of Ibadan	6(66.7%)	4(67.7%)
University of Lagos	7(77.8%)	7(100%)
Obafemi Awolowo University, Ile-Ife	6(66.7%)	3(50%)
National Open University, Osogbo study centre	0(0.0%)	0(0.0%)

Source: Research Survey 2016

Accessing the charts and models for teaching Biology Education in the study area, it is seen that charts and models were available for teaching Biology Education in University of Ibadan (66.7%), University of Lagos (77.8%), Obafemi Awolowo University (66.7%) and NOUN Osogbo (0.00%) while 67.7%, 100%, 50%, 0.0% of the whole in University of Ibadan, University of Lagos, Obafemi Awolowo University and NOUN Osogbo respectively are adequate for teaching Biology Education in the study area. Also, it is observed that items 52, 53 and 59 are not available in University of Ibadan while items 52 and 53 are not available in University of Lagos. It can therefore be said that all the charts and models available for teaching Biology Education are adequate. By using the decision rule at 60% for availability and adequacy, it can be said that the laboratory resources used in BEC implementation has an acceptable level of availability and adequacy in the conventional universities but are not available in the Open University Study centres at all.

## DISCUSSION OF FINDINGS

In accessing the Instructional resources for teaching Biology Education Curricula (BEC) in both University types, it was discovered that the Open University study centres do not have laboratory facilities of their own but rely on the resources and facilities of nearby Conventional universities for their practicals. This is not good enough for science education as each institution is expected to have its own resources and facilities for teaching BEC. However, on observing the resources of the Conventional universities in the study area, it was observed that the Biology Education department has most of the resources in the cognate departments (Botany and Zoology) as the students offer most of their courses in these departments. It was also observed that all the Conventional universities do not have all the needed resources for implementing BEC but they have a high percentage of the resources needed (OAU-69.4%, UI-76% , UNILAG-72%). Further assessment of the available resources reveals that the available resources are not completely adequate; 65.6%, 65.8% and 67.9% of the laboratory resources in OAU, UI and UNILAG respectively are adjudged to be adequate but by the use of decision rule, the laboratory resources are accepted to be available and adequate. It was discovered in the Conventional Universities that Microstone/Stage micrometer, automatic Tissue Processor, Herbarium Index Boxes, Air Pumps, Photometer, Kymographs, Oxygen Meter, Tissue grinder, Calorimeter and Auxanometer are the most commonly unavailable laboratory resources. Most of the conventional Universities do not have these resources in their laboratories. This could be due to reasons such as lack of funds or expertise in operating these resources by the laboratory assistants. These listed resources were could be expensive or need technical knowhow to be able to use them effectively. When the available resources were checked, it was discovered that Hand Lenses, Microscope, Autoclave, Water filter, Hygrometer, Dissecting Microscope, Glass distiller and PH meter were mostly available but not adequate in the conventional universities. This was because the number of students taking the practical classes was more than the available equipment/resources in the laboratory. However, some resources were inadequate because they were bad and not fit for use

by the students; some were obsolete and did not fit into the modern day use. Examples of resources which were small in number as compared to the number of students include the hand lenses, water filter and Dissecting microscope. Equipments such as Ph meter, microscope, hygrometer and glass distiller were obsolete. These would in turn have an effect on the effective use of resources in the laboratory. This is in accordance with Imogie (2010) who believed that factors hindering the use of instructional resources in Biology include increase in student enrolment into science subjects, lack of skills and competency required for resources used, lack of funds, ignorance on proper use of resources and lack of resources. This could be seen as the reason for the disparity for the difference in the quality of education from both University types as the Open University study centre have had to rely on the laboratory resources of the Conventional universities irrespective of the number of students required to undertake practical as compared to the number of resources available in the schools. The findings of the study has shown that the Conventional universities do not have adequate resources of their own which implies that this factor will play a great part in affecting the Biology Education Curriculum Implementation in the Conventional universities also. Ogunmade (2006) stated that majority of the schools lack essential resources for imparting the knowledge of science concepts to students, many students learn little science, or learn majorly by rote memorization and makes science learning in classroom unhealthy and boring because of lack of resources.

### **The Implication of the Findings**

The implication of this in the study is that, concepts meant to be taught in the Conventional universities with the resources that are inadequate will cause the syndrome of classroom boredom or unhealthiness causing weak laboratory practical as pointed out by Okebukola (2008). It has therefore been affecting the quality of Biology Education teachers (graduates) produced by both University types and this could be worse off in the Open University without resources and with no consideration for adequacy for the number of students when they have to use those of the Conventional Universities. Nnabuo et.al (2013) however posited that poor funding has been responsible for the inadequate resources in the Open University study centres in Nigeria.

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