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CALL FOR PAPERS
INTERNATIONAL JOURNAL OF CONTEMPORARY ISSUES IN INTEGRATED SCIENCE EDUCATION (IJCIISE)

NOTE TO CONTRIBUTOR

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1. have a strong introduction that clearly states the organizing points of the study, acquaints the readers to what is ahead, and makes a direct link between theory, questions and research design
2. have focused literature review that clearly establishes why the topic/problem warrants discussion
3. be prepared according to the style prescribed by the 6th or 7th edition of publication manual of American Psychological Association.

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* Footnotes are not allowed.
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EDITORIAL

Dear Readers,

We are excited to announce the launch of International Journal of Contemporary Issues in Integrated Science Education (IJCIISE). This Association Integrated Science Educators' Association of Nigeria (ISEAN) play a vital role in promoting scientific advancement, supporting science education, informing science policy, recognizing science excellence and fostering community engagement. The desire to float this journal was borne out of the passion to organize a yearly conference of Integrated Science by the Integrated Science Educators' Association of Nigeria, of which selected scholarly articles will be published after a thorough review. The journal dedicated to advancing knowledge and fostering dialogue within. Our mission is to publish high-quality research, innovative ideas, and critical analyses that contribute to the understanding and development of Integrated Science. At IJCIISE, we believe in the power of interdisciplinary collaboration and inclusivity. We welcome contributions from scholars, practitioners, and thought leaders worldwide, providing a space for diverse perspectives and groundbreaking work. As we embark on this journey, we invite you to submit your research, engage with our content, and join us in creating a vibrant academic community. Together, we can push the boundaries of knowledge and inspire future generations. Thank you for your support as we launch this exciting new endeavour.

This edition moves around issues that border on **"Enhancing Quality Assurance in Integrated Science in Nigeria."** It is believed that diverse contributions from scholars and researchers expressed in this edition will provoke the understanding of issues that could foster education for societal transformations on a global scale
We look forward to your contributions!

For further information on future conference activities, visit **http://ijciise.org/index.php/ijciise**

Warm regards,
Professor O. S. Agboola
President, Integrated Science Educators' Association of Nigeria (ISEAN)

TABLE OF CONTENTS

INVESTIGATION OF AVAILABILITY AND USABILITY OF LABORATORY RESOURCES IN THE TEACHING OF BIOLOGY IN SENIOR SECONDARY SCHOOLS IN LAGOS STATE

Aminat Adenike OLAYIWOLA
E-mail: aminatolayiiwola@gmail.com
Phone Number: +2348060352040

Adebusola Oluseyi MOKANJUOLA
Biology Department,
Federal College of Education, Iwo
E-mail: oluseyiadebusolaa@gmail.com
Phone Number: +2347039403494

&

Toluwalope Damilola ADEDIRAN
Integrated Science,
Federal College of Education, Iwo
E-mail: adedirantd@fceiwo.edu.ng
Phone Number: +2347030124038

Abstract
The study investigated the availability and usability of Biology laboratory resources in senior secondary school in Lagos State. The study adopted descriptive survey research design. The population for the study comprised of all Biology teachers in senior secondary schools in Lagos State. The study adopted a multistage sampling procedure in selecting sample for the study. One senatorial district was selected from the state using simple random sampling technique and one local government area was selected from the state using simple random sampling technique. Twenty (20) senior secondary schools in the local government were carefully selected using simple random sampling technique. From each selected school, one Biology teacher was selected using simple sampling technique. One research instrument titled "Availability and Utilization of Laboratory Resources" (AULR) was used for the data collection. The data collected were analysed using frequency and percentage. The result showed that 75.0% of the teachers affirmed that laboratory resources were readily available in the school in the study area. Furthermore, the result showed that 65.0% of the available laboratory resources were frequently used, 20.0% of the available laboratory resources were fairly used while 15.0%of the available laboratory resources were not used. Lastly, the result showed that there were challenges associated with the utilization of Biology laboratory resources in senior secondary schools in the study area with cluster mean of 2.59 that was found to be above the criterion mean of 2.50. It is recommended that laboratory resources

should be readily made available for the teaching of Biology in senior secondary schools by the government and also for privately owned secondary schools.
Keywords: Biology, Resources, Availability, Usability, Laboratory

Introduction

Despite the importance of science education to national development, Nigeria lacks sustainable science education since its independence and as a result, science education has not been able to move the country into industrialization and above poverty level. Science is the study of the nature and behaviour of natural things and the knowledge gained about them, this can be done through observation, experimentation and testing theories of evidence that is obtained. It involves regular hands-on practical work for learners to develop scientific literacy to face global challenges. Science is very important in the development of any nation. Aleyideino (2000) opined that sound science education is accepted worldwide as bedrock of human development and progress, and also maintained that no educational system can rise above the quality of its teachers, and no nation can rise above the level of its teaching staff. This means that science plays an important role in the development of the nation as a whole so also the teaching of science. All over the world, most advancement that contributes greatly to a nation's growth is mostly scientific in nature. Science is a very interesting course of study as it involves both theoretical and practical knowledge.

However, Nnaboua and Asodike (2014) described education as a process by which human beings and societies reach their fullest potential. Science education is the field concerned with sharing scientific knowledge, and methods with people not traditionally considered part of the scientific community. Science education should be able to transform the typical teacher centered classroom lecture into a discovery and problem-solving arena. Science education may be defined as the study of the inter-relationship between science as a discipline and the application of educational principles to its understanding, teaching and learning. It therefore means that science education involves the study of some science in- depth and in addition, educational disciplines that relate specially to how scientific knowledge and concepts are learnt and verified; how scientific concepts are programmed for understanding and how science curricula can be meaningfully evaluated. Science education is an applied field which derives its authenticity from the fact that science as a field of endeavour is fundamental to human survival and hence must be seen as the right of every individual to learn. Science education is the bedrock upon which scientific and technological development depend. It is believed by most educators that the giant strides made by developed countries all over the world like Japan, United States of America, China, Great Britain can be attributed to the type of science education available in these developed countries.

Furthermore, Owolabi and Adedayo (2012) stated that despite efforts by the Nigerian government in the pursuance of development in science and technology, the result has been both unsatisfactory and discouraging. According to Momeke (2007),

science education has failed to produce skilled human resources needed for transformation into national prosperity. The development in science and technology is poor and contributes immensely to the state of under development in Nigeria. Therefore, there is a need to redress and bring about a worthwhile growth in science education. Biology, Chemistry, Physics and Mathematics are the subjects at senior secondary level meant to bring about the basic development needed in science and technology. The effective teaching and learning of these subjects are crucial issues of consideration for all round science and technological development.

Biology is a natural science that can be studied both indoors and outdoors. Advanced Biology is very broad with various disciplines such as; Biochemistry, Biophysics, Cell Biology (Cytology), Histology, Aquaculture, Zoology, Botany, Anatomy, Genetics, Biotechnology, Ecology amongst others. There is a large number of sub-disciplines of field in biology numbering up to 60 and more. Some of these fields are new like synthetic biology and some have been around for hundreds of years such as botany and zoology. With such a broad scope attached to biology as a field of study, students that seek to pursue a field in one of the many diverse arms of biology needs to have an accurate understanding of biology. This must be achieved by the teachers which are responsible for facilitating knowledge and ensuring that students have that accurate knowledge needed to go forward in life. Ogunkola and Olatoye (2004) said that enhancing better understanding of products and process of science cannot be overemphasized and also added that the practical nature of biology is commonly regarded as an important source of pupils' motivation. Resources or facilities according to Abbah (2020) referred to facilities that can be used to enhance or improve educational programmes and promote teaching and learning.

Biology is generally defined as the study of all living things. It is the study of the structure, function, heredity, and evolution of all living things-microorganisms, fungi, plants, and animals. Osuafor and Okonkwo (2013) defined Biology as the science of life and plays a very vital role in the life of every human being, they also mentioned the fact that biology is closely related with other science subjects like agricultural science, chemistry, geography, mathematics and physics and finds application in many specialized areas like medicine, pharmacy, food production and processing industries, biotechnology, genetic engineering, agriculture and horticulture, environmental protection, tourism industry (biological gardens) and so on. Biology is usually regarded as the simplest to understand among all other science subjects since it is direct and easily relatable to nature. Adewale, Nzewuihe and Ogunshola (2016)stated that Biology has a large student enrolment than any other science subject especially at the upper basic level of the Nigerian education. Ong'amo, Ondigi and Omariba (2017) concluded that availability of text books, laboratory apparatus and other learning resources contribute significantly to the performance ofstudents in Biology examination and also that, students with positive attitude towards the subject register better performance than those who had a negative attitude.

Results released by WAEC in Biology have consistently indicated that

schools that are well equipped in term of science laboratories, textbooks and qualified teachers tend to produce better results while poorly equipped schools perform poorly (Otami, Ampiah & Anthony-Krueger, 2012). Considering the fact that Biology has many fields of study and vast applications many fields of human life, its importance in a Nation's economic development cannot be over-emphasized. It then becomes very necessary that there are lasting solutions to these problems that seems to affect student's performance and interest in biology. In light of this, several factors have been identified by researchers as being responsible for the persistent poor performance recorded in biology especially at Senior Secondary Certificate Examinations. Some of these include lack of teachers, lack of educational facilities like laboratories, overloaded syllabuses, laziness, poor attitude and lack of interest on the part of the students, poor teaching methods by teachers, large class size, family background of the students, age amongst many others.

Furthermore, Amore, Amore and Adesina (2024) argued that "parents' education has the highest significant influence on the academic achievement of students" (p 120). And this is because students with parents that have a well-educated background have easier access to instruments that enhance education because the parents tend to value education and emphasize the need for education unlike students whose parents are not learned. Suman (2011) also concluded that education and occupation of parents positively influence the academic achievement of children in his research on influence of parents' education and parental occupation on academic achievement of students. Another highlighted problem or obstacle that affect the overall performance and interest of students in biology and all other science subjects is the lack of educational facilities like a standard laboratory and appropriate laboratory resources. Laboratory has been described as a room or a building specially built for teaching by demonstration of theoretical phenomenon into practical terms. For students, it is also a place where theory becomes practical and real, students are able to observe, learn and also carry out experiments. Laboratory activities may also contribute greatly to students' interest and attitude towards the subject of study. There is a talisman in science education which states Ï heard and I forgot; I saw and I remembered; I did and I understood." From this, we can see that true result is achieved from science education when there is a doing and a seeing. So, interest can be born in the hearts of learners by doing and seeing in the laboratory. When students see things that are fascinating them in the lab, it creates a memory in their head and they can relate it to life and when they are actively involved and they carried out activities it is committed to their memory and it becomes ingrained into their memory and it becomes a part of them. This is the result that every lesson should achieve.

Ernest (2010) stated that demonstration method as the most effective in learning science subjects. He reported that, students performed better results and teachers were encouraged to use more of demonstration method while learning some selected concepts in science. During these laboratory periods, the students learn by doing and obtain permanent knowledge. The students are active throughout the class and they are learning on their own by doing, and it's easier for teacher to identify

students that are faltering as it will be obvious since all students will be busy with their task. There are however limitations when the school has no well-equipped laboratory or when the teacher is under qualified and has no teaching experience whatsoever, especially one that is not educated in the field of education. Also, at intervals, there has to be a restock and supply of some of these laboratory resources. Science laboratory resources/facilities can be human or material. The human resources here, refers to the teachers, or laboratory attendants or basically anybody that is implicated in the disseminating of instructions in the laboratory.

The laboratory has been identified as the heart of a good scientific programme which allows students in schools to have experience which are consistent with the goals of scientific literacy. Biology constitutes of a major part of practical and if not taught properly, the education of the students will be affected negatively, resulting in poor performance, low quality of understanding of subject matter and this brings low half-baked students in science subjects which more leads to imaginative perception of students that science subjects are difficult to attain. When students are taught Biology theoretically without the practical aspects inculcated and done in the laboratory, the topic taught remains abstract to the students and they cannot see the significance in real life resulting in students not learning properly as they ought to. It appears that there is dearth literature on the availability and utilization of laboratory facilities in Biology in senior secondary school in Ifako-Ijaiye local government area of Lagos State. The implication of this means that the role of the laboratory and its facilities on academic achievement of students in science subjects is ignored. This study therefore seeks to study the availability and utilization of laboratory resources in Ifako-Ijaiye, Lagos, Nigeria.

Objectives of the Study

Three objectives were raised for the study.

i. assess the availability of laboratory resources in the teaching of biology in Lagos State;
ii. examine the extent of utilization of laboratory resources in the teaching of biology in the study area; and
iii. determine the challenges associated with the utilization of teaching resources in the study area.

Research Questions

Three research questions were raised to guide the study:

1. What are the available Biology laboratory resources in senior secondary schools in Lagos State?
2. How often do teachers utilize the available teaching resources in teaching Biology in the study area?
3. What are the challenges associated with the utilization of teaching resources in the study area?

Methodology

This research was carried out using survey research method. The population for this study comprises of Biology teachers in senior secondary schools found in Lagos State. This study adopted a multistage sampling procedure in selecting sample for the study. One senatorial district was selected from the state using simple random sampling technique and one local government area was selected from the state using simple random sampling technique. Twenty (20) senior secondary schools in the local government were carefully selected using simple random sampling technique. From each selected school, one Biology teacher was selected using simple random sampling technique. One research instrument was used for the data collection and it was titled "Availability and Utilization of Laboratory Resources" (AULR). It was used to the assessed the availability and utilization of laboratory resources and the challenges associated with the use of these resources. Validation of the instrument was carried out by expert in Test and Measurement. They read through the response instrument and the suitability of the response was ascertained. Based on their assessments and suggestions, corrections were made onthe instrument which was used in order to provide evidence to support the interpretation of the analyzed data. The Pilot study was carried out to ascertain the reliability of the instrument. Biology teachers were selected outside the scope of the study. The instrument was administered on them and retrieved back. Cronbach Alpha was used to calculate the reliability coefficient of the instrument and it was found to be 0.87. This made the instrument to be reliable for the study. The data collected was analysed using descriptive statistics of frequency count, simple percentage, mean and standard deviation.

Results

Research Question One: What are the available Biology laboratory resources in senior secondary schools in Lagos State?

Table 1
Descriptive analysis of available laboratory resources for the teaching of Biology in senior secondary schools in Lagos State

Items	Available f (%)	Non-Available f (%)
Laboratory Space	18(90.0)	2(10.0)
Stools	16(80.0)	4(20.0)
Iodine Solution	17(85.0)	3(15.0)
Agar	9(45.0)	11(55.0)
Benedict Solution	17(85.0)	3(15.0)
Common Salt	17(85.0)	3(15.0)
Yeast	10(50.0)	10(50.0)
Formaldehyde	16(80.0)	4(20.0)
Reducing Sugars	16(80.0)	4(20.0)

Items	Available f (%)	Non-Available f (%)
Microscope	16(80.0)	4(20.0)
Petri Dishes	17(85.0)	3(15.0)
Bunsen burner	17(85.0)	3(15.0)
Basins	17(85.0)	3(15.0)
Dissecting Kit and Board	15(75.0)	5(25.0)
Tripod Stand	14(70.0)	6(30.0)
Hand lens	16(80.0)	4(20.0)
Glass Slide and Cover	17(85.0)	3(15.0)
Safety Apparatus	13(65.0)	7(35.0)
Test Tube	17(85.0)	3(15.0)
Test Tube Rack	17(85.0)	3(15.0)
Electronic Balance	12(60.0)	8(40.0)
Forceps	16(80.0)	4(20.0)
Conical Flask	16(80.0)	4(20.0)
Beakers	17(85.0)	3(15.0)
Evaporation Dish	13(65.0)	7(35.0)
Funnel	16(80.0)	4(20.0)
Droppers	17(85.0)	3(15.0)
Spatula	17(85.0)	3(15.0)
Thermometer	16(80.0)	4(20.0)
Litmus Paper	16(80.0)	4(20.0)
Filter Paper	16(80.0)	4(20.0)
Magnifying Glass	17(85.0)	3(15.0)
Centrifuge Machine	5(25.0)	15(75.0)
Wash Bottles	16(80.0)	4(20.0)
Skeletons	16(80.0)	4(20.0)
Models	13(65.0)	7(35.0)
Average	**15(75.0)**	**5(25.0)**

Table 1 presents the available laboratory resources for the teaching of Biology in Senior Secondary Schools in Ifako-Ijaye. The result showed that 90.0%of teachers in the school affirmed that laboratory space is readily available; 80.0% of the teachers in the schools affirmed the availability of Stools, Formaldehyde, Reducing Sugars, Microscope, Hand lens, Forceps, Conical Flask, Funnel, Thermometer, Litmus Paper, Filter Paper, Wash Bottles and Skeletons; 85.0%of the teachers in the school affirmed that Iodine Solution, Benedict Solution, Common Salt, Petri Dishes, Bunsen burner, Basins, Glass Slide and Cover, Test Tube, Test Tube Rack, Beakers, Droppers, Spatula and Magnifying Glass were available; 75.0%of the teachers in the school affirmed that Dissecting Kit and Board was available; 70.0% of the teachers in the school affirmed that Tripod Stand was available;65.0% of the teachers in the school affirmed that Safety Apparatus, Evaporating Dish and Models were available; 60.0% of the teachers in the school affirmed that Electronic Balance was available

and 25.0% of the teachers in the school affirmed that Centrifuge Machine was available. The result showed that 75.0% of the teachers in the school affirmed that laboratory resources were readily available while 25.0% of the teachers in the school were in different about the availability of laboratory resources in the study area.

Research Question Two: How often do teachers utilize the available teaching resources in teaching Biology in the study area?

Table 2
Descriptive analysis of utilization of laboratory resources for the teaching of Biology in senior secondary schools in Lagos State

Items	Frequently Used f (%)	Rarely Used f (%)	Not Used f (%)
A Laboratory Space	18(90.0)	1(5.0)	1(5.0)
Stools	14(70.0)	4(20.0)	2(10.0)
Iodine Solution	16(80.0)	3(15.0)	1(5.0)
Agar	4(20.0)	5(25.0)	11(55.0)
Benedict Solution	15(75.0)	3(15.0)	2(10.0)
Common Salt	16(80.0)	3 (15.0)	1(5.0)
Yeast	5(25.0)	5(25.0)	10(50.0)
Formaldehyde	4(20.0)	8(40.0)	8(40.0)
Reducing Sugars	14(70.0)	4(20.0)	2(10.0)
Microscope	15(75.0)	4(20.0)	4(20.0)
Petri Dishes	16(80.0)	3(15.0)	1(5.0)
Bunsen burner	16(80.0)	3(15.0)	1(5.0)
Basins	16(80.0)	3(15.0)	1(5.0)
Dissecting Kit and Board	10(50.0)	5(25.0)	5(25.0)
Tripod Stand	14(70.0)	2(10.0)	4(20.0)
Microscope	8(40.0)	8(40.0)	4(20,0)
Glass Slide and Cover	15(75.0)	3(15.0)	2(0.0)
Safety Apparatus	13(65.0)	3(15.0)	4(20.0)
Test Tube	17(85.0)	2(10.0)	1(5.0)
Test Tube Rack	17(85.0)	2(10.0)	1(5.0)
Electronic Balance	6(30.0)	8(40.0)	6(30.0)
Forceps	16(80.0)	2(10.0)	2(10.0)
Conical Flask	14(70.0)	4(20.0)	1(5.0)
Beakers	17(85.0)	2(10.0)	1(5.0)
Evaporation Dish	13(65.0)	5(25.0)	2(10.0)
Funnel	16(80.0)	2(10.0)	2(10.0)
Droppers	15(75.0)	3(15.0)	2(10.0)
Spatula	15(75.0)	3(15.0)	2(10.0)
Thermometer	16(80.0)	2(10.0)	2(10.0)

Items	Frequently Used f (%)	Rarely Used f (%)	Not Used f (%)
Litmus Paper	14(70.0)	4(20.0)	2(10.0)
Filter Paper	16(80.0)	3(15.0)	1(5.0)
Magnifying Glass	10(50.0)	3(15.0)	1(5.0)
Centrifuge Machine	2(10.0)	3(15.0)	15(75.0)
Wash Bottles	15(75.0)	4(20.0)	1(5.0)
Skeletons	16(80.0)	4(20.0)	0(0.0)
Models	13(65.0)	4(20.0)	2(10.0)
Average	13(65.0)	4(20.0)	3(15.0)

Result in Table 2 showed that 90.0% of the schools have Laboratory Space, 5.0% of the schools rarely have Laboratory Space while 5.0% of the schools did not Laboratory Space; 70.0% of the schools frequently used Stools, 20.0% of the schools rarely used Stools while 10.0% of the schools did not used Stools; 80.0% of the schools frequently used Iodine Solution, 15.0% of the schools rarely used Iodine Solution while 5.0% of the schools did not used Iodine Solution; 20.0% of the schools frequently used Agar, 25.0% of the schools rarely used Agar while 55.0% of the schools did not used Agar; 75.0% of the schools frequently used Benedict Solution, 15.0%of the schools rarely used Benedict Solution while 10.0% of the schools did not used Benedict Solution;80.0% of the schools frequently used Common Salt, 15.0% of the schools rarely used Common Salt while 5.0% of the schools did not used Common Salt; 25.0% of the schools frequently used Yeast, 25.0% of the schools rarely used Yeast while 50.0% of the schools did not used Yeast;20.0%of the schools frequently used Formaldehyde,40.0%of the schools rarely used Formaldehyde while 40.0% of the schools did not used Formaldehyde; 70.0% of the schools frequently used Reducing Sugar,20.0% of the schools rarely used Reducing Sugar while 10.0% of the schools did not used Reducing Sugar and75.0% of the schools frequently used Microscope, 20.0% of the schools rarely used Micros while 20.0%cope of the schools did not used Microscope.

Additionally, 80.0% of the schools frequently used Petri Dishes, 15.0% of the schools rarely used Petri Dishes while 5.0% of the schools did not used Petri Dishes; 80.0% of the schools frequently used Bunsen burner, 15.0% of the schools rarely used Bunsen burner while 5.0% of the schools did not used Bunsen burner; 80.0% of the schools frequently used Basin, 15.0% of the schools rarely used Basin while 5.0% of the schools did not used Basin;50.0% of the schools frequently used Dissecting Kit and Board, 25.0% of the schools rarely used Dissecting Kit and Board while 25.0% of the schools did not used Dissecting Kit and Board;70.0% of the schools frequently used Tripod Stand, 10.0% of the schools rarely used Tripod Stand while 20.0% of the schools did not used Tripod Stand;40.0% of the schools frequently used Microscope, 40.0%of the schools rarely used Microscope while 20.0%of the schools did not used Microscope; 80.0% of the schools frequently used Glass Slide and Cover, 15.0% of the schools rarely used Glass Slide and Cover while

0.0% of the schools did not used Glass Slide and Cover; 65.0% of the schools frequently used Safety Apparatus, 15.0% of the schools rarely used Safety Apparatus while 20.0% of the schools did not used Safety Apparatus;85.0% of the schools frequently used Test Tube, 10.0% of the schools rarely used Test Tube while 5.0% of the schools did not used Test Tube;85.0% of the schools frequently used Test Tub Rack, 10.0% of the schools rarely used Test Tube Rack while 5.0% of the schools did not used Test Tub Rack;30.0% of the schools frequently used Electronic Balance, 40.0% of the schools rarely used Electronic Balance while 30.0% of the schools did not used Electronic Balance;80.0% of the schools frequently used Forceps, 10.0% of the schools rarely used Forceps while 10.0% of the schools did not used Forceps and 70.0% of the schools frequently used Conical Flask, 20.0% of the schools rarely used Conical Flask while 5.0% of the schools did not used Conical Flask;

Finally, 85.0% of the schools frequently used Beakers, 10.0% of the schools rarely used Beakers while 5.0% of the schools did not used Beakers;85.0% of the schools frequently used Evaporation Dish, 25.0% of the schools rarely used Evaporation Dish while 10.0% of the schools did not used Evaporation Dish;80.0% of the schools frequently used Funnel, 10.0% of the schools rarely used Funnel while 10.0% of the schools did not used Funnel;75.0% of the schools frequently used Droppers, 15.0% of the schools rarely used Droppers while 10.0% of the schools did not used Droppers;75.0% of the schools frequently used Spatula, 15.0% of the schools rarely used Spatula while 10.0% of the schools did not used Spatula;80.0% of the schools frequently used Thermometer, 10.0% of the schools rarely used Thermometer while 10.0% of the schools did not used Thermometer; 70.0% of the schools frequently used Litmus Paper, 20.0% of the schools rarely used Litmus Paper while 10.0% of the schools did not used Litmus Paper;80.0% of the schools frequently used Filter Paper, 15.0% of the schools rarely used Filter Paper while 5.0% of the schools did not used Filter Paper;50.0% of the schools frequently used Magnifying Glass, 15.0% of the schools rarely used Magnifying Glass while 5.0% of the schools did not used Magnifying Glass;10.0% of the schools frequently used Centrifuge Machine, 15.0% of the schools rarely used Centrifuge Machine while 75.0% of the schools did not used Centrifuge Machine;75.0% of the schools frequently used Wash Bottles, 20.0% of the schools rarely used Wash Bottles while 5.0% of the schools did not used Wash Bottles;80.0% of the schools frequently used Skeletons, 20.0% of the schools rarely used Skeletons while 0.0% of the schools did not used Skeletons;65.0% of the schools frequently used Models, 20.0% of the schools rarely used Models while 10.0% of the schools did not used Models. The result showed the overall weighted average of laboratory resources that used. From the Table, 65.0% of the available laboratory resources were frequently used, 20.0% of the available laboratory resources were fairly used while 15.0% of the available laboratory resources were not used.

Research Question Three: What are the challenges associated with the utilization of teaching resources in the study area?

Table 3
Descriptive analysis of the challenges associated with the utilization of laboratory resources in the study area

S/N	Items	Mean	Std.D	Min	Max
1.	The laboratory resources readily available	2.40	0.31	1.00	4.00
2.	The school and government help in providing laboratory resources	1.90	0.32	1.00	4.00
3.	The laboratory resources available align with the course objectives	2.60	0.31	1.00	4.00
4.	Biology does not require laboratory resources	1.00	0.00	1.00	4.00
5.	Laboratory resources are constantly utilized for the teaching and learning of Biology	3.10	0.28	1.00	4.00
6.	Students respond positively to the use of laboratory resources	3.60	0.63	3.00	4.00
7.	Laboratory resources serves as distraction element to the students	1.20	0.31	1.00	2.00
8.	Laboratory resources are quite expensive	2.80	0.20	2.00	4.00
9.	School environment is conducive for the usage of laboratory resources	2.30	0.40	1.00	4.00
10.	Students understands the concept of Biology more when taught with laboratory resources	3.90	0.10	3.00	4.00
11.	There is constant power supply to facilitate the effective use of the laboratory resources available	1.70	0.26	1.00	3.00
12.	Laboratory resources are rarely utilized for the teaching and learning of Biology	3.00	0.21	2.00	4.00
13.	There is active participation of students in classroom when teaching resources are utilized	3.60	0.61	3.00	4.00
14.	Laboratory resources available are in good Condition	2.10	0.35	1.00	4.00
15.	The usage of laboratory resources enhance positive Academic performance of the students	3.7	0.53	3.00	4.00
	Ground Mean			**2.59**	**0.32**

Results in Table 3 showed the mean value of items 1 to 15 which are 2.40, 1.90, 2.60, 1.00, 3.10, 3.60, 1.20, 2.80, 2.30, 3.90, 1.70, 3.00, 3.60, 2.10 and 3.70. The result showed that items 3, 5, 6, 8, 10, 12, 13 and 15 were rated above criterion mean of 2.50 and thus accepted; while items 1, 2, 4, 7, 9, 11 and 14 were rated below it and thus rejected. Moreover, the grand mean of 2.59 was found to be above the criterion mean of 2.50. This indicated that the teachers were affirmative about the challenges associated with the utilization of laboratory resources in the teaching of Biology in senior secondary schools in Lagos State.

Discussion of Findings

The result showed that laboratory resources for the teaching of Biology in senior secondary schools in Lagos State are Microscope, Petri dish, Test-tube, Spatula, Funnel, Card board, Hand lens, Thermometer, Beaker, Bunsen burner, Test-tube rack, Tape rack, Dissecting set, Conical flask, Balance Scale, Scalpel set, Pipette, Measuring cylinder, Evaporating dish, Hot plate, Dissecting pan, Metric ruler, Dropper, Barometer, Indicator, Tripod stand, Skeletons, Forceps, Litmus & filter paper, Volumetric flask, Tongs, Burette, Mortar and pestle; Turning fork; File and Crucible were available. The findings validated Nelson and Bramwell-Lalor (2023) who reported that some necessary teaching resources are readily available for the teaching of Biology in secondary schools. The findings are not in line with Anane and Ankamah-Lomotey (2023) who identified that there is a great deficiency in the availability and the use of science laboratories in the teaching of science subjects. Furthermore, the findings invalidated Chukwuma and Abba (2020) who indicated that resources for the teaching of Biology were lacking and insufficient for effective teaching of Biology at the secondary school level in Anambra State.

Furthermore, the findings showed that most of the available laboratory resources were frequently used in the teaching of Biology in the study area. The findings contradicted with Kaupitwa and Amuthenu, (2022) who aimed at exploring the use of Biology Laboratories in Namibia Secondary Schools mainly to understand the utilization of laboratory facilities, as well as its implication on the performance of learners in final examination. The study finds a low extended usage of laboratories facilitates contributed by lack of chemicals and apparatus required for effective practical. Biology practical works in secondary schools did not follow the learning objectives outlined in the prescribed national Biology syllabus as a result some practical topics which required practical works were taught theoretically. Also, the finding is not consistent with Ismail and Lukman (2022) who observed that despite the availability of laboratory resources, most Biology teachers do not frequently employ these resources for the teaching of the subject in the schools. It was further stated that, some schools lack Biology laboratory and multimedia instructional resources.

Finally, the finding of the study revealed that teachers were affirmative about the challenges associated with the utilization of laboratory resources in the teaching of Biology in senior secondary schools in Lagos State. The finding is consistent with

Daworiye, et al (2015) that the major factors identified that associated with the utilization of laboratory resources include the lack of well-equipped biology laboratories; poor students' attitude to biology; non-conducive classroom environment; overloaded biology curriculum and student's poor communication skills. Teachers' lack of subject matter knowledge and inadequate motivation were also mentioned as factors that inhibit effective science teaching and learning. The low status of the teaching profession equally militates against quality teaching and learning.

Conclusion

This study concluded that there were enough available laboratory resources in senior secondary schools in Lagos State and that these resources were frequently used in teaching the students. The study also concluded that indeed, there are challenges associated with the use of these laboratory resources.

Recommendations

Based on the conclusion of this study, it is recommended that adequate and sufficient funding should be made by the school authorities to replace damaged laboratory resources or renew exhaustible laboratory resources such as common salt, benedict solution, Iodine solution and many more. School authorities should encourage the frequent use of laboratory resources in the teaching of Biology. There should also be constant light supply so that laboratory resources that require light energy to function can function properly and aid the teaching of Biology. There should be seminars, workshops and various programmes organized by the government and school authorities for teachers so that they can be more aware about the appropriate use of the laboratory resources to ensure that the objective of the teaching of Biology is achieved.

References

Abah, A. A. (2020). Availability of learning resources and students' academic performance in senior secondary schools in Kaduna State. *Information Technologist*, *17*(1).

Abdurahaman, H. (2009). *The relationship between laboratory facilities availability and students' academic performance and attitude in biology in Mani educational zone, Kastina State*. Unpublished seminar paper, in Science Education. Presented to the Department of Science Education, Ahmadu Bello University, Zaria.

Adegun, O. A. (2003). *Sociology of education*. Petoa Educational Publishers.

Adewale, A. M., Nzewuihe, G., & Ogunshola, F. (2016). Academic performance in biology at secondary school certificate examination (SSCE) and the influencing factors among Students in Owerri Municipal of Imo State, Nigeria. *International Journal of Education and Evaluation*, *2*(1), 1-10.

Aleyideino,S.C. (2000). Teacher production, utilization and turnover pattern in

educational system inKaduna, Nigeria. *National Commission for Colleges of Education*, *1*(1).

Amore, K. P., Amore, A. R., & Adesina, I. D. (2024). Home environment and academic achievement of senior secondary school students in English language in Ogun-East senatorial district, Nigeria. *Journal of Education in Black Sea Region*, *9*(2), 118-135.

Anane, N. M., & Ankamah-Lomotey, V. A. (2023). Availability and utilisation of science laboratory facilities on science teacher-trainees' pedagogical content knowledge in science. *Phenomenon: Journal Pendidikan MIPA*, *13*(1), 132-144.

Chukwuma, M. O., & Abba, D. N. (2020). Effective teaching and learning of biology at senior secondary school and crises on its curriculum. *STEM Journal of Anambra STAN*, *3*(1), 65-79.

Dahar, M. A., & Faize, F. A, (2011). Effect of the availability and the use of science laboratories on academic achievement of students in Punjab (Pakistan). *European Journal of Scientific Research*, *51*(2), 193-202.

Daworiye1, P. S., Alagoa, K. J., Enaregha, E & Eremasi, Y. B. (2015). Factors affecting the teaching and learning of biology in Kolokuma/Opokuma local government area, Bayelsa State, Nigeria. *International Journal of Current Research in Biosciences and Plant Biology*, *2*(4), 151-156.

Ernest, F.O. (2010). Relative effects of programmed instruction and demonstration method of students' academic performance in science. *College Study Journal*, *2*(2), 12-24.

Isma'il, A. & Lukman, O. M. (2022). Availability and utilization of instructional materials in teaching and learning of biology in senior secondary schools. *Aquademia*, *6*(2).

Kaupitwa, E., & Amuthenu, S. H. (2022). Exploring the status and the utilization of biology laboratories in a secondary school in Namibia. *Open Access Library Journal*, *9*(9), 1-13.

Momeke, C. O. (2007). *Effects of the learning cycle and expository instructional approaches on students' learning outcome in secondary biology*. An unpublished PhD thesis submitted to the school of postgraduate studies, University of Benin, Benin City.

Nelson, N., & Bramwell-Lalor, S. (2023). Implementing student-centred, active-learning instructional strategies in a grade 10 biology classroom. *International Journal of Research in Teacher Education (IJRTE)*, *14*(4).

Nnaboua, P. O. & Asodike, J. D. (2014). Exploring education as a tool for sustainable development in Nigeria. *European Scientific Journal*,*8*(10).

Ochonogor, E. C. & Ajaja, O. P. (2005). *Teaching methods: A multi-disciplinary approval*. Oludare Obielum Printing Enterprise.

Ofoegbu, T.O. (2003). Challenges of implementing senior secondary one (SS1) curriculum in Nigeria. *Journal of the Science Teachers Association of Nigeria*, *38*(1&2), 46-50.

Ogunkola, B. J. & Olatoye, R. A. (2004). Student gender self-concept and attitude towards science as predictors of performance in practical biology tasks. *Journal of Educational Review*,*7*, 124-125.

Ong'amo, B. L., Ondigi, S. R., & Omariba, A. (2017). Effect of utilization of biology teaching and learning resources on students' academic performance in secondary schools in Siaya District-Kenya.*InternationalJournal of Education, 2*(2), 18-28.

Osuafor, A.& Okonkwo, I. (2013). Influence of family background on academic achievement of secondary school biology students in Anambra State. *An International Multidisciplinary Journal*,*7*(3), 156-167.

Otami, D. C., Ampiah, J. G. & Anthony-Krueger, (2012). Factors affecting elective science students' perception of their biology classroom environment in low and high academic achieving schools in central region of Ghana. *International Journal of Educational Studies in Education*, *1*(1), 35-46.

Owolabi, O. T., & Adedayo, J. O. (2012). Effect of teacher's qualification on the performance of senior secondary school physics students: Implication on technology in Nigeria. *English Language Teaching*, *5*(6), 72-77.

Pember, S. T. & Humbe, T. T. (2009, October 7). *Science education and national development*. Being a paper presented at the ASSUTIBS Maiden National Conference at CEO Katsina- Ala.

Suman, B. (2011) Influence of parental education and parental occupation on academic achievement of students. *International Referred Research Journal*, *3*(30), 32-33.