**TITLE PAGE**

 **AVAILABILITY AND UTILIZATION OF LABOARTORY RESOURCES IN**

 **TEACHING AND LEARNING BIOLOGY IN ENUGU NORTH LOCAL GOVERNMENT AREA OF ENUGU STATE**

**BY**

**ANYADIEGWU CHRISSY OLAEDO**

**U14/EDU/BIO/014**

**A PROJECT REPORT SUBMITTED TO THE DEPARTMENT OF**

**SCIENCE EDUCATION, GODFREY OKOYE UNIVERSITY IN PARTIAL FULFILLMENT OF THE REQUIREMENT OF THE AWARD OF**

**BACHELOR OF SCIENCE EDUCATION (B.Sc.ED)**

**JULY, 2018**

**APPROVAL**

This project has been approved by the Department of Science and Vocational Education, Faculty of Education, Godfrey Okoye University, Ugwuomu Nike, Enugu.

Prof.Nkadi Onyegegbu Date

(Supervisor)

Prof,Uche Agwuagah Date

(Head of Department)

Prof. Aaron Eze Date

 (Dean)

External Examiner Date

**CERTIFICATION PAGE**

**ANYADIEGWU CHRISSY OLAEDO**, an under graduate student of the Department of

Science Education, GODFREY OKOYE University ,THINKERS CORNER,ENUGU with Registration Number U14/EDU/BIO/014 has satisfactorily completed requirements for the award BACHELOR Degree in BIOLOGY Education. The work embodied in this project is original and has not been submitted in part or in full for another degree of this or any other university.**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**ANYADIEGWU CHRISSY OLAEDO - STUDENT**

**PROF.NKADI ONYEGEGBU - SUPERVISER**

**DEDICATION**

This work is dedicated to all lovers of what is good and righteous.

**ACKNOWLEDGEMENTS**

I remain very grateful to GOD for his infinite mercies throughout the period of this work. My profound gratitude and appreciation goes to my supervisor, Prof. Nkadi Onyegegbu who is also a specialist in Science Education, University of Nigeria, Nsukka for her immense supervisory guidance and counseling; materials provision, time management, encouragement and prompt attention given to me while this research work was in progress. She never delayed my work despite her tight schedule. She is cherished for being a mother.

I am gratefully indebted to Dr. Okoye and Dr. V.C Ude whose contributions in one way or the other helped to the actualization of this research project. My deep appreciation goes to my husband Mr. Chukwuma Williams Anyadiegwu. who has been the bedrock of my achievement. I also owe immeasurable gratitude to my five children,Tisaiwale, Odera

Katie, Chidubem and Kamsi whose all round support contributed to the success of this study. I am grateful to 2018 undergraduate students in Biology Education who in one way or the other contributed to the success of this work. They include:Nnadika Peace, Oluchi Ozoarinze,Uzodiagu Ujunwa,Chineye Nwaekwe Faith,Onyinye Nwankwo,Chioma Njeze together with lots more whose names could not be mentioned. May God bless you all.

**TABLE OF CONTENTS**

**Content Pages**

Title Page

Approval Page

Certification

Dedication

Acknowledgment

Table of Contents

List of Tables

Abstract

**CHAPTER ONE: INTRODUCTION**

Background of the Study

Statement of the Problem

Purpose of the Study

Significance of the Study

Scope of the Study

Research Questions

**CHAPTER TWO: LITERATURE REVIEW**

Conceptual Framework

 Nature of biology

 Laboratory Resources

 Availability of Laboratory Resources

 Maintenance of Resources

 Concept of Teaching and Learning

Theoretical Framework

 Piaget's Cognitive Constructivists Learning Theory

. Vygosky's Social Constructivists Theory

Empirical Studies

 Effects of integrating theory practicals on student's achievement in Biology

 Effects of Biological Practical activities on students' process skills

.Effects of Laboratory approach on academic achievement of biology of students of different levels of scientific literacy

Summary of Literature Review

**CHAPTER THREE: RESEARCH METHOD**

Design of the Study

Area of the Study

Population of the Study

Sample and Sampling Technique

Instrument for Data Collection

Validation of Instrument

Trial testing of the Instrument

Reliability of the Instrument

Method of Data Collection

Method of Data Analysis

**CHAPTER FOUR: PRESENTATION OF RESULT**

Research Question One

Research Question Two

Research Question Three

Summary of Findings of the Study

**CHAPTER FIVE: DISCUSSION, CONCLUSION AND SUMMARY**

Discussion Based on the three Research Questions

Conclusions Reached from the Findings of the Study

Educational Implications of the Findings of the Study

Recommendations

Limitations of the Study

Suggestions for Further Research/Study

Summary of the Study

**LIST OF TABLES**

**Table 1**: Percentages and Ranks of Laboratory Resources Availability Assessment

**Table 2**: Mean, Standard Deviation and Rank of Adequacy of Laboratory Resources Provision

**Table 3:** Mean, Standard Deviation and ranks Laboratory Resources Utilization

***Abstract***

*The survey of availability and utilization of laboratory resources in teaching and learning biology in Enugu North LGA, Enugu State, It adopted a descriptive survey research design and was guided by one (1) checklist and two (2) research questions. It sought to find out laboratory resources available for teaching and learning biology in secondary schools in Enugu North LGA, the extent of adequacy in the provision of laboratory resources in secondary schools and the extent of utilization of the laboratory resources by the biology teachers in teaching and learning biology. Descriptive survey research design was employed for the study, a population of thirty six (36) teachers, due to factors that could not be controlled by the researcher a total of (20) respondents were used for the study, the total number of teachers of secondary schools in Enugu North LGA is thirty six(36) for this reason, there was no need for sampling . The instrument used for data collection was a researcher developed questionnaire tagged Questionnaire on Availability and Utilization of Laboratory Resources in teaching and learning Biology (QAULR). The questionnaire has sixty (60) items. Descriptive statistics including percentages, mean and standard deviation were used to answer research questions while frequency was used to ascertain the relative position of the items in their order of priority/effect. It was revealed from the study that a total of sixteen out of the twenty listed items were available of in biology laboratories. The study also revealed that laboratory resources are not adequately provided for in secondary schools. Additionally, due to inadequacy in the quantity and quality of laboratory resources provided to secondary schools, students and teachers find it difficult to utilize the laboratory effectively. Different factors ranging from inadequate fund; over enrollment of students into government secondary schools; inadequacy in quantity and quality of human and material resources; lack of storage facilities; lack of supervision; together with ignorance on the proper usage of resources due to lack of training were found to militate against provision, utilization of laboratory resources in secondary schools. Based on the above problems, it was recommended that biology laboratories should be adequately funded; staff, students and laboratory technologists/assistants should be adequately trained on proper improvisation of laboratory; appropriate storage of material resources; provision of accurate records/logistics; replacement/repair of damaged/faulty laboratory materials; appropriate planning, implementation, supervision, monitoring and evaluation of all biology laboratory utilizers among others were suggested as strategies for improving provision and utilization of laboratory resources in secondary schools.*

 **CHAPTER ONE**

**INTRODUCTION**

**Background of the Study**

Biology is the science of life it studies organisms, their interactions with one another and their environments. All living organisms share several key properties such as order, sensitivity or response to stimuli, reproduction, growth, development, regulation, homeostasis and energy. Biology is related to many things in human's daily life, it is a preliquisite for certification at the senior secondary school level (SSCE) and for admission into the tertiary institution for most science oriented courses that will pursue careers in science related fields such as medicine, nursing, pharmacy, nutrition, medical laboratory etc.

Biology as a science subject is studied or taught by using different methods which employs the use of all sense organs including olfactory (smell), gustatory (taste), auditory (hearing), kinesthetic (skin),and optical (seeing) of which only the application of theory in teaching and learning could not yield 100-percent accuracy without the use of laboratory resources. Thus, effective teaching and learning of biology in secondary schools with the use of laboratory resources is very necessary if biology teachers must gainfully achieve stated objectives.

Laboratory is a room, building or part of a building that is specially built for teaching by demonstration of theoretical phenomenon into practical terms. The laboratory experience enables students to translate what seems to be abstract into practical realities, thereby enhancing their understanding of the learning process. The study of biology in secondary schools takes place in laboratories. This is to enable easy access and usage of material resources stocked in the laboratories for teaching and learning, not only during practical classes but also during normal classroom teaching. Biology adopts laboratory method of teaching. The laboratory method is an individual or group activity involving two-way approach namely: the exercise approach and the experimental approach. Okoli & Osuafor (2010) pointed out that this method offers students the opportunity to develop scientific skills and attitude such as objectivity, communication, questioning, formulating hypothesis, analyzing data, critical thinking, carefulness, open-mindedness, making inference and analyze data. Scientific skills can only be effectively developed if biology laboratory resources are effectively utilized.

The study of Biology provides students with basic life skills and processes that helps to prepare them become productive members of the society Azuka (2015) for this reason there is need for teachers to teach it effectively. This can only be achieved when teachers are

favorably disposed to using the appropriate methods and resources in teaching and learning the subject. For science teachers to play their roles in teaching biology effectively, laboratory facilities should be made available and utilized appropriately, this would also improve the performance of students. The poor performance of students in Biology especially at Senior School Certificate Examinations (SSCE) level has become a source of concern to all stakeholders in education in the country (Imogie, 2010). One of the major reasons for this is the unavailability of or in appropriate utilization of laboratory facilities in the teaching of Biology by secondary school teachers (Orji &Ebele Asiyai, 2012). According to a review of student’s performance in Biology in the West African Senior Secondary Certificate Examination (WASSCE) from 2005 to 2013 in Nigeria, it was revealed that there was a fluctuation and downward trend in the students’ performance (Daluba, 2012). This has attracted a lot of concern among science educators. In order to achieve the objectives, aspirations of the government, and to improve the performance of students in Biology, efforts need to be made towards improving teaching and learning of the subject. Effective teaching and meaningful learning of Biology at secondary school level depends to a large extent on the availability, utilization and management of both human and material resources.

Resources according to Hornby (2008) are supplies of something that a country, organization or an individual has and can use especially to increase wealth. According to National Teachers Institute (2010) report, resources in the classroom can be classified into two broad categories, which include those that appeal to the sense of sight, are classified as visual resources and those which appeal to the sense of hearing, are classified as audio materials. other resources also combine both features these are classified as audio-visual (A-V) materials. Isola (2010) referred to instructional resources as objects or devices, which help the teacher to make a lesson much clearer to the learner. Instructional resources are also described as concrete or physical objects, which provide sound, visual, or both to the sense organs during teaching (Agina-obu, 2005).

Teaching of Biology cannot be effective without interaction between the teacher, students and the environmental resources. The Biology curriculum is planned to enable the teacher use activity oriented, child-centered approach (guided inquiry) to teach Nzewi and Nwosu (2010) laboratory resources can therefore be said to be supplies of teachers, learners, laboratory assistants/technologists, instructional materials and other necessary devices made available to the school in order to increase the wealth of knowledge, which gives help, support in the teaching and the learning process in secondary schools.

Laboratory resources are categorized into two namely: human and material resources.

Human biology laboratory resources comprise all human beings or resourceful individuals who in one way or the other aid effective utilization of material resources in biology laboratories. These human resources include teachers, learners, resource persons, laboratory assistants and technologists together with other non-professional personnel (Okoli and Osuafor, 2010).

 Laboratory material resources also bear educational terminologies like: instructional materials, teaching materials, educational media, teaching aids, instructional facilities and instructional media. Chimezie, Ike and Iwu (2002) pointed out that these are devices which present a complete body of information and largely self supporting rather than supplementing in the teaching learning process. Educational material resources are things which are manipulated, seen, heard, read or talked about plus instruments which facilitate such activity (Okafor, 2000). Such material resources Okafor continued are both tools for teaching and avenues for learning. They include textbooks, chalkboards, model/mock-ups, television, radio and other projected as well as non-projected devices. This study therefore seeks to investigate the availability and the extent to which the available laboratory resources are being utilized in Teaching and learning Biology in Enugu North Local Government Area, Enugu State.

**Statement of the Problem**

Teaching and learning of biology ought to be simplified, comprehensive and concrete. Extensive use of laboratory resources makes biology interesting, stimulating and understandable to the learners. The success of biology students in secondary schools largely depends on the availability and effective utilization of available human and material resources.

Biology as a science subject is faced with some problems, such as: the increasing number of students’ enrollment in science subjects in secondary schools which puts pressure on the limited qualified teachers available to reduce the time allotted to practical classes to the minimal or even omit practical activities .Teachers find it difficult during laboratory activities to supervise and teach large classes and combine the practicals effectively with normal class lessons. Students on their part have the problem of comprehending what is taught without the complementary laboratory activities in biology. Most laboratory resources are either lost, damaged or carelessly stored. Storage facilities are not even available in some secondary schools. In some cases, students are not allowed to make use of biology laboratories due to fear of losing valuable materials through stealing in the laboratory, the number of professional teachers in secondary schools are limited whereas competent and experienced teachers cannot give hundred percent of their time, energy and resources to biology practicals due to limited quantity of materials .Most biology laboratories are dilapidated. Some biology laboratories were built since 1970s with maximum occupancy limit of twenty students in view, at present occupies more than two hundred students which can only be managed for instructional delivery without practicals. Evidence from Researchers testify that most biology laboratories are not equipped with science facilities, seats and demonstration tables. Even when these resources are available, their management becomes questionable. These anomalies no doubt affect students’ performance in biology examinations. Most research works reveal the reformation of teaching methods without delving into what effects the management of material resources would have on students’ performance. In addition, scholars have been researching on the physical facilities/equipment in secondary schools without assessing the extent by which teachers utilize the available resources. The challenge to improve the teaching and learning of biology in secondary schools through adequate provision and effective utilization of biology laboratory resources in secondary schools prompted this study.

Consequently, based on the problems so far listed, this survey investigates the Availability and Utilization of Laboratory Resources in Teaching and Learning Biology in Secondary Schools in Enugu North Local Government Area, Enugu State, Nigeria.

**Purpose of Study**

The purpose of this study is to carry out a survey on the availability and utilization of Laboratory Resources in teaching and learning biology in secondary schools in Enugu North Local government area of Enugu State Nigeria. Specifically, the study intends to:

1) identify laboratory resources available for effective teaching and learning of biology in secondary schools in Enugu North Local Government Area of Enugu State Nigeria.

2) determine the adequacy in the provision of these laboratory resources in secondary schools in Enugu North Local Government Area, Enugu state. Nigeria.

3) determine the extent to which teachers utilize laboratory resources in secondary schools in Enugu North Local Government Area of Enugu state, Nigeria

**Significance of the Study**

This study has both theoretical and practical significance. Theoretically, this study is anchored on Piaget’s cognitive constructivist learning theory and Vygotsky’s Social Constructivist learning theory. Piaget emphasized that students should learn by doing. Piaget’s cognitive constructivist learning theory is related to the present study which is a survey on availability and utilization of laboratory resources in teaching and learning biology, because, laboratory activities requires student’s active engagement in practical activities. In social constructivist theory, Vygotsky emphasizes on learning in a social context which is what group laboratory activity is associated with. Vygotsky’s theory is related to the present study which is a survey on the availability and utilization of laboratory resources in teaching and learning biology because it supports the view that in the laboratory, students interact with the materials or with one another in the course of practical work. Hence the result of this study will help to validate the theories.

Practically, the findings of this study will be beneficial to following persons: biology teachers, biology students, education administrators, policy makers, researchers, curriculum planners and textbook writers.

 The result of the study could enable the biology teachers to see the need for effective and efficient utilization of available laboratory resources provided to schools. In the same way, students will appreciate the need to manage and improvise laboratory resources in secondary schools.

 Biology students would realize the importance of group and individual laboratory work situations in the effort of learning biology concepts. It could also help the students to become knowledgeable in the following areas: communication, problem-solving, self-confidence and critical thinking. These are knowledge they are expected to acquire from practical activities which could lead to students’ improvement on their academic achievement.

To education administrators as the recommendations will enhance educational growth. It will also furnish them with the quantity and quality of laboratory resources that are available in secondary schools the extent to which they are utilized for effective and efficient dispensation of lessons. They will also appreciate the need to plan, direct, control, co-ordinate and supervise institutions of higher learning to actualize national educational objectives.

The findings of this study will help policy makers to work out effective means of providing and managing resources in biology laboratories in secondary schools. This could be achieved through the establishment of resource centres where laboratory resources could be purchased, observed and experimented with at subsidized rates.

Researchers on assessing this study would find it useful since it will provide them with documents and reference materials.

To the curriculum experts the findings of the study could form a basis for introducing laboratory innovations in teaching at all levels to promote practical based learning in schools.

The textbook writers on assessing the findings of this study would upgrade the content of the textbooks to include fifty (50) percent practical and fifty (50) percent theoretical work on all science and its related subjects.

**Scope of the Study**

The scope of the study is to investigate the availability and utilization of laboratory human and material resource in some secondary schools. The study will determine the extent to which to which available resources in biology laboratories in secondary schools are being utilised. The study will be limited to senior secondary schools biology teachers in Enugu North Local Government Area of Enugu State.

**Research Questions**.

The following research questions have been formulated to guide the study.

1. What extent are laboratory resources available for teaching and learning of biology in biology laboratories of Secondary Schools?
2. To what extent are these laboratory resources adequately provided for Secondary Schools?
3. To what extent do teachers utilize biology laboratory resources in teaching and learning biology?

**CHAPTER TWO**

**LITERATURE REVIEW**

In this chapter, related literature to the topic will be discussed under the following sub-headings:

Conceptual Framework

Theoretical Framework

Empirical Studies

Summary of Literature Review

**Conceptual Framework**

**The Nature of Biology**

Biology is a branch of science which studies life. Professionals in biology are referred to as biologists. Biology according to Wikipedia (2011) is a branch of science which studies living organisms and how they interact with each other and their environment. It examines the structure, function, growth, origin, evolution and genetics of living and nonliving things. According to the same source, biology classifies and describes organisms, their functions and how species come into existence. Biology deliberately transfers skills, dispositions, knowledge, habits, attitudes, values and norms to the students.

The goal of biology is to develop scientifically literate citizens who can think logically and act rationally, whose goal is to transmit the same values to the next generation. Broadly speaking, biology has two dimensional aims, first to serve the individual, secondly to serve the society. Biology achieves its individual and societal roles through the inculcation of the right type of values and attitudes for the survival of both the individual and the society. The acquisition of appropriate skills, abilities and competencies by utilizing laboratory resources, will enable the student to contribute to societal development. The objectives of biology are aimed at enabling the students who are adequately trained to acquire the following skills:

* Observing carefully and thoroughly.
* Drawing and labeling accurately observed materials.
* Reporting completely and accurately what is observed.
* Organizing information acquired by the above processes.
* Generalizing on the basis of the acquired information.
* Predicting as a result of these generalizations
* Designing experiments (including control where necessary).

Using models or other resource materials to explain phenomena where appropriate.

Continuing the process of enquiry where new data does not conform to prediction. (Onimisi 2006).

Based on the above objectives, a trained biology student invariably is a scientist since all the scientific processes (state the problem; gather information; form hypothesis; perform experiments; analyze data; draw conclusions; form theories and laws) are hierarchically performed in the biology laboratory. These cannot be achieved if the resources in the laboratories are not adequately utilized. Biology as an indispensable part of human activity is important to man and the society. the following are the usefulness of biology to man.

* Helps the individual to understand himself, the parts of his body and its functions.
* Enables the individual to question superstition due to sustained interest from a comprehension of the causes of events.
* Brings into focus, the need to maintain good health such as clean water, clean air, good sanitation, vaccination against infectious diseases, exercise, adequate rest, and balanced diet.
* Promotes understanding of the relation of man to his environment.
* Prepares the individual for vocational selection such as medicine, dentistry, agriculture, teaching and so forth.
* Prepares the individual for higher education.
* Inculcates scientific attitudes and skills in solving personal and social problems.
* Increases the individual’s interest and aesthetic appreciation of nature.
* Also stimulates interest in biologically based hobbies such as growing flowers, collecting insects’ etc thereby encouraging leisure activity for individual enjoyment.
* Improves the individual factual knowledge and stimulates scientific reflective thinking so as to produce a better informed individual.

Biology has also contributed immensely to the development of the society in the following ways: control of human population, control of diseases, environmental conservation, human genetics as well as control of alcohol, smoking and drug addiction. If not for the introduction of biology education the above listed factors could have affected the human race negatively.

**Laboratory Resources**

Resources as defined by Hornby (2006) are supplies of something that a country, an organization or a person has and can use, especially to increase wealth. Hornby further explained that resources are things that can be used to help achieve an aim, e.g. a book, equipment etc that provide information for teachers and students. In the context of this work, resources are discussed as it concerns biology laboratory.

Laboratory resources can be viewed as supplies of individuals and materials whose utility in one way or the other help in the actualization of educational objectives. All resources have unique qualities of utility, availability and consumption (wikipedia, 2011). Resources are vital for any teaching-learning process to proceed effectively. The desirability of adopting material resources for teaching biology cannot be over emphasized in making the lesson concrete and practicable. They are necessary tools that facilitate learning. Chime (2010) is of the opinion that resource materials enable the teacher to teach more effectively or better still enable the children to learn more readily. Learning resources motivate students and serve as effective ways to explain and illustrate subject content. In a similar vein, Oladipo (2008) asserted that resource materials facilitate understanding of concrete materials, creative motivation and interests for the subject. These laboratory resource materials reinforce learners to retain information for a long period of time. Chukelu (2009) agrees with Okafor (2000) that utilization of material resources for teaching-learning processes has the following positive effects on the learners:

* Holds students’ interest.
* Retains information.
* Provides concrete and realistic experience.
* Stimulates imagination and self-activity.
* Helps to clarify abstract ideas.
* They promote greater acquisition and longer retention of factual knowledge.
* They offer real life experience which stimulates self activity on the students. In the same vein, Chimezie, Ike & Iwu (2002) explained that these materials provide opportunities for students to develop independent learning, holds students interest and

reduce meaningless word responses from the students.

 Laboratory resources are broadly classified into two, namely: human and material resources. Researchers have identified different types of resources. For instance, resources could be identified as human resources; natural resources; material resources; community resources; capital resources and personnel resources. Chimezie, Ike and Iwu (2002) categorized resources into message, people, materials, devices, techniques, settings and the learner. For the purpose of this research work, only human and material resources are discussed.

Human Laboratory Resources otherwise called resource persons are people who possess more authentic knowledge and needed information and skill, and are also willing and able to communicate to students the information, and have the right or authority to give the information out. They can be foreigners or indigene. They provide wonderful opportunities through creative activities for self expression. Their invitation and selection depends on the content, objectives and methodology most appropriate for each topic. Wikipedia (2011) view human resources as a term used to describe the individuals who make up a work force of an organization. Human resources are the skills, energies, talents, abilities and knowledge that are used for the production of goods or the rendering of services (Wikipedia, 2011).Resource persons also called human resources are expertise individuals with specialties in different professions. These specialized experts have the needed skills which can be transferred to others. Human resources are selected based on professionalism and talent not because of age, gender or location. Laboratory human resources are both academic staff as well as the laboratory staff. Nwagbo (2005) highlighted some of qualities of a biology teacher as a competent resource person as: being emotionally stable, have good disposition, show a democratic and cooperative attitude. She/he should also demonstrate empathy, patience, humor and fairness. These personality traits of the teacher add to his effectiveness in teaching and learning of biology. Nwafor (2008) listed the professional duties of biology laboratory resource persons as follows:

* Help to determine the objectives of the school system.
* Provide laboratory facilities for use in the biology laboratories.
* Help to develop relevant curricular and learning materials (like posters, charts, videos, tapes, real objects and specimens).
* Assist in the development and evaluation of resources for school learning.
* Serve as speakers on career days.
* Help in the implementation of biology laboratory innovations.
* Organize meetings, workshops, conference and seminars for teachers and or students
* Providing advice on budgeting, financing, purchasing, policies and procedures to be employed in biology laboratories.
* Help in the development of programmes for the maintenance of biology laboratory building and equipment.
* Monitoring and evaluation of staff, students and all available material resources.

 Material laboratory resources could be divided into four namely: audio-visual materials, visual/non-projected materials; audio media and projected media. Chimezie et al(2002) classified material laboratory resources as instructional media, instructional materials and educational media. For the purpose of this research work, Biology laboratory resource materials are classified into four as summarized below:

(a) Classification as appealed to the two main senses.

(b) Classification as print and non-print media.

(c) Classification into two-dimensional and three-dimensional materials.

(d) Classification into projected and non-projected media.

(a) Classification as appealed to the two main senses (hearing and sight).

For effective utilization of learning resources, all the body sense organs must be involved. All learning is the result of sensory experience whether kinesthetic (touch), gustatory (test), Olfactory (smell), auditory (hearing) or optical (seeing). The classification as appealed to the senses of hearing and sight are as follows:

Audio (auditory or aural) aids are material laboratory resources which appeal only to the sense of hearing. Audio media refers to those compliments that appeal to the sense of hearing. They produce sound which makes sense to the hearer; they can be used for group and individualized instruction and more importantly, for “homebound students” under special education schools. The teacher should break the content in small bits (task analysis) from simple to complex and specify the instructional objectives bearing in mind the age, ability level, interest and background of the learner (learner analysis); as well as the characteristics of the audio- resource material (material analysis)such as visibility, replaceability, compatibility (with other materials such as filmstrips, slide, programmes instructions); which make the medium of instruction more potential for educative purposes especially in developing countries.

Visual (optical) aids are resource materials which appeal only to the sense of sight. Audio-visuals are resource materials which appeal to the senses of sight and hearing at the same time. Egbu (2010) warned that audio visual instructional materials must produce both sound and hearing before classified as audio-visual material. They include computers, television, video films, motion pictures with sound, documentary films, recorded programme and demonstrations.

(b) Classification as printed media such as textbooks, journals, posters, mimeographs, pamphlets, brochure and non-printed media such as chalkboards, flannel boards, models, 16mm film/projector, transparencies, overhead projector, mock-ups diorama. Non-printed media can be in the form of hardboard or software.

(c**)** Classification into two-dimensional materials**:** they are flat materials which have length and breadth such as pictures, charts, posters, comics, cartoons, slides, graphs, filmstrips, films and three dimensional materials: they are thick materials which have length, breath and height such as models, puppets, dioramas, simulations and games, mock-ups etc.

(d) Projected and non-projected media are classified as: projected resource materials are those instructional materials which require projection viewing. The projection is accompanied by either passing light through a transparent material or throwing light on an opaque object and the desired image is projected on the screen or wall. Light is passed or thrown on the material with the help of a projector. In other words, the materials (software) are presented with the help of the projector. Basically, projected materials are categorized into two namely, the transparent and opaque projections. Transparent projected resource materials are those materials that allow light to pass through transparent materials containing images such as drawings or pictures and projecting them into a screen or white wall. The image so projected is still or motionless. Slides, filmstrips, overhead transparencies, microfiche, microfilm and microscope slide are the examples of transparent still projected materials. The hardware/equipment which are used in presenting the above materials are slide projectors, filmstrip projectors, Overhead Transparency Projector (OTP), microfiche reader, microfilm reader and micro projector. Opaque projection involves the projection of opaque or non-transparent materials using the opaque projector. The opaque projector projects opaque materials by means of reflected light. The opaque projector is very versatile as it can manipulate any opaque material that can be accommodated in it. The projector is unique for instruction in that materials for projection are readily available in the classroom. on-projected visual media do not require projection viewing. They are opaque in nature. Examples include: books, and other printed materials, objects, specimens, models, mock-ups, graphic materials, bulletin boards, and exhibits, chalkboards, buildings, field trips, simulations and games. All researchers in biology Ozofor 2001 and Neboh 2008; Oladipo 2008) advocate to the proper utilization of material resources for teaching and learning since it produces the under listed effects on students:

* They develop a continuity of thought; this is especially true of motion pictures.
* They supply a concrete basis of conceptual thinking; hence they reduce meaningless word responses of students.
* They contribute to the growth of meaningful learning and vocabulary development.
* They prevent and correct misconceptions of abstract concepts, spatial relations and special details. In spite of the above advantages of research reports, (Okoli and Osuafor, 2010) indicate that biology laboratory resources are lacking or inadequate in schools. It is sad to note that even where biology laboratory resources are present, they are not effectively utilized for instruction due to certain factors.

**Availability of Laboratory Facilities**

The use of aids in teaching is of importance as they help to stimulate Learners interest and promote understanding. According to Akoano and Akpokiere (2006) the teaching and learning of science which is practical course requires practical laboratory activities because experiment is the hall mark of science education. Uyoata (2006) also opined that meaningful learning of science requires the use of multisensory approaches where appropriate instructional resources are selected and used. This is necessary because in this kind of learning students make use of more than one sense modality in learning. Dangbin (2008) also reported that practical activities using sufficient facilities enable learners to acquire cognitive skills such as formulation of hypothesis, making assumptions, designing investigations, understanding variables, observing, recording date etc and associated with these activities are scientific attitudes like curiosity, perseverance etc which are necessary for engaging in faithful science investigation. However, Lawal (2006) reported that biology physical structures as well equipment are inadequate. Ajayi (2008) also reported that biology teachers in secondary schools have always lamented that among the various obstacles to effective teaching of biology practicals includes lack of laboratory space and equipment, large class and in adequate time allocation. Oludare Abiodun and Ajayi (2006) also reported that there are no enough classrooms and laboratories. Laboratories have poor facilities and equipment and that, supplies of chemicals and reagents for experiments are quiet low. Also schools lack laboratory assistance resulting in the poor maintenance and obsolete nature of laboratory facilities. Adepoju (2000) also reported that the quality of the products of the education system is daily depreciating due to obsolete, inadequate or even non-availability of materials. There is a general consensus among science educators that science teaching in schools has continued to be theoretical and not practically oriented (Ihieglulem 2006, Oludare Abiodun and Emmanuel 2009) As a result of this learners do not think practically and they are not able to apply the knowledge acquired. Little encouragement is given to learners to find out things for themselves instead they are being fed with fact and dogmas. As a result of this many science classrooms are characterized by for the purpose of passing examination. Supporting this view Ogu (2008) reported that in most schools emphasis is more on the memorization of facts with a view to passing examination and less on the method of finding out the facts and learning to apply them. That the practice is to defer practice to few weeks to the external examination. This practice prepares the students for the examination but does not give room for any meaningful learning. Resources are aids to learning rather than teaching, sourcing them however, is the responsibility of the teacher. Sourcing for resources makes the teachers work cumbersome as a result of which few teachers would like using them (Dangbin, 2008) That some teachers may not want to use facilities simply because they are too lazy to go for them even when they are available. Also some teachers may not want to use teaching facilities because they have been trained in the use of excessive verbalization of ideas and they are reluctant to shed the old practice. According to Lewin (2000) high institutions in Nigeria charged with the responsibility of training science teachers are increasingly turning out teachers without requisite experiences in laboratory practices. Such trained teachers usually lack the necessary competence and confidence to conduct practical classes thus even when materials are within easy reach they may refuse to use them. The conditions under which many teachers function do not engender any enthusiasm for practical work. The class size especially in urban schools is sometimes larger. According to Chika (2010) there is a general increase in the environments f students who study biology without a corresponding increase to school facilities. Adebayo (2000) had earlier reported that the population of students has continued to grow every year at the expense of available physical facilities for their use that government as failed to expand or put in place new facilities thereby making existing facilities to be over utilized because of the pressure on them. supporting this vie Lewin (2000) reported the importance attached to laboratory activities does not match government's provision of laboratory resources and equipment possibly due to the condition of the national economy which is deteriorating. Justifying this Lewin (2000)noted that in most state governments have given up the hope of adequate equipping all schools with science facilities. Instead they have designated some schools as 'special science schools' which hey equip with their meagre resources .Another related problem is the practice in which teachers are not involved in planning and procurement of relevant instructional facilities for use in schools. According to Uyoata (2006) truckloads of items some of which are so strange and not related to the contents of the science curriculum are imposed on the teachers. Such materials are packed away where they collect dust for years which leads to malfunctioning of such facilities. They may lie waste because the teacher does not know how to use. And when they are faulty the replacement parts are hardly available.

 **Utilization of Laboratory Resources**

The process of managing and organizing resources for teaching and learning is referred to as resource utilization (Lewin 2000) Resources utilization has to do with the extent to when facilities are provided to schools, these are three possibilities, they are either used effective or inefficiently or they may remain unused. When item of equipment is maximally used such as equipment is effectively utilized. If the equipment is not maximally used it can be said to be underutilized. When there is so much pressure on the use of an equipment this may result to over utilization which could lead to breakdown of such item of equipment.

Teaching leaning facilities improves the quality of teaching and make learning content meaningful. According to Ihiegbulem (2006) resource materials utilization during practices lessons inculcates in the students the spirit of careful observation, manipulative skills, respective thinking and creativity in the learners, Lewin (2000) however reported that science facilities are only important when they are used. One of the major problems facing the teaching and learning of science is connected with the management of available resources (Ogunleye, 2003) movement of resources requires the science teacher himself be resourceful and creative and be careful in handling and using available facilities are handled cautiously especially the fragile ones. This is necessary because once the facilities are misused they cannot offer the best service required.

 **Maintenance of Facilities**

The process in which good care is taken of tools and equipment to prolong their life span is referred to as maintenance. It involves all activities put in place to keep and restore the condition of facilities. Momoh and Onjewu (2006) define maintenance as any action or group of action taken to keep a facility in good working conclusion for as long as possible. When activities such as repairs, servicing, greasing etc are put in place to keep or restore the component of an item, the item is being maintained.

Laboratory equipment and facilities must be adequately taken care of in order to ensure their normal working conditions. Maintenance prevents deterioration and also weeds out obsolete items which no longer serve the required function. Momoh and Onjewu (2006) identified the followings as objectives of maintenance of facilities:- *-*To ensure that facilities are always available to provide services to for maximum benefits to staff and students.

- To ensure operational readiness of facilities for continuous service so as to reduce losses which may result from down time.

- To protect operating personnel and save facilities

- To extend the use of the facility for maximum benefit. Maintenances could be routine ongoing activities such as daily or weekly cleaning of the laboratory equipment and facilities, it could be periodic activities such as inspection and lubrication of parts of equipment to ensure continued working condition or corrective maintenance which include activities carried out to fix back a failed equipment or facility maintenance also involves the security of the equipment and facilities. Security here covers protection from physical damage from pests, fire, rain etc. It also pertains to protection from theft or unauthorized use.

Teachers should not wait for an equipment to breakdown completely before it is serviced. Report of the need for repairs or replacement of equipment must be made to school authority with the view to making immediate arrangement for the repairs and maintenance to avoid waste and depreciation.

However it has been reported that one of the major problems facing the teaching and learning of science is connected with the management of available resources (Ogunleye, 2003) that inability to appropriately manage resource in the laboratory is a sign of poor management. Kalat (2006) also reported poor maintenance culture among teachers. That outright hostility, manhandling, inferior texture, weathering, over use etc are among the factors inhibiting proper management of facilities. Moses (2006) reported that maintenance culture is very poor in Nigerian schools, homes, offices and industries. That facilities and equipment are laying waste due to breakdown; some are forced to breakdown by dust and cobwebs due to negligence and lack of care.

 **Concept of teaching and learning**

 Aronson (2002) explained learning as the degree of attainment by student in schools, either in class, laboratory, library, project or field work in which the student is sufficiently exposed to. Anekwe (2006) sees learning as a test for the measurement and comparison of skills in various fields of academic study. Hence learning could be described as a task which has been accomplished successfully, especially by means of exertion, skill practice or perseverance. Learning enables us to obtain information on the extent to which a student has attained the criterion performance. It also enables us to determine the relative position or rank of individual student with respect to their performance (Etuk, Koko & Eno, 2011).

Students, teachers, parents and the society are much concerned about the academic achievement of students. Some of the purposes of learning are itemized by Ekhasemomhe (2010) as follows:

* To determine the relative effectiveness of the programme in terms of students behavioral output.
* To identify students’ growth or lack of growth in acquiring desirable knowledge, skills, attitudes and societal values.
* To help teachers determine the effectiveness of their teaching technique and learning materials.
* To help motivate students to achieve more as they discover their progress or lack of progress in a given task.
* To encourage students to develop sense of discipline and systematic study habits.
* To acquaint parents or guardians with their children’s performance.
* To predict the general trend in the development of the teaching –learning process.
* To make reliable decision about educational planning.
* To provide educational administrators with adequate information about teachers’ effectiveness and school needs.

In summary teaching and learning is used for instructional, administrative, guidance and counseling and research purposes.

Many researchers have long investigated factors that affect the academic achievement of students in science. One of the factors that have been investigated for its effects on biology teaching and learning is classroom environment. According to Talton and Simpson (2006) classroom environment is composed of six areas; the emotional climate of science classroom, science curriculum, physical environment of science classroom, science teacher, students in the science classroom, friends’ attitude toward science. Talton and Simpson stated that there exists a significant correlation between attitude towards science and all the classroom environmental variables and that these affect students’ achievement in science particularly biology. Manoussou (1999) investigated the relationship between attitudes toward biology teaching and learning of Greek students; and found significant correlation between attitudes toward biology classroom environment and teaching and learning in biology; and concluded that classroom environment is an important factor that develops positive achievements towards biology. Simpson and Troost (2002) also emphasized that if students experience an unpleasant punishment in science classroom the little science knowledge that they learn may disappear because the classroom environment is not suitable and will affect the students’ academic achievement. In the laboratory practical work the teacher should create good atmosphere by organizing the lesson that would be interactive and attractive to students either in group or individually. Teaching method is another factor in academic achievement especially cooperative learning approach which encourages students to work together in small groups and to use a variety of activities to improve their understanding of subject matter. Inquiry instructional approach encourages students to extend their thinking and express their ideas in a variety of ways through exploring and experiencing their environment through guided or unguided learning activities. inquiry approach which involves students gathering information, collecting and interpreting data, formulating hypotheses and drawing logical conclusions; (Scheneider, Marx & Soloway, 2001). It could be therefore possible for effective learning to be attained if biology subject will be taught practically through the use of inquiry method in the laboratory or outside the laboratory. Laboratory method in science lessons has an important position among instructional approaches for meaningful learning. It is generally believed that science is better learnt in an applied manner through laboratory activities. The students in doing experiments construct the bases for learning science because practical work involves the use of five senses which enable the students to understand and retain the knowledge they acquired through the process of teaching and learning; this makes them behave like scientists. Laboratory experiment could therefore enhance students’ academic achievement through practical skills (Weinburgh & Englehard, 2009).The teacher has always been considered a crucial factor affecting learners in biology and science in general. Students always identify the teacher as the most important element in a classroom learning environment. The teacher should always create good atmosphere by interacting with the students freely in the laboratory to make the lesson not boring and at the same time maintains discipline; such attitude promotes academic achievement (Ozkan, 2003). Several researchers like Ozkan (2003); Scheneider Marx and Soloway (2001) have commended on the attitudes of students, teachers, teaching methods, laboratory activities, classroom environment and how they affected students’ academic achievement in biology. However, this study is particularly interested in investigating the availability and utilization of laboratory resources in teaching and learning Biology in secondary schools.

**Theoretical Framework**

**Piaget’s Cognitive Constructivist Learning Theory.**

Piaget’s cognitive constructivist theory was propounded in (1973) and proposed that children progress through a sequence of four stages, assumed to reflect qualitative differences in children’s cognitive abilities. Limited by the logical structures in the different developmental stages, learners cannot be taught key cognitive tasks if they have not reached the particular stage of development. Piaget emphasized on the holistic approach to learning. To him a child constructs understanding through exploring and experiencing his or her environment. Later in (1985) Piaget expanded this theory to explain how new information is shaped to fit with the learner’s existing knowledge, and existing knowledge is itself modified to accommodate the

new information. The major concepts in this cognitive process include:

* Assimilation: it occurs when a learner perceives new objects or events in terms of existing schemes or operations. This information is compared with existing cognitive structures.
* Accommodation: it occurs when existing schemes or operations have been modified to account for a new experience.
* Equilibration: it is the master developmental process, encompassing both assimilation and accommodation. Anomalies of experience create a state of disequilibrium which can be only resolved when a more adaptive, more sophisticated mode of thought is adopted. Piagetian constructivist theory generally regards the purpose of education as educating the individual child in a fashion that supports the child’s interests and needs; consequently, the child is the subject of study, and individual cognitive development is the emphasis. This is a child-centered approach that seeks to identify, through scientific study, and the natural part of cognitive development. It also assumes that learners come to classrooms with ideas, beliefs, and opinions that need to be altered or modified by a teacher who facilitates this alteration by devising tasks and questions that create dilemmas for the learners. Considering the educational reflections of this theory, Piaget sees the child as continually interacting with the world around the child, solving problems that are presented by the environment and learning occurs through taking action to solve these problems. The laboratory work in this study will also be based on these principles. Within Piaget’s theory, the basis of learning is discovery: to understand is to discover, or reconstruct by rediscovery and such conditions must be complied with if in the future individuals are to be developed who are capable of production and creativity and not simply repetitive. According to Piaget, children go through stages in which they accept ideas they may later discard as wrong. Understanding, therefore, is built up step by step through active participation and involvement. Piaget further states that children begin to think logically between the age of 8 and 11 years, a stage he called the concrete operational stage of development. The average age for senior secondary schools year one (SSI) students (the targeted population for the study) is 11 years and above which implies that learners at this age can apply logical thought to practical works and be able to understand them better.

Laboratory activities require meaningful learning, i.e. learning that involves critical and creative thinking. Piaget’s ideology supports this with the idea of logical thinking. This implies that teachers should create situations that would help the learners to discover facts by themselves. In this case, the teacher should establish an explorative environment for the learners to explore facts or truth by themselves. Prepackaged information can lead only to rote memorization of facts. Rote memorization is of no substantial benefit to the learner because it is not of much benefit in the exploration of the environment and the solution of problem. Individual acquires information through his interaction with the materials and the environment. Such information is retained and utilized for the solution of the environmental problem. Piaget’s cognitive constructivist learning theory is related to the present study the availability and utilization of laboratory resources in teaching and learning biology in secondary schools; because laboratory work encourages students’ active participation, critical thinking, problem solving abilities and others. Hence this proposition/assumptions will be embedded in the instructional strategy.

**Vygotsky’s Social Constructivist Learning Theory**

Vygotsky is one amongst those who believe that children actively construct their knowledge. Vygotsky (1962) viewed cognitive development as a result of a dialectical process, where the child learns through shared problem solving experiences with someone else, such as teachers, parents, siblings and peers. As a social constructivist theorist, Vygotsky emphasizes the social contexts of learning and the fact that knowledge is mutually built and constructed. It also emphasizes the benefits of collaboration in learning and with a more skilled tutor; an individual will facilitate transition from learners’ zone of proximal development to new levels of skills and competences. Zone of proximal development (ZPD) is Vygotsky’s term for the range of tasks that are too difficult for children to master alone, but can be learnt with the guidance and assistance from adults or more skilled children working independently. This implies that the science teacher should act as a facilitator by gradually withdrawing explanation, hints and demonstrations until the student is able to perform the skill alone. This will encourage the students to learn from previous knowledge they had before coming to school or the knowledge they already have to build the new knowledge.

Vygotsky (1962) also emphasized that in the practical class the science teacher is expected to sensitize learners to their environment, develop critical thinking, encourage creative thinking and encourage exploration that will enhance self directed and cooperative learning amongst the learners. Vygotsky’s theory also encourages social learning and recognizes that learning involving group activities in the laboratory could improve students’ academic achievement. Vygotsky theory is related to the present study which is survey on the availability and utilization of laboratory resources in teaching and learning biology because it supports the view that in the laboratory, students interact with the resources or with one another in the course of practical learning .This theory plays an important function in education to guide students in learning the skills that are necessary in the culture in which they live. The teacher according to Vygotsky’s view should also establish many opportunities for students to learn with the teacher and more skillful peers. In this respect it is evident from this theory that science should be taught in such a way that students will be able to apply the knowledge outside the classroom. Practical activities in the laboratory can help achieve this. Looking at the constructivist theory as postulated by Vygotsky in the context of this study we find that achievement in biology largely depends on the learner and the environment itself and then the interactions that exist between the learners. The implication of this is that the science teacher must give the learners the opportunities to construct, produce and use experience that is meaningful to their understanding of their environment. When this is done, then they can comfortably think, reason, perceive, talk and reflect about their environment. The expectation within this study may require that learners are given the opportunities to interact with their peers, classmates and teachers in order to socially construct meaningful knowledge about their environment. Such knowledge construction will equally enhance the practical skills and subsequently better achievement in biology. The child’s interaction with other people is important in the development of the child’s view of the world. Through exchange of ideas with other people the learner becomes aware that self-criticism is possible only in the social interaction. Vygotsky’s theory is related to the present study which is the survey on the availability and utilization of laboratory resources in teaching and learning biology in secondary schools, because in the laboratory, students interact with the materials or with one another in the course of practical activities. Hence the result of this study will help to validate the theories.

**Empirical studies**

There are several related studies to the survey on the availability and utilization of laboratory resources in teaching and learning biology. Ona (2007) in a study examined the effects of integrating theory with practicals on students’ achievement in biology. Four research questions and three null hypotheses guided the study. A quasi experimental design was adopted for the investigation. A sample of ninety four schools was used for the study. From the result of the study, it was observed that students perform poorly in biology examinations because of the theoretical method of teaching that dominate most classrooms. As a result of this, students lack necessary skills which are the ultimate goal of any scientific and technological development. The study also revealed that those students’ who were taught biology through integrating theory with practical which utilizes biology resources improved tremendously in their performance and acquisition of biology skills. It was therefore recommended that theoretical aspect of teaching biology should not be separated from practical activities. Additionally, efforts should be made by the government to provide necessary materials and equipment needed for meaningful and functional scientific knowledge in our schools. This result shows that performance of students in biology had been poor over the years. Chukelu (2009) in a review of the effects of biology practical activities on students’ process skills acquisition in Abuja municipal Area council revealed that practical activity method of teaching biology which utilizes resource materials was more effective in fostering students’ acquisition of theoretical learning in biology. A quasi experimental design was adopted by the researcher. Three research questions guided the study with two hypotheses. The result of the study proved that, it is not enough to teach students without using materials which does not appeal to the senses (sight, hearing, touch, smell and taste) with the notion that they should have known them before then. The research further revealed that experimental group taught using biology practical activities performed better than the control group. Chukelu revealed that modification of teaching methods only does not guarantee hundred percent efficiency if materials are not utilized. Chukelu recommended the use of materials for teaching and learning. She further reported that despite the various efforts made to improve students’ performance in biology, their performance is still poor. A survey research conducted by Okoli (2006) on the effects of laboratory approach on academic achievement of biology students of different levels of scientific literacy revealed that in biology particular, the trend has shown that they have consistently been achieving low. Okoli attributed low performance of students in biology to careless reading, wrong use of time, and inappropriate use of material resources while on the part of the teachers, incompetence and laziness, wrong experimental set-up and misinterpretation of results. The survey recommended that laboratory resources which are always complained by students and teachers to be lacking should be provided.

Additionally, adequate laboratory resources should be made available to schools and teachers should utilize resource materials when teaching by adopting laboratory teaching methods. A survey research on the equality in the distribution of educational resources in Enugu state secondary schools conducted by Chikani (1997), he argued that since resources are inadequately distributed in schools, there is every tendency that poor performance recorded in results is its output. His findings further revealed that the methods adopted by the state and federal ministry of education in the provision, distribution and management of human and material resources affected not only the teachers’ teaching methods but also the performance of the students whom they teach.

The results also indicated that 4.9% of Nigerian schools have no teaching and learning resources, equipment for science, home economics, arts and sports were lacking in majority of the schools. The product of the deficiencies is poor performance of students in various levels of examinations. He recommended that the government should distribute financial, human and material resources equally to all schools irrespective of location or level. He also recommended monitoring of the distributed resources for effective utilization of such resources. In a similar study conducted by Okoli and Osuafor (2010) on the status of human and material resources for teaching the basic sciences in senior secondary schools in Anambra state, forty eight secondary schools were sampled for the study. The schools were assessed for the availability and adequacy of science teachers, laboratory assistants/attendants, laboratories and laboratory equipment. Four research questions guided the conduct of the research. Results show that both human and material resources for teaching the basic sciences in secondary schools were inadequate. Based on this, the paper recommended among other things that adequate number of science teachers, laboratory assistants/attendants and laboratory materials be provided by the government for effective teaching and learning of basic sciences in secondary schools. Akano (2006) in a survey of the status of human and material resources for teaching the basic sciences in Colleges of Education in Niger State revealed that human and material resources in colleges of education are inadequate. Akano recommended that all well meaning Nigerians should support the government in provision of resources to higher institutions. In the same vein, Aroh (2006) in an experimental study of the effects of videotaped instruction on secondary school students’ achievement and interest in mathematics reported that utilization of videotaped instruction enhanced students performance in any subject while students taught without the videotaped instruction performed poorly. From the study, he recommended the appropriate use of resource materials when teaching science subjects for permanent transfer of learning to take place. The trend in achievement of students in biology has shown that they have constantly been recording low performance. Nwagbo (2006) on the study of the effects of two teaching methods on the achievement of biology students maintained that most of the conventional (lecture) methods presently employed in teaching biology in secondary schools have not yielded much dividend judging from the poor performance of students in west African senior certificate examination. Aguele and Imhanlahim (2006) in a study that compared three instruments for assessing biology teacher’s effectiveness in the instructional process in Edo state reviewed the following performance of students in biology for seven years (1995-2001). They found that 24% of the students had grade A-C and 27% had between D4-P8 while 53% failed. Their findings were based on the West African Senior Secondary Certificate Examination annual report. From the above researches, it has been confirmed beyond doubt that performance of students in biology has always been very low. This calls for restructuring of teachers and students oversight to the effective utilization of human and material resources for teaching and learning.

**Summary of Literature Review**

The review of literature was presented under conceptual framework, theoretical framework, review of empirical studies and summary literature review. In the conceptual framework, it was noted that biology as a branch of science required the use of laboratory resources to teach students effectively if maximum educational objectives are to be achieved. The use of laboratory resources for teaching biology is very beneficial to the learners, teachers as well as the entire society hence its implementation is highly advocated in the teaching learning process. Utilization of laboratory resources involves seven basic functions: planning, co-coordinating, directing, organizing, supervising, monitoring and evaluation. Factors militating against effective utilization of laboratory resources include lack/insufficient fund, training, over enrolment of students into secondary schools, lack/inadequate materials for use in the laboratories, ignorance of teachers and students on effective use of resources, indiscipline among teachers and students, lack of qualified personnel to handle biology practical classes effectively, inappropriate documentation of resources, lack of integrity, political constraints as well as logistics problems. The above problems could be effectively curbed through proper utilization of resources in biology laboratories and maintenance of facilities.

**CHAPTER THREE**

**RESEARCH METHOD**

In this chapter, the researcher describes the procedures for carrying out the study. These include: design of the study, area of the study, population of the study, sample and sampling technique, instrument for data collection, validation of the instrument, reliability of the instrument, method of data collection and procedures for data analysis.

**Design of the Study**

Descriptive survey research design was used for the study. According to Ali (2006), descriptive survey design is concerned with the documentation and description of what exists or the present status of existence or absence of what is being investigated without any manipulation of what caused the event. It develops a profile on what is and not why it is so. It is considered appropriate for the study because it is based on the views, opinions of respondents as well as resources available in the area of study.

**Area of Study**

The study was conducted in all the nine(9) government secondary schools located in Enugu North Local Government Area which is found in Enugu state. Enugu North is a local government Area of Enugu state, Nigeria. Its headquarters are in the city of Enugu, it covers an area of 106 km2 and a population of 244,852 at the 2006 census. It has a total number of nine (9) government owned secondary schools.

**Population of the Study**

The population of the study comprised of the entire thirty six (36) biology teachers biology teachers within the nine (9) government secondary schools in Enugu North LGA. (PPSMB)2017/18 academic year.

**Sample and Sampling Technique**

The entire thirty six (36) biology teachers in the nine(9) secondary schools in Enugu North LGA of Enugu state were selected for the study. Therefore there was no need for sampling.

**Instrument for Data Collection**

A structured questionnaire called Questionnaire on Availability and Utilization of Laboratory Resources in teaching and learning biology (QAULR) was used for data collection. Questionnaire items were constructed to afford answers to the research questions formulated to guide the study. The questionnaire consisted of two sections and is divided into four (4) sections (A-C). Section A was designed to obtain background information from respondents while sections B-C were to elicit information from the respondents to answer the four (4) research questions. Section A was the Bio-Data while sections B-C was in clusters. The entire questionnaire contained sixty (60) items.

Section B was structured with two (2 options of yes/no (available/not available) while sections C-D were Likert type of scale.

Section A was tagged Availability of Laboratory Resources. Respondents were requested to indicate their level of agreement (Yes/Available) or disagreement (No/Not Available) to materials available in their biology laboratories.

Section B was tagged Provision of Laboratory Resources. It consisted of the same twenty (20) items as listed in section A above. It was a four (4) point type of scale comprising of Very Great Extent (VGE), Great Extent (GE), Moderate Extent (ME) and Low Extent (LE). The instrument measured the extent to which laboratory resources are adequately provided for in secondary schools.

Section C and D was tagged Laboratory resources utilization it consisted of the same twenty (20) items as listed in section B above respectively with a four (4) point scale of Very Great Extent (VGE), Great Extent (GE), Moderate Extent (ME) and Low Extent (LE)

 It measured the extent to which teachers and students effectively utilize resources available to them.

**Validation of the Instrument**

The instrument for data collection was validated by a specialist in Science Education University of Nigeria Nsukka, and two (2) other specialists in measurement and evaluation Science and Vocational Education, Godfrey Okoye University, Thinker's Corner, Enugu for face validation. Their corrections and suggestions were effected and the final draft of the instrument was produced.

**R**e**liability of the Instrument**

After trial testing, the instrument (QAULR) was subjected to a test of internal consistency to ensure its reliability. Research question 1 was analyzed using frequency and percentage.

Research questions 2-3 cronbach alpha (x) was used. The scores were used to calculate the variations. The coefficient of reliability was found to be 0.93.

**Method of Data Collection**

The instrument was collected from the respondents personally by the researcher. The researcher administered the questionnaire personally to the respondents and on the spot collection was made. This method enabled the researcher to obtain at least 100% return of the filled questionnaires; it also helped the researcher to offer assistance to the respondents when needed.

**Method of Data Analyses**

Research questions one (1) was answered using frequency percentages. this was appropriate because it had only two response options (Yes/No)Responses that have a percentage score of 50% and above were rated positive(available)while percentage score below 50% were rated negative(not available).

Research questions 2-3 were answered using mean and standard deviation. for four(4) points scale responses, values of 4, 3, 2 and 1 for Strongly Agree/Very Great Extent (SA/VGE), Agree/Great Extent (A/GE), Disagree/Moderate Extent (D/ME) and Strongly Disagree/Low Extent (SD/LE) respectively were assigned to responses from which a mid-point mean value was calculated.

Formular

∑ = Sum of

X = Nominal Value

N= Total Number of Respondents

Formula for Standard Deviation

 ∑ =*FX*

 *N*

*∑ =*sum of

F = frequency

X= Nominal value

N = Total number of respondents

The numeric values assigned to a different scaling items used as follows:

SA/Very Great Extent = 4

A/Great Extent = 3

D/Medium Extent = 2

SD/Low Extent = 1

 X = 4 + 3 +2 + 1

 4

 = 2.5

**Decision Rule**

The decision rule was based on the values of the calculated mean of the response options numerical values.

Therefore any item of mean score which is 2.5 and above were agreed by the researcher as positive influencing the questionnaire items, while any point that is below 2.5 were disagreed by the researcher as negative

**CHAPTER FOUR**

**PRESENTATION OF RESULTS**

This chapter presents the data obtained from the responses given by the respondents on the questionnaire. The results are presented according to the research questions.

**Table 1: Observational Checklist on Availability of Laboratory Resources for Teaching and Learning Biology in secondary schools in Enugu North LGA, Enugu State.**

**Research Question 1:** What extent are learning resources available for teaching and learning of biology in biology laboratories of secondary schools?

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **S/N** | **ITEMS**  | **Available****frequency**  | **Percentage**  **(%)** | **Not Available** **frequency**  | **Percentage** **(%)** | **Decision**  |
| 1 | Biology Laboratory | 17 | 47.2% | 3 | 8.3% | Not Acceptable |
| 2 |  Wall Chart | 17 | 47.2% | 8.3 | 8.3% | Not Acceptable |
| 3 | Petri Dishes  | 20 | 55.5% | 0 | 0% | Acceptable |
| 4 | Beakers | 20 | 55.5% | 0 | 0% | Acceptable |
| 5 | Bunsen Burner | 12 | 33.3% | 8 | 22.2% | Not Acceptable |
| 6 | Hand Lens | 18 | 50.0% | 2 | 5.56% | Acceptable |
| 7 | Conical flask | 17 | 47.2% | 3 | 8.3% | Not Acceptable |
| 8 | Tripod stand | 13 | 36.1% | 7 | 19.4% | Not Acceptable |
| 9 | Chemicals | 19 | 52.8% | 1 | 2.8% | Acceptable |
| 10 | Models | 15 | 41.7% | 5 | 13.9% | Not Acceptable |
| 11 | First Aid Box | 11 | 30.6% | 9 | 25.0% | Not Acceptable |
| 12 | Dissecting Kits | 12 | 33.3% | 8 | 2.2% | Not Acceptable |
| 13 | Fire Extinguisher | 2 | 5.6% | 18 | 50.0% | Not Acceptable |
| 14 | Insect Nets | 14 | 38.9% | 6 | 16.7% | Not Acceptable |
| 15 | Filter papers | 17 | 47.2% | 3 | 8.3% | Not Acceptable |
| 16 | Litmus paper | 17 | 47.2% | 3 | 8.3% | Not Acceptable |
| 17 | Test tube rack | 14 | 38.9% | 6 | 16.7% | Not Acceptable |
| 18 | Spring balance | 11 | 30.6% | 9 | 25.0% | Not Acceptable |
| 19 | Teachers | 17 | 47.2% | 3 | 8.3% | Acceptable |
| 20 | Laboratory Assistants | 3 | 8.3% | 17 | 47.2% | Not Acceptable |

The data in table 1 shows that 4 items had a high frequency percentage out of the 20 listed items on the availability of laboratory resources for teaching and learning Biology in government secondary schools in Enugu north LGA of Enugu state. Specifically items 3,4,6 and 9 had frequency percentage range of 55.5,55.5,50.0 and 52.8 respectively. The values were up to the average and above ,which were interpreted as available, and therefore indicated that Petri dishes, hand lens, beakers, tripod stand, and chemicals are the available laboratory resources, on the other hand, low frequency percentage of 3.3,5.6,8.3,30.6,30.9,33.3,38.9,47.2,,38.9,47.2 were obtained for items 1,2,5,7,8,10,11,12,13,14,15,16,17,18,19,20,respectively. The values indicate that Biology laboratories, wall charts ,Bunsen burner, conical flask, charts, models, first aid boxes, insect nets, Laboratory assistants, spring balance, insect nets and dissecting kit, Fire extinguisher, tripod stands, teachers are not available.

**Table 2 :Mean scores on the extent by which laboratory resources are provided for in secondary schools in Enugu North LG of Enugu state**

**Research Question 2:**

To what extent are these laboratory resources adequately provided for Secondary Schools in Enugu North LGA, Enugu State?

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| S/N | ITEMS  | Very Great Extent |  Great Extent | Medium Extent | Low Extent |  No. | Mean (X) | Decision  |
| 1 | Biology laboratory | 616 | 39 | 02 | 33 | 2031 | 1.55 | Rejected |
| 2 | Wall chart | 624 | 618 | 48 | 44 | 2054 | 2.7 | Accepted  |
| 3 | Petri dishes | 728 | 824 | 12 | 44 | 2054 | 2.6 | Accepted |
| 4 | Beakers | 936 | 1030 | 12 | 00 | 2068 | 3.4 | Accepted  |
| 5 | Bunsen burner | 728 | 412 | 36 | 66 | 2040 | 2.0 | Rejected |
| 6 | Hand lens | 624 | 618 | 36 | 55 | 2056 | 2.6 | Accepted  |
| 7 | Conical flask | 936 | 824 | 24 | 11 | 2045 | 2.75 | Accepted |
| 8 | Tripod stand | 520 | 618 | 714 | 22 | 2044 | 2.3 | Rejected |
| 9 | Chemicals | 728 | 39 | 612 | 44 | 2043 | 2.5 | Accepted |
| 10 | Microscope | 520 | 618 | 48 | 55 | 2041 | 2.15 | Rejected |
| 11 | Models | 832 | 927 | 14 | 22 | 2046 | 2.3 | Rejected |
| 12 | First Aid Box | 28 | 1339 | 36 | 22 | 2043 | 2.2 | Rejected |
| 13 | Dissecting Kits | 832 | 927 | 14 | 22 | 2045 | 2.25 | Rejected |
| 14 | Fire Extinguisher | 312 | 412 | 36 | 1010 | 2040 | 2.0 | Rejected |
| 15 | Insect Nets | 525 | 824 | 36 | 44 | 2049 | 2.4 | Rejected |
| 16 | Litmus paper | 1248 | 618 | 36 | 00 | 2042 | 1.6 | Rejected |
| 17 | Spring balance | 420 | 618 | 48 | 66 | 2042 | 2.2 | Rejected  |
| 18 | Test tube rack | 1144 | 412 | 48 | 11 | 2046 | 2.45 | Rejected |
| 19 | Teachers | 1664 | 412 | 00 | 00 | 2034 | 1.8 | Rejected |
| 20 | Laboratory assistants | 936 | 39 | 510 | 33 | 20 | 1.6 | Rejected |
|  |  |  |  |  |  |  |  |  |

Table 2 above shows high mean scores were obtained from the twenty listed items. specifically item2,3,4 and 9 had mean values of 3.0,3.0,2.7 and 2.5 respectively. The values were up to 2.5 and above which was interpreted as accepted which indicated that hand lens, wall charts, Petri dishes, beakers and chemicals were adequately provided for teaching and learning biology in secondary schools. On the other hand low mean scores of 2.4,2.4,2.0,2.15,2.4,2.2,2.2,2.45,2.2,2.2.2.15,2.0,1.80 and 1.80 respectively. the values were less than 2.5,which indicate that biology laboratories, Bunsen burners, conical flasks, tripod stands, microscopes, first aid boxes, fire extinguishers, litmus paper, teachers insect nets, dissecting kits, first aid boxes and laboratory assistants were not adequately provided for the teachers to utilize in teaching and learning biology in secondary schools.

**Table 3:** Mean scores on the extent teachers utilize laboratory resources in teaching and learning biology in secondary schools

**Research Question 3**

**To what extent do teachers utilize biology resources in teaching and learning biology in Enugu North Local Government area, Enugu State?**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| S/N | ITEMS  | Very Great Extent |  Great Extent | Medium Extent | Low Extent |  No. | Mean (X) | Decision  |
| 1 | Biology laboratory | 728 | 618 | 63 | 33 | 2032 | 1.6 |  Rejected |
| 2 | Wall chart | 416 | 721 | 510 | 33 | 2050 | 2.5 | Accepted  |
| 3 | Petri dishes | 728 | 927 | 24 | 11 | 2060 | 3.0 | Accepted  |
| 4 | Beakers | 624 | 618 | 714 | 00 | 2052 | 2.6 | Accepted  |
| 5 | Bunsen burner | 520 | 412 | 36 | 77 | 2049 | 2.45 | Rejected |
| 6 | Hand lens | 520 | 412 | 816 | 33 | 2049 | 2.55 | Accepted |
| 7 | Conical flask | 832 | 824 | 36 | 11 | 2045 | 2.15 | Rejected |
| 8 | Tripod stand | 624 | 515 | 510 | 44 | 2045 | 2.15 | Rejected |
| 9 | Chemicals | 1040 | 412 | 36 | 33 | 2061 | 3.05 | Accepted |
| 10 | Microscope | 520 | 824 | 12 | 66 | 2042 | 1.6 | Rejected |
| 11 | Models | 936 | 39 | 12 | 77 | 2044 | 2.1 | Rejected |
| 12 | First Aid Box | 14 | 921 | 48 | 88 | 2041 | 2.0 | Rejected  |
| 13 | Dissecting Kits | 312 | 26 | 918 | 66 | 2042 | 2.1 | Rejected  |
| 14 | Fire Extinguisher | 312 | 39 | 510 | 99 | 2040 | 2.0 | Rejected  |
| 15 | Insect Nets | 312 | 515 | 510 | 77 | 2044 | 2.2 | Rejected  |
| 16 | Litmus paper | 1144 | 515 | 24 | 22 | 2065 | 2.2 | Rejected |
| 17 | Spring balance | 728 | 412 | 510 | 44 | 2054 | 2.7 | Accepted  |
| 18 | Test tube rack | 936 | 618 | 36 | 22 | 2060 | 2.1 | Rejected |
| 19 | Teachers | 1664 | 39 | 12 | 00 | 2075 | 2.4 | Rejected |
| 20 | Laboratory assistants | 416 | 26 | 510 | 44 | 2036 | 1.80 | Rejected  |

Table 3 above shows high mean scores were obtained from the twenty listed items. specifically item 2,3,4,9, and 17 had a mean values of 3.0,3.0,2.7,2.6,and 2.5 respectively. The values were up to 2.5 and above which was interpreted as accepted which indicates that Hand lens, wall charts, Petri dishes, beakers, chemicals and spring balance were utilized by the teachers.

On the other hand low mean scores of 2.4,2.4,2.0,2.15,2.4,2.2,2.2,2.45,2.2,2.2.2.15,2.0,1.80 and 1.80 respectively. the values were less than 2.5,which indicate that biology laboratories, Bunsen burners, conical flasks, tripod stands, microscopes, first aid boxes, fire extinguishers, litmus paper, teachers insect nets, dissecting kits, first aid boxes and laboratory assistants were not being utilized by the teachers.

**CHAPTER FIVE**

**DISCUSSION, CONCLUSION AND SUMMARY**

The research findings based on the data presented in chapter four are interpreted and discussed in this chapter. The outline of the chapter is as follows:

1. Discussion based on the three research questions.

2. Conclusion reached from the findings of the study.

3. Educational implications of the findings of the study.

4. Recommendations.

5. Limitations of the study.

6. Suggestions for further research.

7. Summary of the study.

**Discussion Based on the Three Research Questions**

Discussion based on the three research questions are done under the following

subheadings:

 The availability of laboratory resources in secondary school in Enugu North Local Government Area of Enugu state.

 The extent of adequacy in the provision of laboratory resources to secondary schools in Enugu Local Government Area of Enugu state.

 The extent of utilization of laboratory resources provided to secondary schools to in Enugu Local Government Area of Enugu state.

**Table 1:**

**Checklist on the Availability of Biology Laboratory Resources in Secondary Schools in Enugu North LGA of Enugu State.**

**Research Question 1:** What extent are learning resources available for teaching and learning of biology in biology laboratories of secondary schools?

The result of the study as shown in table one (1) revealed that most of biology

laboratory human and material resources are not available in secondary schools in Enugu North LGA . The opinion of the respondents on Availability of Laboratory Resources

 Assessment revealed that material resources such as Hand lens, chemicals ,beaker, petri dishes are available, at least one of the brands of the resources is present in all biology laboratories of secondary schools in Enugu North LGA. The findings of this study are in contrast with the findings of Okoli and Osuafor (2010) that almost all the required biology laboratory resources are not available in the schools. Among the resources they reported not being available are: flask, tripod stand,models,fire extinguishers, filter papers, litmus papers, test tube stands and laboratory assistant, wall charts and dissecting kits which is in accordance with the earlier findings of Okoli and Osuafor (2010).

 This goes to affirm the fact that most laboratory resource are not available in secondary schools in Enugu North LGA of Enugu state Nigeria.

**Table 2:**

**Research Question2**

**To what extent are the biology laboratory resources adequately provided for to secondary schools in Enugu North LGA**

The result of the study as revealed in table 2 indicates that, laboratory

resources are not adequately provided for in secondary schools in Enugu North LGA Enugu State.

Judging from the table of provision of Laboratory Resources in teaching and learning Biology in secondary schools Enugu North LGA, some of the laboratory resources are observed to be provided for although materials like fire extinguishers flask, tripod stand, models, teahers,insect nets, filter papers, litmus papers, test tube stands and laboratory assistant, wall charts and dissecting kits which were provided for at very low extent and their quantity and quality were not measured.This report is in agreement with the findings of Okoli and Osuafor (2010) who opined that models, reagents/chemicals, beakers and test tubes are the only resources adequately provided to schools. Judging from the reports of this research finding, most resources are only provided to secondary schools but the quantity and quality of the resources provided to such secondary schools are inadequate. The findings affirm with the work of Nwankwo et al (2011) on the state of physical facilities in secondary schools that resources are not adequately provided for when viewed from the stand point of quality and quantity. The findings equally agree with the observations of Akano (2006), Okoli and Osuafor (2010) that human and material resources in secondary schools are grossly inadequate. This can affect its utilization in teaching and learning of biology.

**Table 3:**

**Research Question 3**

**What Extent are biology laboratory resources utilized by teachers in teaching and learning biology in secondary schools**

Table 3 depicts Utilization of laboratory resources by teachers in teaching and learning Biology. The results obtained show that most laboratory resources are not adequately and effectively utilized by teachers due to inadequacy in the quantity and quality of such resources provided to secondary schools. In a situation whereby the desired resources to use for teaching and learning are not available, teachers are left with no other option than to change the original method of teaching such topics which will not require resource utilization hence, adopt substitutional method which might not be in the best interest of the secondary school students. This has hampered the actualization of biology educational objectives. This goes to affirm the findings of Imogie (2010) that resources are not effectively utilized in secondary schools. With reference to the above report, Okoli and Osuafor (2010) opined that resources which are effectively utilized in secondary schools are wall charts, Petri dishes, beakers, hand lens, conical flask, microscopes and models. It is worthy to note that the extent of utility of laboratory resources depends on their level of availability. The inadequacy in the quantity and quality of such resources has invariably affected their utilization.

From the findings of the result utilization of laboratory resources in teaching and learning biology in secondary schools by the students indicates that not all the listed items are being utilized by the students. This is because students’ enrolment into science courses in secondary schools is always on the increase. Meanwhile, laboratory technologists/assistants are moderately utilized while teachers are greatly utilized. The findings are in consonance with the findings of Ejionueme (2010) and Imogie (2011) who stated that increase in students’ enrolment has created an imbalance in teacher to student ratio. Nwankwo et al (2011) equally observed that students do not make effective use of laboratory resources because the resources are inadequate. Oladipo (2008) too noted that students procurepersonalized dissecting kits or even computers if they want to make effective use of suchresources during and after laboratory activities instead of waiting for limited number ofdepartmental dissecting sets. All the above assertion point to onefact: only laboratory resources that are adequately provided in biology laboratories of secondary schools are effectively utilized. These over populated classes are major problems facing the actualization of secondary school biologyeducational objectives. When classes are overpopulated, some students will be standing, some will be sitting and in some severe cases, others will be standing outside the laboratory to listen to teachers. In such a situation, the teachers are forced to adopt automatic teaching method to suit the present condition.

**Conclusion Reached from the Findings of the Study**

The purpose of the study is to find out the availability and utilization of laboratory resources in Enugu North LGA of Enugu state. Findings made from this study showed that : most laboratory resources are available. Among the twenty (20) listed items, only four (4) were unavailable. Based on the findings of the study, the following conclusions were made:

 Most Biology laboratory resources are available in secondary schools in Enugu North LGA, Enugu state. Among the 20 resources considered in the study, only four (4) among the resources were not available, such as spring balance, insect nets, dissecting kits and laboratory assistants which makes it almost impossible for only the teachers to supervise and control large classes thereby affecting the utilization and actualization of the teachers objectives.

The extent to which the resources for teaching and learning biology are provided for in secondary schools is not satisfactory because some resources were provided for at very low extent and some had poor quality and low quantity. The present state of the provided resources to secondary schools invariably affected its utilization in biology laboratories. Hence, the extent of utilization of resources in secondary schools is paralyzed while only resources that are commonly available are effectively utilized.

 Equally revealed in the findings are the extent to which teachers and students utilize laboratory resources, which revealed that effective utilization was affected by progressive increase in students’ enrolment without proportionate increase in resources, ignorance on the proper use of resources due to lack of training and poor supervision of laboratory resources, which could be controlled by adopting some strategies such as constant training, funding, planning, organizing, co-coordinating, directing, supervising, monitoring and evaluating biology laboratory resources in secondary schools in Enugu North LGA.

**Educational Implications of the Findings of the Study**

Availability and utilization of laboratory resources in teaching and learning biology is vital in the actualization of biology educational objectives of teachers. The findings of the study have the following implications to the biology teachers biology students, education administrators, policy makers, researchers, curriculum planners and text book writers. The following recommendations were made in line with the results of the study:

The government, policy makers and non-governmental organizations should pay constant

attention to the unavailable laboratory resources and make sure they are provided for in good working condition, this will motivate teachers and students to put in their best in the teaching learning process which will invariably boost students performance in examinations, curtail purposeful protests and demonstrations of students and lecturers likewise inadequacies of resources in biology laboratories in secondary schools.

Adequate provision of laboratory resources to biology laboratories in secondary schools will reduce unnecessary accidents which have affected the quantity of resources provided to secondary schools through breakages, stealing, safety, negligence of laboratory rules and regulations but improve the quality of resources available to secondary schools. However, this improvement depends on training of laboratory utilizers on the proper use of laboratory resources. Therefore, the integration of biology laboratory resource utilization which entails comprehensive planning, supervising, directing, monitoring and evaluating of resources to biology laboratory by inspectors and supervisors of secondary schools will improve academic performance of students.

**Recommendations**

The following recommendations are made from the findings of the study.

* Efforts should be made by the governmental and non-governmental organizations together with the general public to provide adequate human and material resources to secondary schools.
* Unavailable resources should be improvised to achieve the best in the teaching and learning of biology in secondary schools. This will boost students’ active participation during and after biology practicals.
* Deserving teachers, students and laboratory assistants/technologists who have contributed in one way or the other to the availability, provision and utilization laboratory resources should be adequately rewarded and their remunerations promptly paid so that other laboratory resource persons could emulate their exemplary standards in the teaching-learning process.
* Biology laboratories in secondary schools should be adequately funded so that needed resources could be procured locally.
* Appropriate functional storage facilities such as refrigerators/freezers and infrastructural facilities such as electricity should be provided to secondary schools to ensure the sustainability and durability of resources provided to biology laboratories in secondary schools.
* Text book authors and publishers should incorporate the use of biology laboratory

resources in their textbooks in order to offer students the opportunity to learn how to use biology resources even when they are not guided.

**Limitations of the Study**

The researcher encountered the following difficulties while carrying out the research work.

Some of the teachers were reluctant in responding to the questionnaire. The researcher however persuaded the respondents. On the day for the administration of the instrument, some of teachers were not present in the school making the number of questionnaires anticipated to be distributed and retrieved from such secondary schools to reduce un number. Since the researcher cannot control this variable personally, the questionnaires was administered only to the teachers present in the school while those absent were disregarded.

Due to the fact that the number of the items were many, sixty (60 resources), the respondents easily get tired and bored after completing the first few pages of the work. This made some of them to complete the questionnaire without reading the content or even skipping some resources while responding to the questionnaire.

**Suggestions for Further Research**

The researcher felt that this work should not be considered conclusive, therefore she suggested that more work should be carried out in the fields of biology since the importance of availability and utilization of laboratory resources cannot be overemphasized. A research study should be carried out on the availability and utilization of laboratory resources.

**Summary**

The main purpose of this study is examine the availability and utilization of laboratory resources in teaching and learning biology in secondary schools Enugu North LGA of Enugu state.

The estimated population of the study consisted of thirty six (36) biology teachers from all the nine(9)secondary schools in Enugu North Local Government Area of Enugu state. There was no sampling.

Three structured research questions were used. The instrument was for data collection was validated by a specialist in Science Education University of Nigeria Nsukka, and two (2) other specialists in measurement and evaluation Science and Vocational Education, Godfrey Okoye University, Thinker's Corner. The questionnaires were administered to biology teachers in the secondary schools in Enugu North LGA and were collected by the researcher. The data collected was analyzed using mean, standard deviation and frequency percentage.

The result from the analysis showed that most biology laboratory resources are not available in secondary schools in Enugu North LGA of Enugu state. The extent to which biology laboratory resources are provided to the schools are not adequate both in quantity and in

quality when compared with the number of students’ population . It was also revealed that the inadequacy in the quantity of resources provided invariably affected its utilization.

 Some factors shared by respondents as being responsible for inadequacy in the provision, and utilization of biology laboratory resources include; insufficient fund, increase in students’ enrolment without proportionate increase in laboratory resources, lack of training, poor maintenance culture of laboratory utilizers, lack of constant supervision and evaluation of resources in biology laboratories.

**References**

Abolarin, D. O. (2006). Anti-Corruption Crusade Initiated Afresh by Obasanjo-Led Administration Deserves to be Widely Supported. Retrieved on 13/06/ from http://nigerianewspaper.com/education-system.htm

Adewale, J. G. & Anjorin, T. O. (2010). Effects of Formative Testing on Junior Secondary School Students Achievement in Integrated Science. *Institute of Education Journal,* 21 (2), 1-8.

Aguele, L. I. and Imhanlahim, (2006). Comparing Three Instruments for Assessing Biology Teachers’ Effectiveness in the Instructional Process in Edo State*. Journal of Social Science* 13(1), 67-70.

Akano, B. U. (2006). The Status for Human and Material Resources for Teaching the Basic Sciences in Colleges of Education in Niger State. *Proceedings of the 47th Annual Conference of STAN.* 27-32.

Akpokiere, R. (2004). Comparative Academic Achievement of Chemistry Students in Adequately and Inadequately Equipped Senior Secondary Schools in Niger state, Nigeria. *Unpublished M.ED Thesis.* University of Ilorin.

Ali, A. (2006). *Conducting Research in Education and Social Sciences*. Nigeria: Tashiwa Networks. Armstrong, M. (2006). *Human resource management practice*. London: Kogan Page. Retrieved on 03/06/2011 from <http://www.bartleby.com/65/x-/x-personne.html>

Armstrong, A. (2007). A Handbook of Human Resource Management Practice. Retrieved on 03/06/2011 from [www.booksites.net/download/chadwickbeech/Glossary.htm](http://www.booksites.net/download/chadwickbeech/Glossary.htm) Aroh, D. C. (2006). Effects of Video Taped Instruction on Secondary School Students Achievement and Interest in Mathematics. *An Unpublished M.ED Thesis*. University of Nigeria, Nsukka.

Adesoji, F. A. (2006). Modern strategies in the teaching of integrated science. In S.O. Ayodele (Ed.), *Teaching strategies for Nigeria secondary school*. Ibadan: Power House Press

 Publishers.

Afolabi, F. & Akinyemi, O. A. (2009). Constructivist problem-based learning technique and the academic achievement of Physics students with low ability level in Nigerian secondary schools. *Eurasian Journal of Physics and Chemistry Education. 1(1), 45- 51.*

Agbai, A. I. (2004). *Fundamental of science education.* Kaduna: Datura Publishers.

Agbenyeku, U. E. (2004). Effects of students’ participation in practical biology lessons on their learning outcome. *Unpublished M. Sc. Ed. Thesis.* Departmet of Science and

 Technology Education, University of Jos.

Agomouh, P. C. (2010). Effect of prior knowledge, exploration, discussion, dissatisfaction with prior knowledge and application (PEDDA) and the learning cycle (TLC) constructivist instructional models on students’ conceptual change and retention. *An Unpublished* *Ph.D thesis, University of Nigeria Nsukka*

Alebiosu, K. A. (1999). Effects of two cooperative learning models on senior secondary school students’ learning outcomes in chemistry. *Unpublished Ph.D Thesis.* Department of Science Education. University of Ibadan: Ibadan.

Ali, A. (1998). *Strategic issues and trends in science education in Africa*. Publishers

 international Ltd. Abajue street, Awada, Onitsha, Nigeria.

Ali, A. (2001). Effect of manipulating science materials and equipment on science process skills by Nigerian students, Jos*. Journal of Education 2(1*), 103-109.

Ali, A. (2006*). Conducting research in education and social science*. Enugu: Tashiwa Nation

 publishers.

Anekwe, J. U. (2006). Effect of constructivist-based instructional model on students’ interest and academic achievement in French in Anambra state. *Unpublished Ph.D Thesis* University of Port Harcourt.

Aniodoh, H. C. O. (2001). Foundational chemistry education and the chemistry teachers’ role; *Journal of Science and computer Education 3(2), 111-118.*

Antil, L. R., Jekins J. R., Wayne, S. K. & Vadasy, P. F. (1998). Cooperative learning:

 prevalence, conceptualization and the relation between research and practice. *American Educational Research Journal*, *35*(3), 419 – 423.

Aronson, J. (2002). *Improving academic achievement: impact on psychological factors on*

 *education*, Elsevier Inc, New York.

Awodi, S. & Timothy, J. (2001). Effects of inquiry and lecture methods on the performance o f high and low achievers in senior secondary school biology. *Journal of Science Teachers* *Association of Nigeria 82(12), 59-64*.

Babajide, V. F. T. (2010). Generative and predictive-observe-explain instructional strategies as determinants of senior secondary school students’ achievement and practical skill in physics. *Unpublished Ph.D Thesis. University of Nigeria*, *Nsukka.*

Bilesanmi-Awoderu, J. B. & Oludipe, D. I. (2002). Effectiveness of cooperative learning

 strategies on Nigerian junior secondary school students’ academic achievement in Basic Science. *British Journal of Education, Society and Behavioural Science. 2(3), 307- 325*.

Bruffe, K. A. (1995). *Sharing our toys: cooperative learning versus collaborative learning*. New York: Collier books.

Bruffe, R. (2012). Effective strategies for cooperative learning. *Journal of Cooperation and*

 *Collaboration in College Teaching, 10*(2), 69-75.

Bybee, R. W. & Champagne, A. B. (1995). The national science education standards: An

 achievable challenge for science teachers. *The Science Teacher Education, 62(1), 40- 45*

Caroselli, B. (1998). The residual effect of cooperative learning experiences: a two year follow – up. *Journal of Educational Research, 96(1), 15-20.*

Cengiz, T. (2010). The effect of the virtual laboratory on students’ achievement and attitude in chemistry. *Journal of educational science. 2(1), 37-53.*

Chime, C. E. (2010). Appraisal of Availability and Utilization of Instructional Materials for Teaching and Learning Mathematics in Secondary Schools in Udi Local Government Area of Anambra State. *An Unpublished M.ED Thesis*. University of Nigeria, Nsukka.

Chimezie, O. S, Ike, G. A. & Iwu, A. O. (2002). *New educational technology.* Nigeria: Onii Publishing House.

Chukelu, U. O. (2009). Effects of Biology Practical Activities on Students’ Process Skill Acquisition in Abuja Municipal Area Council. *An Unpublished M.ED Thesis.* University of Nigeria, Nsukka.

Egbu, E. N. (2010). Factors Militating Against the Organization of Biology Practicals in Secondary Schools in Udenu Local Government Area. *An Unpublished P.HDThesis*. University of Nigeria, Nsukka. Egbuna, O. N. (2010). Interaction Patterns in Senior Secondary School Practical Biology Classroom. *Unpublished M.ED Thesis*. University of Nigeria, Nsukka.

Ejionueme, I. K. (2010). Management of Student Personnel Services in Federal and State Universities. *An Unpublished P.HD Thesis.* University of Nigeria, Nsukka. Federal Republic of Nigeria. (2002)*. National Commission for Colleges of Education (NCCE): Minimum Standard for NCE Teachers. (Sciences)*

Federal Republic of Nigeria. (2004). *National policy on education (revised).* Lagos: NERDC Press. Hungwa, S. (2011). Information and Communication Technology (ICT) Facilities and Skills Development of Library Staff in Academic Libraries in Benue State.

*Unpublished M.ED Thesis.* University of Nigeria, Nsukka. Hornby, A. S. (2006). *Oxford Learners Dictionary of Current English*. London: Oxford University press.

Imogie, A. I. (2010). A New Paradigm for Teacher Preparation in the 21st Century Nigeria. *A Paper Presentation at the Annual National Conference Organized by the Institute of Education*, University of Nigeria, Nsukka.

Kumar, M. (2009). Academic libraries in electronic environment: a paradigm shift. Retrieved on 20/07/2011 from [http://www.Crl.ed.in/ica/09/papers/indexfilesical-16182 384 rv.pdf](http://www.Crl.ed.in/ica/09/papers/indexfilesical-16182%20384%20rv.pdf)

Mamah, H. N. (2000). Problems of Resource Management in Enugu State Secondary Schools. *Unpublished M.ED Thesis*. University of Nigeria, Nsukka

Michael, P. (2008). *Management innovations*. Retrieved on 03/04/2011 from <http://managementinnovations.wordpress.com/2008/12/03/define-management-itsfunctions/>

Miller, K. R. & Joseph, L. (2002). *Biology.* New Jersey: Pearson Education, Inc. Neboh, O. I. (2009). Effects of Learning Activity Package (LAP) on Students Achievement and Retention in Secondary School Biology. *An Unpublished P.HD Thesis*. University of Nigeria, Nsukka.

Negedu, A. S. (2008). Effects of Science, Technology, Society (STS) Approach on Students Achievement and Interest in Integrated Science in Junior Secondary School. *An Unpublished M.ED Thesis.* University of Nigeria, Nsukka.

Ngwoke, D. U. (2010). *School Learning: Theories and Application*. Enugu: Immaculate

Publication Limited.

Nwafor, O. (2008). *Educational Innovation: Process and Products*. Enugu: Magnet Business Enterprises.

Nwagbo, C, R. (2005). Attainment of Professionalism in Science Education: Competencies and Skills Needed by Biology Teachers*. Proceedings of 46th Annual STAN conference.*118

Nwagbo, C, R. (2006). Effects of Two Teaching Methods on the Achievement in and Attitude to Biology of Students of Different Levels of Scientific Literacy*. International Journal of Education Research*, 45(2006)216-229*.*

Nwagbo, C. R. (2007). Developing observational and drawing skills in teachers for effective conduct of biology practical*. The proceedings of the 2007 STAN, National Biology Panel Workshop.*

Nwankwo, I. N; Onuselogu, A. P. and Uzoechina, D. (2011). State of Physical Facilities

**Research Questionnaire**

Department of Science and Vocational Education,

 Godfrey Okoye University, Enugu.

 19th June 2018.

Dear respondent,

The researcher is an undergraduate of the above named university, who is conducting a research on availability and utilization of laboratory resources in teaching and learning of biology in secondary schools in Enugu North LGA , Enugu state.

The research is purely an academic exercise, and any information given will be treated confidentially and will only be for the purpose of this study.

Please try to respond correctly to the items, as your co-operation would be highly appreciated.

Yours sincerely,

**ANYADIEGWU, CHRISSY. OLAEDO**

**Research Questionnaire**

**Observational Checklist on Availability of Laboratory Resources for Teaching and Learning Biology in secondary schools in Enugu North LGA, Enugu State.**

**SECTION A: Personal data of the respondent**

Please respond carefully to each question by ticking (**√**) as appropriate

  **Item Statement**

Respondent: Male Female

School .........................................................................................................................................

**SECTION**  **B :**

**Instruction:** Tick (√) in the appropriate box with regards to the availability of the laboratory resources for teaching and learning Biology in Secondary schools in Enugu North Local Government Area.

This study uses a two(2) point scale

**Key**

A (2) - Available

NA (1)-Not Available

**Research Question 1:**

 **Availability of Laboratory Resources in Teaching and Learning Biology in Secondary Schools**

|  |  |  |  |
| --- | --- | --- | --- |
| **S/N** | **ITEMS**  | **Available** | **Not Available** |
| 1 | Biology Laboratory |  |  |
| 2 |  Wall Chart |  |  |
| 3 | Petri Dishes  |  |  |
| 4 | Beakers |  |  |
| 5 | Bunsen Burner |  |  |
| 6 | Hand Lens |  |  |
| 7 | Conical flask |  |  |
| 8 | Tripod stand |  |  |
| 9 | Chemicals |  |  |
| 10 | Models |  |  |
| 11 | First Aid Box |  |  |
| 12 | Dissecting Kits |  |  |
| 13 | Fire Extinguisher |  |  |
| 14 | Insect Nets |  |  |
| 15 | Filter papers |  |  |
| 16 | Litmus paper |  |  |
| 17 | Test tube rack |  |  |
| 18 | Test tube rack |  |  |
| 19 | Teachers |  |  |
| 20 | Laboratory Assistants |  |  |

**Questionnaire on Availability and Utilization of Laboratory Resources in Teaching and Learning Biology in Secondary Schools in Enugu North LGA**

 **SECTION A:**

**Personal data of the respondent**

Please respond carefully to each question by ticking (**√**) as appropriate

**Item Statement**

Respondent: Male Female

School:..........................................................................................................................................

**SECTION B:**

**Instruction:** Tick (√) in the appropriate box with regards to the utilization of laboratory resources for teaching and learning Biology in Secondary schools in Enugu North Local Government Area.

SA/VGE = Strongly Agree/Very Great Extent

A/GE = Agree/Great Extent

D/ME = Disagree/Medium Extent

SD/LE = Strongly Disagree/Low Extent

**Research Question 2:**

To what extent are these laboratory resources provided for Secondary Schools in Enugu North LGA, Enugu State?

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| S/N | ITEMS  | SA/Very Great Extent | A/Great Extent | D/Medium Extent | SD/Low Extent |
| 1 | Biology laboratory |  |  |  |  |
| 2 | Wall chart |  |  |  |  |
| 3 | Petri dishes |  |  |  |  |
| 4 | Beakers |  |  |  |  |
| 5 | Bunsen burner |  |  |  |  |
| 6 | Hand lens |  |  |  |  |
| 7 | Conical flask |  |  |  |  |
| 8 | Tripod stand |  |  |  |  |
| 9 | Charts |  |  |  |  |
| 10 | Microscope |  |  |  |  |
| 11 | Models |  |  |  |  |
| 12 | First Aid Box |  |  |  |  |
| 13 | Dissecting Kits |  |  |  |  |
| 14 | Fire Extinguisher |  |  |  |  |
| 15 | Insect Nets |  |  |  |  |
| 16 | Litmus paper |  |  |  |  |
| 17 | Spring balance |  |  |  |  |
| 18 | Test tube rack |  |  |  |  |
| 19 | Teachers |  |  |  |  |
| 20 | Laboratory assistants |  |  |  |  |
|  |  |  |  |  |  |

**Research Question 3:**

To what extent do teachers utilize biology resources in teaching and learning biology in Enugu North Local Government area, Enugu State?

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| S/N | ITEMS  | SA/Very Great Extent | A/Great Extent | D/Medium Extent | SD/Low Extent |
| 1 | Biology laboratory |  |  |  |  |
| 2 | Wall chart |  |  |  |  |
| 3 | Petri dishes |  |  |  |  |
| 4 | Beakers |  |  |  |  |
| 5 | Bunsen burner |  |  |  |  |
| 6 | Hand lens |  |  |  |  |
| 7 | Conical flask |  |  |  |  |
| 8 | Tripod stand |  |  |  |  |
| 9 | Chemicals |  |  |  |  |
| 10 | Microscope |  |  |  |  |
| 11 | Models |  |  |  |  |
| 12 | First Aid Box |  |  |  |  |
| 13 | Dissecting Kits |  |  |  |  |
| 14 | Fire Extinguisher |  |  |  |  |
| 15 | Insect Nets |  |  |  |  |
| 16 | Litmus paper |  |  |  |  |
| 17 | Spring balance |  |  |  |  |
| 18 | Test tube rack |  |  |  |  |
| 19 | Teachers |  |  |  |  |
| 20 | Laboratory assistants |  |  |  |  |
|  |  |  |  |  |  |