

**ASSESSMENT OF TEACHER'S AWARENESS AND THE USE OF
MODERN AND SCIENTIFIC TOOLS IN TEACHING OF BIOLOGY
IN SENIOR SECONDARY SCHOOLS IN OREDO LOCAL
GOVERNMENT AREA, EDO STATE.**

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FACULTY OF EDUCATION
UNIVERSITY OF BENIN
BENIN CITY**

JANUARY, 2023

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**A RESEARCH WORK SUBMITTED TO THE DEPARTMENT OF
CURRICULUM AND INSTRUCTIONAL TECHNOLOGY,
FACULTY OF EDUCATION, IN PARTIAL FULFILLMENT OF
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JANUARY, 2023

CERTIFICATION

We, the Undersigned, certify that this research project was carried out by **Tobechukwu Vanessa ONWAEZE** in the Department of Curriculum and Instructional Technology, Faculty of Education, University of Benin, Benin city.

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DEDICATION

This work is dedicated to God Almighty, my creator, my rock of ages and my pillar of strength for seeing me through my academic years.

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ABSTRACT

This study investigates assessment of teacher's awareness and the use of modern and scientific tools in teaching Biology in senior secondary schools in Oredo local government area of Edo State.

Descriptive survey research design was used in carrying out the study. The population consists of thirteen (13) secondary schools and twenty eight (28) Biology teachers from which a sample of sixteen (16) respondents were randomly selected from the population. The instrument for data collection was a questionnaire designed by the researcher and the data collected from the instrument were analysed using frequencies and percentage.

From the results of the findings, the study proved that there are inadequacy in the supply of modern and scientific tools in schools for Biology teachers. It also revealed that even though there were some available tools, they were not functional due to lack of electricity to power them, lack of time allocated to the subject and large class size. It was therefore recommended from the findings that: Biology teachers should be enlightened or given more orientation about the existence and use of modern and scientific tools; Government should provide sufficient and adequate modern and scientific tools to schools in the local government area for the efficient teaching and learning of Biology.

CHAPTER ONE

INTRODUCTION

Background to the Study

The rate at which Science and Technology is integrating into the world is such that only nations and countries that are committed to it will compete in the present day global market. To meet up with the rapid scientific progress in technology, it requires the presence of well trained, efficient, knowledgeable and skillful teachers who are versatile in discharging their duties and responsibilities (Buseri, 2010). The persistent poor performance of students in science subjects at school certificate level and studies has given rise to an assumption that most science teachers in secondary schools in Nigeria probably do not make use of varying form of teaching strategies to be able to cope with some specific difficulties associated with teaching of science (Ogbeba, 2009). In other words, it implies that teachers are knowledgeable in science content but not in pedagogical aspects.

The National policy on Education (FRN, 2013) honestly spells out the objectives of science teaching from pre-primary to tertiary level. Specifically, at the secondary level, it entails equipping students to stay correctly in our modern age of science and technology.

The global change in science curriculum springing up from know how explosion and new wave in science and technology development demands for qualitative science technology. Science is a systematic acquisition of organized knowledge about the natural and physical world which is installed in form of predictions, observations and experimentations, without which a nation's technological advancement becomes almost impossible.

There are three (3) basic science subjects offered in Nigerian secondary schools amongst which Biology is one. The teaching of Biology is very essential because the knowledge of Biology helps in enhancing the quality of life as it helps to remedy many societal issues relating to health, poverty, meals shortage, crop production and environmental conservation.

The mastering of biology in real life context is critical for personal development and also the improvement of scientific and technological world.

The accelerated pace of technological innovation in recent years has created a pressing want for academic research that can help us to understand how the use of modern and scientific tools in teaching biology for students' learning is being mediated with the aid of emerging technologies. However, even though there are many new technological tools presently available for teachers to use in their classrooms, it looks as if teachers lack awareness and do not comprehend how to use these tools. Thus, education in science and technology that responds to the 21st century global perspectives which ought to have the acquisition of scientific literacy as its central theme, becomes integral and has made every nation in the world crave for it's advancement. This need for advancement of science and technology that responds to the global

perspectives has led to the adoption of scientific literacy as a cutting-edge aim of science and technology education (STE) all over the world.

Teachers should understand that if they spend the preliminary time gaining knowledge on how to use technological tools such as the interactive white board, email or the internet, the tools could benefit their students on the long run. Furthermore, with a growing instance of electronic possibilities as teaching methods, textbooks are speedy becoming obsolete and the usage of technological tools might also likely enlarge students' interest, motivation and achievement.

Mobile and electronic learning have converted the traditional learning context from classroom to a virtual space. Despite a notably high presence of cellular devices, computer systems and interactive technologies in today's classrooms, teachers nonetheless lack the required capabilities and understanding regarding how to integrate these technologies into the curricula. With practice and a little greater planning time, teachers need to be able to integrate technology into their classrooms and soon witness the

benefits such as improved students' test scores, motivation and interest. In addition, the use of multiple and relevant learning and teaching strategies and evaluation practices will provide a basis for this.

From the above, the awareness of teachers in the use of modern and scientific tools have key impact in the improvement of a student's cognitive abilities, hence, this study aims to assess teacher's awareness in the use of modern and scientific tools in teaching Biology in senior secondary schools in Oredo Local Government Area of Edo State

Statement of the Problem

Nigeria has been facing a lot of challenges in teaching and learning of science, such as lack of expertise in science teaching, lack of adequate laboratory equipment, the use of traditional method of teaching (Osisioma, 2012).

According to Ugwu and Nzewi (2015), Biology teachers play very prominent role in using science and technology and moulding up tomorrow's citizens. Biology teachers are expected to integrate science and technology

in the teaching and learning process, they must use technology so that it supports instruction and enables learners to use technology as an important tool to meet their learning needs.

The problem is that Biology teachers who are not ready to make use of technology, the time and money spent on it is going to be a waste. The question therefore is: how ready are the Biology teachers to use technology? Technological knowledge and attitude of teachers have been viewed as yardstick to determine their readiness to adopt and integrate science and technology into the teaching and learning of Biology.

Hence, the focus of the study is to assess teacher's awareness in the use of modern and scientific tools in teaching Biology in senior secondary schools in Oredo Local Government Area of Edo State.

Research Questions

In order to address the problem of the study, the following research questions were;

1. What are the modern and scientific tools available to Biology teachers in secondary schools?
2. Are Biology teachers aware of the modern and scientific tools used in teaching Biology in secondary schools?
3. How often do teachers use modern and scientific tools in teaching Biology in secondary schools?
4. What are the challenges faced by Biology teachers in using modern and scientific tools in secondary schools?
5. How can these challenges faced by Biology teachers in using modern and scientific tools in secondary schools be solved?

Purpose of the Study

The main purpose of the study is to assess teacher's awareness and the use of modern and scientific tools in teaching Biology in senior secondary schools in Oredo Local Government Area of Edo State.

The purpose of the study centers on the following;

1. Assess the modern and scientific tools available to Biology teachers in secondary schools.
2. Assess the awareness level of Biology teachers in the usage of modern and scientific tools in secondary schools.
3. Examine teacher's use of modern and scientific tools in teaching Biology in secondary schools.
4. Identify the challenges faced by Biology teachers in using modern and scientific tools in secondary schools.
5. Identify how the challenges faced by Biology teachers in using modern and scientific tools in secondary schools can be solved.

Significance of the Study

In an effort to improve the teaching of biology in Nigerian secondary schools and make the learning of biology more desirable to students, this study may also make the following vital contributions.

This study would be of gain to teachers as it would provide teachers with the actual picture of science education generally and biology education in particular, it would make them to be aware of a number of innovative techniques that can be used to train effectively, thereby enabling them to produce highly innovative teachers who would be in a position to determine and use the techniques that best suit the topics and concepts they are to teach when in service.

To students, it will aid better grasp of the subject. Students are in a position to remember quicker and simpler concepts in science classes, following the fast change in the growth of technological reforms.

Also, the study will be beneficial to curriculum designers and school proprietors in organizing workshops and providing in-service trainings about new methods of teaching biology for teachers.

This study would have an impact on the education policy of the government and provide room for development of new educational policies that will help in increasing the quality of education in the nation at large.

Scope and Delimitation of the Study

The study is focused on assessment of teacher's awareness and the use of modern and scientific tools in teaching of biology in senior secondary schools in Oredo Local Government Area. This study is limited to teachers in secondary schools in Oredo Local Government Area.

Definition of Terms

The following terms will be encountered in the course of this study and will be defined as operationally used in the study.

- **Biology:** The natural science that studies life and living things.
- **Teacher:** A person who teaches in school.
- **School:** An educational institution designed to provide learning spaces and learning environments for students and teachers.
- **Awareness:** Knowledge or perception of a situation or fact.

- Science: The intellectual and practical activity encompassing the systematic study of the structure and behaviour of the physical and natural world through observation and experiment.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

The review of related Literature is presented under the following headings:

- Concept of Biology
- Teaching Methods in Biology
- Modern and Scientific Tools used in Teaching Biology
- Biology Teacher's Awareness and The Use of Modern and Scientific Tools
- Challenges Faced by Biology Teachers in The Use of Modern and Scientific Tools
- Solutions to Challenges Faced by Biology Teachers in The Use of Modern and Scientific Tools
- Summary of Reviewed Literature

Concept of Biology

Biology is the science that studies life. From its earliest beginnings, biology has wrestled with four (4) questions; what are the shared properties that make something "alive"? how do those various living things function? when faced with the remarkable diversity of life, how do we organize the different kinds of organisms so that we can understand them better? and finally, how did this diversity occur and how is it continuing? As new organisms are found everyday, biologists proceed to seek answers to these and other questions (Roush and Wise, 2017).

All group of living organisms share several key characteristics or functions; order, sensitivity/response to stimuli, reproduction, adaptation, growth and development, regulation, homeostasis and energy processing. When viewed together, these eight characteristics serve to define life (Fowler, 2017).

Order

Organisms consist of highly organized structures made of cell.

Sensitivity/response to stimuli

Organisms respond to diverse signals from the environment. Movement towards stimulus is a positive response and movement away is a negative response ie plants moving towards light.

Reproduction

Single celled organisms reproduce by duplicating their DNA and dividing equally preparing to divide to form two new cells. Multicellular organisms produce specialized reproductive cells that form new individuals.

Adaptation

Organisms fit to the environment. As the environment changes, natural selection causes the characteristics of the individuals in a population to track those changes.

Growth and Development

Organisms grow (get larger) and develop (change over their lifespan) according to specific instructions coded by their genes.

Regulation

Organisms require multiple regulatory systems to co-ordinate internal functions such as transport of nutrients depending on the environmental influences.

Homeostasis

To function, cells require appropriate conditions such as; temperature and pH, the organisms are able to maintain constant internal conditions.

Energy Processing

Taking in and storing energy, some organisms take in the sun and convert it into chemical energy in food. Others use chemical energy from the molecules they take in.

Teaching Methods in Biology

There are different teaching methods employed in science education in Nigerian secondary schools. Miles (2015) asserts that it is predicted of a teacher to enforce a range of teaching methods that will bring academic

success to all science students. For any method to be able to carry excellent end result in the modern age, it have to be a method that promotes maximum social interaction.

The teaching methods commonly used in science education classes are the lecture method and demonstration method. According to Gehlen-Baum and Weinberger (2014), lecture method is designed to supply a new information to a large group of students. This method is recognized to be high quality in dealing with a large class, however, it may want to additionally be used for a small class.

Franklin, Sayre, and Clark (2014) opined that students taught in lecture-based classes learn less than those taught with demonstration-based method. Lecture method is regularly a one way method unaccompanied by discussion, questioning or immediate practice that makes it a negative teaching method (Al-Rawi, 2013).

Lecture method concentrates on information rather than learners (Al-Rawi, 2013). In the lecture method, the teacher tells the students what to do instead of directing them to find out for themselves (Miles, 2015).

According to Al-Rawi (2013), the demonstration teaching method is effective in teaching skills that deals with the use of tools and laboratory experiments in science. However, the time handy to raise out the demonstration method is very limited in the school room setting.

Modern and Scientific Tools used in Teaching Biology

One of the objectives of the Science Course curriculum is stated as “By developing the competencies that students have developed during primary school education, to raise individuals who have adopted national and spiritual values, are aware of their rights, fulfill their responsibilities, are productive, contribute to the country’s social and cultural development, have self-confidence and self-discipline, have acquired essential verbal, numerical and scientific reasoning and social skills and aesthetic sensitivity they will need in daily life, can use these skills effectively and become healthy life

oriented people” (Ministry of National Education Turkey, 2018). As can be understood from this statement, the aim of Science Curriculum is not only to equip students with academic information but also to raise them as versatile, social, active and productive individuals. Today, in many countries of the world, Science Courses are taught as essential courses. As essential courses in the programme, they are important in the teaching of science education.

In this context, the importance of biology teaching can be understood better. Science covers the most important areas that require information and comprehension. Especially through Biology, students can make sense of their own and families’ development, topics such as nutrition and health, and many important events and developments occurring in their environment and in the world.

Biology is an essential part of education for everyone. Biology teaching should be able to reflect the elements of this field and its interesting features. Students should actively participate in the subject, perform experiments and learn through making associations with daily life (Ohlsson and Ergezen, 2015). In biology teaching, which has an important place in science

education, it is of utmost importance to create a learning environment in which students can comprehend and enjoy learning biology (Yalman, 2016). In biology teaching, in the classroom or in the laboratory, creating a multi-faceted environment in order for an effective teaching to take place is important in terms of teacher-student interaction and communication.

The essential elements for creating a multi-faceted environment are equipments. While equipments use in biology teaching cannot be limited in a classroom, it also covers a wide area that addresses the nature in a broader sense. Furthermore, it is obvious that the necessity of using equipments in education and teaching is also valid for Biology education.

The field of Biology, which is of vital importance for life, needs to get more support in education in this sense. In Biology education, many equipment ranging from the simplest writing board to the most advanced electron microscope are provided as accessories to teaching. The more the number of sense organs are involved in Biology education, the better and more permanent the learning will be.

There are various methods and techniques employed at each stage of biology teaching that appeal to both hearing and seeing.

As one of the teaching equipment in Biology teaching, models play a key role in the interpretation of science and help to understand complex concepts easily. Besides, they support students in producing new and creative ideas. Models are the equipment that can be used the most effectively in biology teaching. The materials that teachers use in educational environments help them to establish communication with students. It is doubtless that the communication established by the teacher in learning is very important (Aydin and Yel, 2016). One of the most challenging phases in Biology teaching process is the selection and design of teaching equipment. Equipment use has a wide range of utilization in Biology teaching.

Teaching Biology without equipment and not using the opportunities provided by the equipment seems almost impossible in Biology teaching.

Equipment in Biology teaching can be categorized as visual equipment, aural equipment and both visual and aural equipment. A categorization according to primary groups can be as follows:

Written Materials

They are the most used materials used in educational environments. Written materials are easy to be accessed and carried (Course textbooks, supplementary books, magazines, newspapers, guides, brochures, teacher handbooks etc.).

Pictures and graphs

They are the most widely teaching materials used in making the verbal messages meaningful and concrete for students (maps, globes, film strips, slides, teaching boards and graphs).

Realia and Models

These are the use of real objects and models for teaching purposes (Bringing different species of plants into the classroom or inviting an expert on a specific subject to class, body and organ models, cross-section of a leaf etc.).

Overhead Projector Transparencies

They are the materials which were used recently.

Visual and Aural devices

Radio, voice tapes, CD, computer, VCR, smart board, tablet and telephones are among these materials.

Projectors

These are the Slide projector, tablets and smart boards.

Television programmes and videos

They are the materials through which the events and objects from real life are brought into classroom environment in the most realistic way.

Computer Software and Internet

They are the materials which provide the highest communication with students. They are very effective in drawing the attention of students, presenting information, having students do exercises and repetitions, providing feedback and assessing students' performance. Visual and audio features can be used in combination (sound, picture, motion pictures, and animations). Today, internet is full of materials for using in science teaching. If it is chosen well, they can really be useful on students' learning.

Other equipments

Writing board, revolving boards, individual learning sets, CDs, package software, collections can be counted in this category. Smart Boards and Smart Phones must be mentioned among today's equipment.

One of the issues that teachers should pay attention while using computer-assisted biology teaching is the approach adopted by the teacher. Using the computer in class in line with behavioural approach would only mean replacing the conventional book with the computer. In this case, since it is the teacher who uses the computer, only the teacher is actively engaged. In contrast, computer should not be a “savior” in teaching. According to structural approach, computer is a tool that helps students to make sense of information and to be active in helping to create their own knowledge. Some of the software that are widely used in recent years in our country are not different from textbooks. They can be thought as the electronic form of the textbooks. For this reason, in relation to the subject of the course and the features of the software, either research and experiment should be performed

through computers or research and observations performed must be processed by students with appropriate software (Ekiz, 2011).

Biology Teacher's Awareness and use of Modern and Scientific Tools

According to Olumorin (2008), awareness of policies usually forms the backbone of the utilization and productivity level of any programme. He further asserted that it is when an individual is aware of the principles and content policy that such an individual can cultivate right type of attitude that will result in improved productivity. In the teachers' awareness of scientific tools, the decision of the teacher on the utilization of the scientific tools will be based on the teachers' knowledge on the existence of these tools. Therefore, a teacher who is not aware of the tools will neither attempt to use them in the first place or use them correctly and adequately.

Edumadze (2014) conducted a study to assess the awareness and perceptions of teachers in using e-learning tools. He indicates some key parameters used in measuring perception of staff towards using E-learning. The first one is adoption of E-learning, which refers to the decision of schools, instructors or teachers, and students to use e-learning and its tools for instructional

delivery and learning. The second parameter is e-learning readiness, which is an important factor in any organization or school. It discusses the condition of schools, instructors as well as students to engage in using e-learning as a means of educational package delivery. Likewise, the study regards confidence and perception of instructors or teachers as a critical issue can affect the learning capabilities of the student or learner. E-learning users must trust and believe the abilities or good qualities of e-learning. The last parameter is e-learning training, which is closely related to confidence since the satisfactory training will reveal high confidence level. Finally, the study results, shown that many teachers fail to use e-learning tools due to many reasons, but mainly, because they are not proficient in using them. Edumadze recommended to educate the teachers on E-learning and give them the necessary training.

According to Almekhlafi (2010), in order to increase effective technology integration, both male and female teachers recommend the following: Regular professional development workshops, Enhancing curriculum with technology enhanced materials such as CDs and videos, Increasing

collaboration between schools across the country, and Giving enough freedom for teachers in the selection and coverage of curriculum materials.

Khursid and Zahur (2013), examined the extent of teachers' awareness and utilization of innovative teaching strategies in private and public secondary schools, it further examined the differences in the responses of teachers across teaching experience and professional background. They sampled 100 secondary school teachers from various private and public schools of Islamabad. In the study, sixteen (16) selected teaching strategies were used to analyze teacher's awareness and its utilization in classroom settings. Result revealed that the level of teachers' awareness and utilization of innovative strategies was high in the private schools as compared to the public sector schools; moreover, teachers with more teaching experience and professional qualifications are aware with innovative teaching methodologies.

In addition, Khurshid and Zahur (2013), discovered that females teachers are more aware and utilize innovative teaching strategies than the male teachers. However, the studies were inconclusive, hence, this study investigated the

effect of gender on the awareness and utilization of innovative strategies for teaching biology in secondary schools.

Challenges faced by biology teachers in using modern and scientific tools

The use of advanced educational technologies is vital when teaching biology using the STEM methodologies. A 21st century teacher must have the necessary skills to use Information communication technologies (ICTs) well within the digital classroom of the 21st century. Digital classrooms connect the classroom to the whole world and create an environment for learning to become student centered. The teacher assumes a new role of becoming a facilitator of learning. According to teachers, lack of Advanced Educational Technologies in schools hinders them from effectively teaching biology in a STEM way. Both students and teachers may not have access to research on the Internet and in most schools, the chalkboard and the prescribed textbooks are still the greatest tool within the classroom. In such a situation, the teacher will concentrate on completing the syllabus so that they meet the

immediate need of the pupils, which is passing examinations. In some cases, the teachers said they are not able to use the advanced educational technologies since they were never exposed to them during their training and this applies mostly to the older teachers. The younger teachers expressed concern over the lack of electronic boards or smart boards in their classroom. This means that they have no option but to use the chalkboard and the textbook. Digital classrooms in most schools are non-existent and in most cases, the whole science department may have only one projector. Teachers are not very keen in preparing a lesson using advanced educational technologies due to unreliable source of power. This means that in order for the lesson to proceed without any problems due to lack of power they have to use the traditional methods of teaching. Teachers in most schools identified lack of laboratory equipment and chemicals means that the student cannot have a hand on approach when learning biology. Biology is a practical subject that requires hands on approach.

Furthermore, Students' poor attitude and interest towards school science is an issue identified across the world (Adu-Gyamfi, 2013; Fensham, 2008; Hallack and Poisson, 2001; UNESCO, 2010).

Adu-Gyamfi (2013) added that students' lack of interest in science is anchored on the time consuming and less practical nature of learning school science as well as the learning of science which is basically knowledge transfer from science teachers and textbooks. Science teachers' decisions about instructional practices such as procedures for assessment, grouping of students, and the types of rewards and punishments are crucial to influence students' interest and attitude in pursuing any science related subject or course in the future (Anderman, 2012). It is therefore recommended that teachers should inculcate in students the interest in and adequate knowledge of the contribution of school science to the development and technological advancement of the society they live in (Fensham, 2008).

Solution to Challenges faced by Biology Teachers in using Modern and Scientific Tools

According to Fisher (1999), the creative process is to a large extent reorganizing the possessed knowledge in order to realize what we do not know. In this context, the application of ICT helps form teachers' and students' competences connected both with creative use of information and with its creation. Not every sender of information is its creator, but every user of information is its receiver. In school situation, users of information are all the people who use it in any purposeful way. The results allow to verify research hypothesis and confirm the previous authors' views that changes in the to-date ways of work and media/information technology tools use in teaching and learning are necessary. Necessity of these changes is the consequence of psychological needs of learners in the situation of universal access to information. The changes must regard the teaching, learning and mental cognitive strategies. Teachers need much more than just knowing how to operate the computer or specific software. They need to be convinced about the value of ICT tools in supporting and enhancing teaching and

learning (Kiridis, 2006). They need specific examples demonstrating the added value of ICT in teaching and learning and they also need pedagogical content knowledge on the role of ICT tools in the respective disciplines and how that influences how we formulate learning objectives.

In addition, teaching for creativity can be promoted by;

Encouraging students to believe in their creative identity.

Identifying young people's creative abilities.

Fostering creativity by developing some of the common capacity's sensitivities of creative such as curiosity, recognizing and becoming more knowledgeable about the cognitive process that help to foster creativity; and

Providing opportunities to be creative, a hands-on approach. (National Association of Community College Approach, 1999).

In the biology classroom, the teacher can therefore promote creativities using various strategies such as:

Brainstorming; which elicits not only intellectual excitement and linear thinking but also cognitive flexibility which as earlier discussed is essential in creative problem solving.

Providing the student opportunity in the classroom to actively develop their own representation of information convert it to usable form. This enhances transfer of knowledge for creativity.

Students should be actively engage in the classroom through hands-on and minds on and minds-on activities.

Teachers should shift from traditional methods of teaching dominated by facts and algorithmic processing to move innovative methods dominated by conceptual and evidence-based also repeated by conceptual and evidence-based ways of thinking.

Teachers should also repeatedly encourage generation of ideas. Students need to be reminded to generate their own ideas and solution to problems in an environment free of criticism.

Summary of Reviewed Literature

In the context of this study, an attempt was made to review the awareness of modern and scientific tools in teaching biology in senior secondary schools. From the review of literature, there is evidence that even though teachers may be aware of these modern tools in teaching biology, lack of availability

of these tools bedevils the performance of these teachers. In addition, the equipment and objects that are used within the scope of Biology education technologies are determined specifically. These tools can be computers, software, models, samples, transparencies, shapes, slide projectors, film strips, figures, written-printed materials, audio devices, radio and cassettes, TV, VCR, smart boards and telephones, Internet technology devices. Group works, projects and experiments are widely used in Biology teaching.

The Biology's curriculum is student-centered and emphasis is laid more on learning science as a process than as a body of knowledge. Learning science as a process is not a common practice in science teaching in Nigeria, and hence it is necessary for the planners of the new curriculum to specify the methods of teaching to be adopted in handling the materials (Olaewaju, 2006).

Among the methods to be used, the following were specifically recommended: Use of guided discovery teaching strategy; Use of laboratory exercise (STAN, 1970); and Field trip.

The guided discovery strategy is an innovative way of teaching Biology. It enables the student to find answers themselves. A change usually occurs in students' learning when they are actively involved in the learning process (Olarewaju, 2006). The use of guided discovery in teaching Biology is not usually practiced since this strategy is time consuming and the progress is comparatively slow. Apparatus has to be set up and result of the investigation awaited. The strategy is good for a small class where effective teacher supervision is easy to achieve. This is not the case in most of our secondary schools where a teacher is assigned to teach more than 40 students in a class. The teacher should be made to use other teaching strategies and allowed to use the appropriate ones. If the guided discovery strategy, however, becomes imperative for a large class, the class could be divided into groups to enhance effective supervision.

Apart from this, some teachers do not know what is actually involved in guided-discovery method or how to attain the educational aims and objectives. Biology involves various activities. These include project work, demonstration, lecturing, individual practical work, small group discussion,

building models, explaining phenomena to students and a host of other verbal and non-verbal activities. The choice of approach depends on several factors, one of which is the object of the activity. The teacher should be made acquainted with all these and allowed to use the appropriate ones instead of being restricted to certain strategies recommended by the curriculum.

Finally, it is crucial to note that different variables can have effect on student's performance in senior secondary schools. Such variables are the teacher characteristics and the quality of teaching and learning by way of preparation.

It is in light of this that the researcher seeks to examine teachers' level of awareness in the use of modern and scientific tools in teaching biology in senior secondary schools in Oredo Local Government Area, Edo State.

CHAPTER THREE

METHODOLOGY

This chapter is organized under the following sub-headings:

- Design of the Study
- Population of the Study
- Sample and Sampling Technique
- Research Instrument
- Validity of the Instrument
- Reliability of the Instrument
- Method of Data Collection
- Method of Data Analysis

Design of the Study

The research design adopted by the researcher is the survey research design, which is intended to seek the views of selected teachers on the awareness and use of modern and scientific tools in teaching biology in senior secondary schools. The survey research design was chosen because it allows

the researcher to collect a large amount of data in relative short period of time.

Population of the study

The population of this study consists of all Biology teachers from the thirteen (13) public Senior Secondary Schools in Oredo Local Government Area of Edo State. The total number of teachers teaching Biology in Senior Secondary School is twenty eight (28) In Oredo.

Sample and Sampling Technique

The researcher randomly selected sixteen (16) Biology teachers from nine (9) selected secondary schools in Oredo Local Government Area of Edo State as sample for the study using the simple random sampling technique.

Research Instrument

The research instrument, Questionnaire entitled “Awareness of Modern and Scientific Tools in Teaching Biology” was used for the study. The questionnaire was divided into two sections A and B. Section A is made up of items that elicited the information about the demographic data variable such as sex and teachers’ educational qualification. In section B, the

questionnaire contained forty (40) items designed to cover the entire research questions. Teachers were required to tick the best option in the option provided. The response box is divided into; (Section I): A and F- Available and Functional, A but not F- Available but not functional, Not available. (Section II): Yes , No. (Section III): Always, Sometimes, Never. (Section IV-V): SA- Strongly Agree, A- Agree, D- Disagree, SD- Strongly disagree.

Validity of the Instrument

The questionnaire was validated by the supervisor. The researcher after constructing the questionnaire took it to his supervisor and two other lecturers in his Department who scrutinized the instrument and made useful suggestions which were used in the final draft of the questionnaire.

Reliability of the Instrument

In establishing the reliability of the instrument, the test re-test procedure (pilot test) was used. This implies that the instrument was administered to twenty (20) respondents (teachers) from outside the sample group; but from the population.

After an interval of two weeks, the instrument was re-administered to the same set of respondents and their responses were collected, collated and encoded through IBM Statistics- SPSS22.0 data software. The Cronbach Alpha reliability of the instrument was thereafter established and it came up to 0.71 indicating a high stability.

Method of Data Collection

Data were personally collected by the researcher by visiting the selected schools and after obtaining permission from the school authorities, administered the questionnaire to the teachers. The questionnaire was collected after the teachers had filled on the spot for the purpose of high rate of return.

Method of Data Analysis

Simple percentage was used to analyze the data collected in order to answer the research questions raised.

CHAPTER FOUR

PRESENTATION OF RESULTS AND DISCUSSION OF FINDINGS

This chapter deals with the presentation of results from the data analysis.

The results are presented in tables according to the research questions which were answered using simple percentages.

Presentation of Results

Research question 1: What are the Modern and Scientific Tools Available to Biology teachers in Secondary Schools?

Table 1: Summary of Modern and Scientific Tools Available in Schools for Biology Teachers.

S/N	MATERIALS	A & F	A & N.F	NA
1	Projectors.	4 (25%)	2 (12%)	10 (63%)
2	Standard virtual Biology laboratory.	5 (31%)	3 (19%)	8 (50%)
3	Integrated e-learning environment.	3 (19%)	2 (12%)	11 (69%)
4	Online publishing	5 (31%)	4 (25%)	7 (44%)
5	Electronic Probes (Sensors and softwares)	5 (31%)	2 (12%)	9 (57%)
6	Models and simulations.	3 (19%)	2 (12%)	11 (69%)
7	Computer	11 (69%)	2 (12%)	3 (19%)
8	Internet based communication (e-mail)	12 (75%)	1 (6%)	3 (19%)
9	Concept Maps	8 (50%)	4 (25%)	4 (25%)
10	Audio books.	4 (25%)	5 (31%)	7 (44%)

For Item 1, the responses for projectors shows that 25% of the teachers claimed that it was Available and Functional, 12% Available but Not Functional, and 63% claimed that it was Not available. Item 2 shows the responses to the availability of access to virtual Biology laboratory for Biology teachers in schools; 31% claimed that it was Available and Functional, 19% Available but Not Functional and 50% claimed that it was not Not Available. Item 3 shows the responses of the availability of Integrated e-learning Environment for Biology teachers in schools; 19% claimed that it was Available and functional, 12% Available But Not Functional and 69% claimed that it was Not Available. Item 4 shows the responses of the availability of Online publishing for Biology teachers in schools; 31% claimed that it was Available and Functional, 25% Available But Not functional and 44% claimed that it was Not Available.

Item 5 shows the responses of the availability of Electronic probes (Sensors and softwares) for Biology teachers in schools; 31% claimed that it was Available and Functional, 12% Available But Not Functional and 57% claimed that it was Not Available. Item 6 shows the responses of the

availability of Models and Simulations for Biology teachers in Schools; 19% claimed that it was Available and Functional, 12% Available But Not functional and 69% claimed that it was Not Available. Item 7 shows the responses of the availability of Computer for Biology teachers in schools; 69% claimed that it was Available and Functional, 12% Available But Not Functional and 19% claimed that it was Not Available. Item 8 shows the responses of the availability of Internet based communication (e-mail) for Biology teachers in schools; 75% claimed that it was Available and Functional, 6% Available But Not Functional, 19% claimed that it was Not Available. Item 9 shows the responses of the availability of concept maps for Biology teachers in schools; 50% claimed that it was Available and Functional, 25% Available But Not Functional and 25% claimed that it was Not Available. Item 10 shows the responses of the availability of Audio books for Biology teachers in schools; 25% claimed that it was Available and Functional, 31% Available but Not Functional and 44% claimed that it was Not Available.

Research Question 2: Are Biology teachers aware of the Modern and Scientific tools used in teaching Biology in Secondary Schools?

Table 2: Awareness of Modern and Scientific Tools for Biology Teaching.

S/N	MATERIAL	YES	NO
11	Projectors.	13 (81%)	3 (19%)
12	Standard Virtual Biology laboratory.	10 (63%)	6 (37%)
13	Integrated e-learning environment.	11 (69%)	5 (31%)
14	Online publishing	12 (75%)	4 (25%)
15	Electronic Probes (Sensors and softwares)	8 (50%)	8 (50%)
16	Models and simulations.	11 (69%)	5 (31%)
17	Computer.	13 (81%)	3 (19%)
18	Internet base communication (e-mail)	11 (69%)	5 (31%)
19	Concept Maps	11 (69%)	5 (31%)
20	Audio books.	13 (81%)	3 (19%)

Table 2 presents the awareness level of teachers of Modern and Scientific Tools in Biology teaching. Teacher's awareness of these tools are relatively high, ranging from 75% (Online Publishing) to 81% (Projectors, Computers and Audio books). Others were 63% (Standard Virtual biology laboratory), 69% (Models and Simulations, Internet base communication [e-mail],

Concept Maps and Integrated e-learning environment) and 50% Electronic Probes [Sensors and Softwares]).

Research Question 3: How often do teachers use Modern and Scientific Tools in Teaching Biology in Secondary Schools?

Table 3: Frequency of Biology Teacher's use of Modern and Scientific Tools.

S/N	MATERIALS	ALWAYS	SOMETIMES	NEVER
21	Projectors.	1 (6%)	12 (75%)	3 (19%)
22	Standard virtual Biology laboratory.	2 (12%)	9 (57%)	5 (31%)
23	Integrated e-learning environment.	2 (12%)	11 (69%)	3 (19%)
24	Online publishing	4 (25%)	5 (31%)	7 (44%)
25	Electronic Probes (Sensors and softwares)	2 (12%)	10 (63%)	4 (25%)
26	Models and simulations.	3 (19%)	5 (31%)	8 (50%)
27	Computer	11 (69%)	2 (12%)	3 (19%)
28	Internet base communication (e-mail)	12 (75%)	3 (19%)	1 (6%)
29	Concept Maps	2 (12%)	4 (25%)	10 (63%)
30	Audio books.	3 (19%)	2 (12%)	11 (69%)

From the table; Item 21 shows the responses on how often Biology teachers use projectors in teaching Biology; 6% responded that they used it ALWAYS, 75% responded that they use it SOMETIMES While 19% responded that they have NEVER used it in teaching Biology. Item 22 shows the responses on how often Biology teachers use the standard virtual Biology laboratory in teaching Biology; 12% responded that they used it ALWAYS, 57% responded that they used it SOMETIMES While 31% responded that they have NEVER used it in teaching Biology. Item 23 shows the responses on how often Biology teachers use integrated e-learning environment in teaching Biology; 12% responded that they used it ALWAYS, 69% responded that they used it SOMETIMES While 19% responded that they have NEVER used it in teaching Biology. Item 24 shows the responses on how often Biology teachers use online publishing in teaching Biology; 25% responded that they used it ALWAYS, 31% responded that they used it SOMETIMES While 44% responded that they have NEVER used it in teaching Biology.

Item 25 shows the responses on how often Biology teachers uses Electronic Probes (sensors and softwares) in teaching Biology; 12% responded that they used it ALWAYS, 63% responded that they used it SOMETIMES While 25% responded that they have never used it in teaching Biology. Item 26 shows the responses on how often Biology teachers use models and simulations in teaching Biology; 19% responded that they used them ALWAYS, 31% responded that they used them SOMETIMES While 50% responded that they have NEVER used them in teaching Biology. Item 27 shows the responses on how often Biology teachers use computer in teaching Biology; 69% responded that they used it ALWAYS, 12% responded that they used it SOMETIMES while 19% responded that they have NEVER used it in teaching Biology. Item 28 shows the responses on how often Biology teachers use internet base communication (e-mail) in teaching Biology; 75% responded that they used it ALWAYS, 19% responded that they used it SOMETIMES While 6% responded that they have NEVER used it in teaching Biology. Item 29 shows the responses on how often Biology teachers use concept maps in teaching Biology; 12%

responded that they used them ALWAYS, 25% responded that they used them SOMETIMES While 63% responded that they have NEVER used them in teaching Biology. Item 30 shows the responses on how often Biology teachers use audio books in teaching Biology; 19% responded that they used them ALWAYS, 12% responded that they used them SOMETIMES While 69% responded that they have NEVER used them in teaching Biology.

Research Question 4: What are the challenges faced by Biology teachers in using Modern and Scientific tools in Secondary Schools?

Table 4: Analysis based on the problems the Biology teacher face in the use of Modern and Scientific tools.

S/N	STATEMENTS	AGREE	DISAGREE
31	Lack of access to virtual Biology laboratory.	6 (37%)	10 (63%)
32	Time constraints in the classroom.	11 (69%)	5 (31%)
33	Lack of availability of modern and scientific tools.	11 (69%)	5 (31%)
34	Large class size.	13 (81%)	3 (19%)
35	Lack of skills in the use of modern and scientific tools.	12 (75%)	4 (25%)

From the table above, in Item 31, 37% of the total respondents AGREED that lack of access to virtual Biology Laboratory is a problem faced by Biology teachers in schools, While 63% DISAGREED. In item 32 and 33, Time constraints and lack of availability of Modern and Scientific Tools for teaching Biology in schools were also mentioned as problems faced by Biology teachers, 69% of the total respondents AGREED While 31% DISAGREED. In Item 34, 81% of the total respondents AGREED that Large class size was a problem for Biology teaching in schools While 19% DISAGREED. Item 35, 75% of the total respondents AGREED that Biology teachers lack the skills in handling Modern and Scientific Tools for effective teaching of Biology While 25% DISAGREED.

Research Question 5: How can these challenges faced by Biology teachers in using Modern and Scientific Tools in Secondary Schools be solved?

Table 5: Analysis based on the solutions to the problems faced by biology teachers.

S/N	STATEMENTS	AGREE	DISAGREE
36	Provision of access to virtual Biology laboratory.	14 (88%)	2 (12%)
37	Enough time should be allocated to Biology teaching in the classroom.	16 (100%)	–
38	Provision of appropriate and adequate modern and scientific tools.	16 (100%)	–
39	Reduction of large class size to at least average class size.	13 (81%)	3 (19%)
40	Teachers should be properly trained to handle the modern and scientific tools effectively.	14 (88%)	2 (12%)

From the table above; In Item 36, 88% of the respondents AGREED that provision of access to standard virtual Biology laboratory is one of the solutions to the problems faced by Biology teachers in schools While 12% DISAGREED. In Item 37 and 38, 100% of the respondents AGREED that allocating enough time to Biology teaching and provision of appropriate and adequate Modern and Scientific Tools as a way of solving the problems of time constraint and lack of availability of these tools While none of them DISAGREED. In Item 39, Reduction of large class size to at least average class size was suggested as a solution to problem of large class size, 81% of the respondents AGREED, While 19% DISAGREED. Item 40, 88% of the respondents AGREED that teachers should be properly trained to handle the Modern and Scientific Tools effectively While 12% DISAGREED.

Discussion of Findings

Availability of Modern and Scientific Tools for Biology Teachers in Secondary Schools.

The result from table 1 indicates that there are insufficient Modern and Scientific tools for Biology teachers in public schools as shown by the response from the teachers. This has been a major problem and a great set back to the effective teaching of Biology in senior secondary schools in Oredo Local Government Area.

Biology Teachers Awareness of Modern and Scientific Tools Used in Teaching Biology.

On the basic of the findings from Table 2, it is seen that most Biology teachers are aware and have seen Modern and Scientific tools used in teaching Biology but the problem was that most of the tools were not available in their schools and even if they were available, they were not functional and also few of the Biology teachers were not aware of the existence of these Modern and Scientific tools which may also hinder the effectiveness of Biology teaching in the classroom.

Biology Teachers' Use of Modern and Scientific Tools in Teaching.

From the result of the finding in Table 3, it was observed that Biology teachers who have never used Modern and Scientific tools in teaching Biology were higher than those that have used these tools Always and Sometimes, this may be due to the unavailability of these tools or in a situation where they were available but not functional. This may result in low level of effectiveness in the teaching and learning of Biology. This is a major cause for concern because it will deprive students a wholesome experience from the study of Biology.

Challenges faced by Biology Teachers in The Use of Modern and Scientific Tools in Secondary Schools.

Findings from the analysis on Table 4, Item 31-35 reveals that Biology teachers were faced with challenges such as Time constraints in classroom, Lack of availability of these Modern and Scientific tools and Large class size, even though lack of access to virtual Biology Laboratory and lack of skills in handling the Modern and Scientific tools were not problems to few of the Biology teachers, it was still a problem faced by few others.

Solutions to the Challenges Faced by Biology Teachers in The Use Modern and Scientific Tools.

Basically in Table 5, Item 36-40 presents data on most Biology teachers suggestions on how to tackle the challenges; Provision of access to virtual Biology laboratory, Allocating enough time for Biology teaching in the classroom, Provision of appropriate and adequate Modern and Scientific tools, Reduction in class size to at least average class size, and Training of the teachers to handle the tools effectively.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATION

This chapter deals with the summary, conclusion drawn from the analysis of the data collected and recommendations made based on the findings of the study.

SUMMARY

This study has assessed Biology teachers awareness and use of modern and scientific tools in the teaching of Biology in Senior Secondary Schools in Oredo Local Government Area in Edo State. Five research questions were raised to guide the study.

1. What are the Modern and Scientific tools available to Biology teachers in Secondary Schools?
2. Are Biology teachers aware of the Modern and Scientific tools used in teaching Biology in Secondary Schools?
3. How often do teachers use Modern and Scientific tools in teaching Biology in Secondary Schools?
4. What are the challenges faced by Biology teachers in using Modern and

Scientific tools in Secondary Schools?

5. How can these challenges faced by Biology teachers in using Modern and Scientific tools in Secondary Schools be solved?

The population of this study consists of thirteen (13) secondary schools and twenty eight (28) Biology teachers. Questionnaire was used for data collection for the study. Frequencies and percentage were used to analyze the data collected in order to answer the research questions raised.

Based on the findings:

1. The high percent of the respondents based on the availability of Modern and Scientific Tools proved that there are inadequacy in the supply of these tools in schools for Biology teachers.

2. Most Biology teachers in Oredo Local Government Area are aware of the Modern and Scientific tools available in the schools in Oredo Local Government Area but the challenges posed at some of them was that even though there were some available tools, they were not functional due to lack of electricity to power them, Lack of time allocated to the subject, large class size or because of their bad conditions or state.

3. Most Biology teachers in Oredo Local Government Area has never used Modern and Scientific tools in teaching Biology due to the high rate of their unavailability in the school.

4. Most Biology teachers are faced with major challenges such as; unavailability of Modern and Scientific tools, time constraints and large number of audience which posed serious challenge in carrying out effective teaching with the few available tools in some schools.

5. Almost all the Biology teachers supports the provision of access to virtual Biology laboratory, allocating enough time to Biology teaching, provision of appropriate and adequate modern and scientific tools, reduction of class size to at least average class size and training of teachers properly to handle these tools effectively, as ways to tackle the challenges they face in Oredo Local Government Area.

CONCLUSION

Based on the findings of this study, It was concluded that assessment of teacher's awareness and use of modern and scientific tools no doubt will aid

effective teaching and learning of Biology in senior secondary schools in Oredo local government area of Edo State.

RECOMMENDATION

The following recommendations were made from this study:

1. Biology teachers should be enlightened or given more orientation about the existence and use of modern and scientific tools.
2. Teachers should be properly trained on the effective handling of the tools.
3. Access to virtual laboratory should be provided as it is effective and mandatory for carrying out practicals for proper understanding of the most topics in Biology.
4. The Government should provide sufficient and adequate modern and scientific tools to schools in the Local Government Area for the efficient teaching and learning of Biology especially in public schools. The materials should be adequate in form and quality.
5. Overpopulation (Large class size) should be avoided in classroom so as to enable effective utility of modern and scientific tools.
6. The time allocated for teaching Biology in the school time table should be

increased so that modern and scientific tools could be conveniently used in a period.

It is also recommended that this study be carried out in other Local Government Areas of Edo State in particular and Nigeria in general.

SUGGESTIONS FOR FURTHER STUDIES

Based on the findings of this study the following suggestions have been made by the researcher for further studies.

1. Teacher's level of awareness on the availability of modern and scientific tools should be studied.
2. The extent of utilization of modern and scientific tools in teaching Biology in senior secondary schools should be studied.
3. The impact of the use of modern and scientific tools on Biology student's examination performance in their senior secondary school certificate examination (SSSCE).

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**DEPARTMENT OF CURRICULUM AND INSTRUCTIONAL
TECHNOLOGY
FACULTY OF EDUCATION
UNIVERSITY OF BENIN
ASSESSMENT OF TEACHER'S AWARENESS AND THE USE OF
MODERN AND SCIENTIFIC TOOLS IN THE TEACHING OF
BIOLOGY IN SENIOR SECONDARY SCHOOLS, OREDO LOCAL
GOVERNMENT AREA OF EDO STATE.
QUESTIONNAIRE FOR TEACHERS**

Dear Respondents,

The questionnaire is designed to solicit your candid opinion on the analysis of the awareness of modern and scientific tools in teaching biology in senior secondary schools. Your cooperation in providing honest and sincere responses to the questions will be appreciated as they will be treated confidentially.

SECTION A

Please respond to the questions below by ticking () in the appropriate spaces provided below.

Sex: Male () Female ()

Educational qualification: NCE (), B.Ed/B.Sc (), M.Ed/M.Sc(),
Ph.D ()

SECTION B

Instruction: Tick (√) in the column that best express your response: A & F- Available and Functional, A & N.F- Available but not functional, Not available, Yes , No, Always, Sometimes, Never, A- Strongly Agree, A- Agree, D- Disagree, SD- Strongly disagree

SECTION I

KEY: A & F= Available and Functional, A & N.F= Available and not Functional, NA= Not Available.

What are the modern and scientific tools available to biology teachers in secondary schools

S/N	MATERIALS	A & F	A & N.F	NA
1	Projectors.			
2	Standard virtual biology laboratory.			
3	Integrated e-learning environment.			
4	Online publishing			
5	Electronic Probes (Sensors and softwares)			

6	Models and simulations.			
7	Computer .			
8	Internet base communication (e-mail)			
9	Concept Maps			
10	Audio books.			

SECTION II

Have you seen any of the following modern and scientific tools?

S/N	MATERIALS	Yes	No
11	Projectors.		
12	Standard virtual biology laboratory.		
13	Integrated e-learning environment.		
14	Online publishing		
15	Electronic Probes (Sensors and softwares)		
16	Models and simulations.		
17	Computer .		

18	Internet base communication (e-mail)		
19	Concept Maps		
20	Audio books.		

SECTION III

How often do you use the following Modern and Scientific tools in teaching biology?

S/N	MATERIALS	Always	Sometimes	Never
21.	Projectors.			
22.	Standard virtual biology laboratory.			
23.	Integrated e-learning environment.			
24.	Online publishing.			
25.	Electronic Probes (Sensors and softwares).			
26.	Models and simulations.			
27.	Computer .			
28.	Internet base communication (e-mail)			

29.	Concept Maps			
30.	Audio books.			

SECTION IV

KEY: SA= Strongly Agree, A= Agree, D= Disagree, SD= Strongly Disagree.

What are the problems you face in the use of modern and scientific tools in the teaching of biology in secondary schools?

S/N	STATEMENTS	SA	A	D	SD
31.	Lack of access to virtual biology laboratory.				
32.	Time constraint in the classroom.				
33.	Lack of availability of modern and scientific tools.				
34.	Large class size				
35.	Lack of skills in the use of modern and scientific tools				

SECTION V

KEY: SA= Strongly Agree, A= Agree, D= Disagree, SD= Strongly Disagree.

How can these challenges faced by biology teachers in the use of modern and scientific tools in teaching biology be solved?

S/N	STATEMENTS	SA	A	D	SD
36.	Provision of access to virtual biology Laboratory.				
37.	Enough time should be allocated to biology teaching in the classroom.				
38.	Provision of appropriate and adequate modern and scientific tools				
39.	Reduction of large class size to at least average class size.				
40.	Teachers should be properly trained to handle the modern and scientific tools effectively.				