EFFECTS OF TWO CONSTRUCTIVIST BASED TEACHING STRATEGIES ON BIOLOGY STUDENTS ACHIEVEMENT AND RETENTION IN BOSSO LOCAL GOVERNMENT AREA OF NIGER STATE

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ABSTRACT

The study Examine the Effect of two constructivist based teaching strategies on Biology students' achievement and Retention in Bosso Local Government of Niger State. A sample of hundred and ten (110) S.S1 students from two schools (2) senior secondary in Bosso Local Government were used fpr the study. The students were randomly assigned to Experimental and control groups. Quasi experimental design was adopted in the study. The instrument used for data collection was the Biology Achievement Test (BAT) which was developed by the researcher and validated by lecturers in science Education Department, Federal University of Technology Minna. The instrument was also pilot tested to ascertain the internal consistency and the reliability coefficient formular was r= 0.70 was obtained. The data collected were analyzed using the mean, standard deviation and t-test analysis. The result indicates that there was significant difference in the mean achievement score of students taught using Discussion to those using Demonstration teaching method ($t=10.3, df=108, p<0.05$), there was significant difference in the mean achievement score of male and female students taught using Discussion and Demonstration method with ($t=2.67, df=58, p<0.05$). there was a significant deference in the mean retention score of students taught using Discussion method ($t=10.3, df=108, p<0.05$). there was no significant difference in the mean retention score of male and female students taught using Discussion and Demonstration method ($t=0.74, df=58, p>0.05$). Based on this findings it was concluded that the use of Discussion method is more effective in improving students achievement in Biology than the conventional Demonstration method. It is also therefore recommended that Government should provide adequate infrastructure and enabling environment for the use of Discussion method. School Principals should encourage and give necessary support to teachers for effective use of these methods in teaching and learning outcome.

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CHAPTER ONE

1.0 INTRODUCTION

1.1. Background of the Study

There has been a consistent poor achievement in Biology as shown by the West African Examination Council (WAEC) annual reports of (2017-2018). Many scholars have therefore tried to find the ways and means of improving student's achievements in Biology. They have, therefore, looked at many factors and carried out some empirical studies on the effect of these factors on performance of students.

The factor considered in the present study is the effects of two constructivist based teaching strategies on biology student's achievement and retention in Bosso Local Government Area, Niger State. The methods being considered are the DISCUSSION and the DEMONSTRATION methods. These two methods encourage co-operative learning between the teacher and the learners. Johnson and Johnson (1997) were of the opinion that co-operative learning experiences promoted higher achievement among the students. Although most studies have stressed on students' participation and interaction as being very important factors of achievement, there may, however, be other alternative contributing factors and teacher's method of teaching is definitely one of them.

Jonassen (2006) states that pedagogy is a different way by which a teacher can teach. Teaching method therefore, is the act or science of being a teacher, generally referring to strategies of instruction or style of instruction. Science is an activity oriented subject. The way it is thought is important in helping the students acquire basic scientific knowledge, skills and attitude to solving different problem in life. Biology being

A science subject, therefore involve the teacher using methods that will give the students opportunity to be actively involved.

It is a well-known fact that no skilled teacher ever uses just one method of teaching Shield (2002) pointed out that good teachers follow no one method, instead he/she uses whatever methods and materials that seems to be best for the particular combination of individual situations.

This research work is focused mainly on Discussion and Demonstration methods of teaching. Discussion method involves the discussion of a biology topic, issue or concept by groups of students or the entire classroom.

Trusted (1997) asserts that the discussion method could be teacher cantered, task cantered or student cantered. The teacher opens the discussion by asking one of the prepared questions and the students going to discuss while he moderates.

Walker (2003) says that in discussion method, students are given chance to react while the teacher who has the answer in mind allows the students to think about the question.

According to Wirschner (2006), discussion method is a teaching method that includes questioning which is similar to testing. A teacher may ask a series of question to collect information of what students have learned and what needs to be taught. Testing is another application of questioning. A teacher tests the student on what was previously taught in order to identify if a student has learned in order to identify if a student has learned in the material.

According to Mayer (2004), demonstrations are done to provide an opportunity to learn new exploration and visual learning tasks from a different perspective. A teacher may use

experimentation to demonstrate ideas in a science class. Demonstration may be used in the circumstance of proving conclusively a fact, as by reasoning or showing evidence.

Over the past years, these have been an unsteady progress rate in Biology for secondary school students as regards internal and external examinations. Measuring academic performance can occur at multiple levels and serves multiple purposes.

For instance, the classroom teachers after conduct formative and summative tests, to evaluate students mastering of course content and provide grades for students and parents. This relative achievement of secondary school students is an example that has internal and external impact depending on the method adopted by the teacher. It is in the light of the above that the need to examine the effect of two teaching methods on secondary school student performance of biology in Minna Niger State cannot be overemphasized.

1.2 Statement of the Problem

The popular opinion in Nigeria today is that the standard of Education has fallen short of what it should be. This fall in the standard of education is perceived by many as the inability of the teachers to impact knowledge to the learners, the way they will understand and write well in examinations. Reports by examination councils in Nigeria have disclosed the recurrent and endemic failure of students in both internal and external examinations especially in Biology (WAEC) annual reports; (2017-2018). Agbo (2010) says that teachers no more show commitment as they see themselves as most “measure up”. Also Layi (2004) found out that teacher’s lateness to work, absenteeism and poor attitude to work encourage indolence and contribute to poor performance among students. The problem of this study is therefore to

investigate the effect of two teaching methods- Discussion and demonstration, on secondary school student's performance in Biology.

1.3 Aims and Objectives:

The aim of this study is to investigate into the effects of two Constructivist Based teaching Strategies on Biology student achievement and Retention in Bosso Local Government Area of Niger state. This study strives to achieve the following objectives;

I. Determine the effect of Discussion and Demonstration method on student's achievement.

II. Examine the effect of Discussion and Demonstration on gender achievement.

III. To Determine the effect of Discussion and Demonstration method on students Retention.

IV. To find out the effects of Discussion and Demonstration method on gender Retention.

1.4 Research Questions

The following research questions were raised for the study;

i. Will there be any difference in the mean achievement scores of students taught Biology using Discussion and Demonstration methods?

ii. Is there any difference in the mean achievement scores of male and female students taught Biology using discussion and demonstration method?

iii. Will there be any difference in the mean retention scores of students taught Biology using discussion and demonstration method?

iv. Is there any difference in the mean retention scores of male and female students using discussion and demonstration method?

1.5 Research Hypotheses

The following Null hypotheses were formulated and tested 0.05 level of significance;

HO_1: There is no significant difference in the mean achievement scores of students taught Biology using discussion and demonstration method.

HO_2: There is no significant difference in the mean achievement scores of male and female students taught Biology using discussion and demonstration method.

HO_3: There is no significant difference in the mean retention scores of students taught biology using discussion and demonstration method.

HO_4: There is no significant difference the mean retention of scores of male and female students taught Biology using discussion and demonstration method.

1.6. Significance of the Study

The finding of this study will be of benefit to the teachers, students and curriculum planners. The study critically discusses extensively the effect of two Constructivist based teaching strategies on secondary school students in biology, the consideration of academic performance of students in biology.

This findings will help the students who have lost hope in doing well in biology that all hope is not lost as they can still understand the subject by improvement in teaching methods used by their teachers.

The teachers will benefit since the study will help them to understand the appropriate methods of teaching to be employed in carrying out their duties. The curriculum planners will get used information that will enable them improve in their planning of curriculum.

The overall significance is that when all the stake holders in this study benefit from the findings, the learning of biology will be very enjoyable and the students will perform better in both internal and external examinations. Encourage publishers to incorporate all constructivist based teaching strategy levels of questions in their books.

Provide empirical evidence on how to improve the teaching/learning of Biological science in schools. Encourage curriculum planners to incorporate constructivist based teaching strategy questions in planning the curriculum. Also form a foundation for further studies in science education in relation to constructivist based teaching strategy styles.

1.7 Scope of the Study:

The study will concern itself with the effect of two constructivist based teaching strategies on biology student's achievement and retention in Bosso LGA of Niger State. Biology teachers in the public secondary schools in the Local Government Area will be used for the study. The study was restricted to senior secondary school (SSS1) students in two secondary schools in Bosso LGA of Niger state. The school are; (Government Day secondary school, Minna and Bahago secondary school, Bosso Minna). Senior secondary school one was used for the study because the content to be learnt falls into their curriculum and syllabus in Biology. The study was designed to cover the Topic; Ecological Concept (Ecosystem) in biology and the class was not an examination class. A multiplicity of variables come under the topic, but the researcher have decided to focus on the following variables, These includes, the use of discussion and

demonstration methods in teaching Biology, as independent variables while achievement and retention as dependent variables. The skills involved in the use of the two teaching methods, the facilities available for the two teaching methods. The research work lasted for a period of Four (4) weeks.

1.8 Basic Assumptions of the Study

The basic assumptions of the study include;

i. Public schools located in a given area are likely to have the same educational standards in terms of staffing and materials.

ii. Improved teaching strategies will enhance positive teaching and learning of Biological concepts.

iii. Seminars, workshops, conference will improve teacher's competency in their subject area, thus enhancing level of achievement/retention among biology students.

iv. Discussion and demonstration methods would have not been used in teaching the concepts of biology.

1.9 Operational Definition of Terms

Gender: - The properties that distinguish organism on the basic of their reproduction roles, a state of being a male or female or as a member of one sex or the other.

Discussion: - An intended communication [often interactive] dealing with some particular Topics, and exchange of views

Demonstration: - Demonstration in science refers to carrying out science activities with illustrations of ideas or concepts.

Academic Performance: - A measure of what a person has accomplished after exposure to an educational program.

CHAPTER TWO

2.0 LITERATURE REVIEW

This chapter reviewed literatures under the following sub-headings;

Conceptual framework, Theoretical framework, empirical studies, summary of literature reviewed.

2.1 Conceptual Framework

2.1.1 Concept of Biology

Biology is the study which is concerned with life, it deals with cell, tissues, organs, system and also plant. Some of the nature and scope of Biology is concerned with the study of living organism i.e. plats and animal, including micro-organism such as viruses, bacteria, protozoa, algae, fungi etc. it also studies the characteristics and general life and factors associated with living organism such as environment in which they live.

Consequently, the cardinal goals of Biology education at senior secondary school level are that the students at the end of their study should get hold of ample knowledge in Biology, talent to affect scientific knowledge to everyday existence in issues of individuals and neighborhood health and agriculture with sensible and efficient approaches. [FME 2009]

2.1.2 Importance of Biology

Biology is an essential component of everyday life, whether it is been recognized or not. According to Oloddu (2010) Biology is of importance by understanding our bodies, that is, it helps us prevent, cure and even eliminate diseases, it teaches us to become stronger and faster or

lose weight. And understanding our environment that is, how plants and animals interact with humans, natural planet, teaches us how to conserve our natural resources, which also help us to pinpoint what causes harm to ecological system, harvesting of food etc.

2.1.3 Teaching and Learning Biology

Teaching simply means the act of passing across knowledge, while learning deals with the process of inhibiting the knowledge had been passed across. The success of a good teaching and learning of Biology is a major objective of the new science/Biology curriculum.

Thus it is paramount to the goals of aspiration of the society at large, provided its activities or requirements are commensurate to the society's available resources.

It is however pertinent for school, especially the knowledge facilitators (i.e. the teachers) to see to the attainment of effective teaching and learning of Biology, (most especially, in a financially challenged nation like Nigeria) which would in turn better the societies status and development. Hence, the need for teacher to employ teaching approaches/methods/strategies/techniques that is academically effective.

One of the most cited problems of teaching Biology has been the effects of the teaching strategy. Students lack of understanding of different concepts in biology result to poor performance of students at SSCE and backwards in scientific and technological advancement of our nation.

Research findings have been shown that a number of topics in Biology amongst which is Genetics contain some concepts which pore difficulty for biology students Esiobo, and Soyibo, (1995) Okebukola (1995) stated it clear that the concepts in genetics are not meaningfully understood by students, they tend to shy from questions set on them during senior secondary

certificate examinations (SSCE). Invariably, this leads to poor performance of students in these areas, the overall performance of Biology students at SSCE.

2.1.4 Concepts of Teaching

Teaching is the process through which knowledge's skills and values are consciously or unconsciously acquired as the result of interaction between the teacher and his pupils. Therefore, teaching as a profession plays an important role in every educational system. Teaching therefore according to Maduewe, Ezeani and Maduewesi (1999) involved a coherent and systematic accumulated body of knowledge conserved with skilled that have wealth's of intellectuals foundation. It is a conscious and deliberate attempt by matured and experienced persons to impart information, knowledge, skill, attitude, and value and habit to inexperienced and immature persons with the intention of bringing about learning. They pointed out that teaching performs the following rules that are to:

i. Increase the odds that potential learners will learn.

ii. Point learning towards the desire accomplishment by learners.

iii. Make knowledge sensible

iv. Present leaners with a live opportunity to learn.

v. Enhance the persons who are learners.

Aliyu (2001). Also stated that teaching is the imparting of knowledge and skills for effective classroom skill acquisition. There are different ways in which teaching can be carry out depending on what an individual one to achieved or want to impart on a learner at a given point in time. Also Duncan in Nzeribe and Sawa (2002) outlined that teaching is an activity, a unique

profession and a humane act in which one's creativities and imagination are not put into used. Teaching in other words, is cluster of activities that one engages in doing some specific things which is an act of a particular kind. Lanier in Nzeribe and Sawa (2002) viewed as manipulative the variable of instruction to produced intended changes in learners Behavior. Okoh (2003) define teaching as the conscious and deliberate effort by a matured or experienced person to impart information, knowledge, skills and so on, to an immature or less experienced person with the intention that the learner will learn or come to believed what he is taught on good grounds.

According to Abimbola (2004) teaching is a process of facilitating students leaning through proper management of the teacher of the interrelationship among students interests content for learning and the method as well as materials he or she intend to use in the teaching and learning of content materials Mishara (2007) observed that teaching are more difficult than most faculties are willing to acknowledge. Teaching and learning should be inseparable; in that leaning is a goal of teaching. Mishara (2007) further explained that teaching is part of a hole which comprises of the teacher the learner the disciplinary content, the learning and teaching process, and evaluation of both the teacher and the learner. Cain (2008) emphasized that the success in teaching is measured by the degree to which the teacher is able to achieved the desire learning in his students, and to achieved this, the teacher the teacher must know the type of learning needed by his pupils and how to bring such learning.in other words, the basic thing in teaching concerns the selection of content and material. Yet walk (2008) describes teaching as an art which can be made concretes through practice and by formal study.

2.1.5 Teaching Methods

Teaching methods involves the study and practice of various methods of teaching which includes the mastering and application of different principles of learning. white (2003) opined that teaching method are the tools or means through which practicing teachers engage there students into meaningful activities, as a results of which ideals, values and fact are learned. joseph (20004) added that for effective teaching to take place, the skillful teacher need to use different method and techniques at his command, even though there is a great diversity in teaching methods, there is no one of them that can be regarded as the best for every teaching situation. Carefully designed teaching methods, can works wonders in making learning effective. Therefore, the success in the use of method depends on an intelligent analysis of the educational purpose, the pupils in the class, and the curriculum content at the moment as well as the type of subject being thought. Some of this teaching method according to Daniel (2006) includes; Lecture method, Discussion method, Inquiry method, Case study method, and Demonstration method. But a brief analysis of Discussion and Demonstration method is as presented in subsequent paragraphs.

Discussion Teaching Method

Discussion is when two or more interact verbally with each other. Discussion teaching method could be adopted deliberately in learning situations, but sometimes iy occurs spontaneously as a teacher uses this method (Martin. 2005). According to him, discussion could be considered as a technique within a method, sometimes it may occur at brief intervals during an informal lecture, and so maximum participation is achieved. In this way, discussion could be considered Student-

centered teaching. It involves taking over subjects from various points of view, and the teacher's role is not dictate or influence the view points of the students as he moderates the discussion.

There is no doubt that many teachers have experienced days when spontaneous discussion arose even though they were unplanned. Discussions are therefore. As important as learning process because it is a way of considering various facts of problem and also because it lays the groundwork for the many discussion situation in which young and adults are constantly taking part Jane (2006). In a different way, discussion implies the participation of pupils in the process of learning by evaluating points of views, raising issues of their own, and seeking solution based upon study, examination and group analysis under the teacher's guidance (Denis,2006).

Advantages of Discussion Method:

i. Emphasis on learning instead of teaching.

ii. Participation by everyone in the class.

iii. Development of democratic way of thinking.

iv. Training in reflective thinking.

v. Training in self-expression.

vi. Spirit of tolerance is inculcated.

vii. Learning is made interesting.

Disadvantages of Discussion Method:

I. Discussion method is not appropriate for all the topics.

II. It can be used only to students who have some basic knowledge in the topic.

III. Some of the students may feel shy or reluctant to take part while others may try to

IV. Dominate.Teachermaylosecontroloverthestudentsandtheymayendupinquarelling.

Demonstration Teaching Method

The demonstration method is one of the teacher's greatest assets in arriving at fundamental skills and practice in a very short amount of time. Demonstration method is valuable to people who want to learn new skills or ability or even to learn a better way of doing something. (Godwin,2004). Infact, it is the basic method for introducing new skills to the learner, for developing understanding and for setting people to accept new and better ways of doing things. The demonstration is done by the teacher while the students watch. Demonstration method of teaching according to Clark (2005) is based on the simple but sound principle that we learn by doing. It is accompanied by examinations on the part of the teacher, this teaching method can only be effective if it is properly chosen and used. Demonstrations, when used by skilful teacher are conducive to the development and maintenance of interest among pupils.

Demonstration is a method of teaching where sight and hearing are the major means of communication (Martin, 2005). The instructor generally begins with a description of what is to be shown along with a list of main points on which the students should focus their attention. This is followed by the Demonstration proper, accompanied by a running narrative discussion of what is happening. If the demonstrationist to teach a skill, then there follows a period in which the students are given opportunity to perform the procedures just demonstrated while the instructor circulates and offers suggestions and feedback. According to Denis (2006) demonstration can be

prepared in three major ways; the class demonstration. The groups demonstration and the individual's demonstration.

The Class Demonstration

In many courses of study, there are various instances when demonstration are used as a teaching method for the entire class. Since it involves the entire class, the teacher's time is saved as there will be no cause for some students to bother the teacher to repeat the procedure, or to give them the basic information. Generally, this type of demonstration involves much enthusiasm and interest among the pupils, especially as the entire class members are actively involved in watching the teacher and asking questions on some poits not clear to them.

The Group Demonstration

The major difference between this type of demonstration and the class demonstration is that it is presented in section of the class while the rest of the class is engaged in another assignment. Which may not be related to the Topic presented. The need for group demonstration arises as a result of individuals difference in anility an aptitude which may cause some pupils to complete a given project ahead of time, thus creating a serious gap in maintaining a uniform demonstration.

Individual Demonstration

Despite the other types of demonstration, there are times when individuals are taught at a time, some of the outstanding reasons for using this could be because of the differences in background, mechanical aptitude and general learning ability, irregularity in attendance, differences in speed and difference in problems attacked by pupils.

The advantages and disadvantages of demonstration method of teaching according to (Marilla,2006).

Advantages of Demonstration Method

i. This method saves a lot of time.

ii. Demonstration could be used to introduce a lesson or to end a lesson.

iii. Demonstration adds variety to lesson.

iv. It assist students to become good observers.

v. It has a high interest value.

vi. It is effective as-an introduction to new skills

Disadvantages of Demonstration Method

i. This method cannot replace a real practical work.

ii. It sometimes students participation which could lead to boredom.

iii. This method assumes all students see, hear and feel the same.

iv. When classes are large, there could be problem of audibility and visibility.

v. If demonstration fails, students could develop lack of confidence in their teacher.

vi. It is difficult to evaluate thoroughly student's understanding during the demonstration exercise.

Usage of Discussion and Demonstration method in teaching Biology

The successful learning of Biology in secondary schools depends largely on the correct use of teaching methods, whose activities target most learning experiences (Bello, 2003). Students may learn definitions of Biology and other parts on the syllabus through the use of Discussion method theoretically, but to master the application of Biology practical's a proper Demonstration is involved to ensure students observe the teacher properly. And subsequently apply the knowledge of Demonstration and what they have seen and learnt to deal with their daily life. Using demonstration teaching, the teacher could give a demonstration or a format of doing practical Biology, as well as emphasis and explains specific important points with regards to the format. According to Ken (2004) demonstration method gives every student the ample opportunity to see critical elements involved in solving our practical. Through guided discovery method of learning, the teacher may guide the class through various steps in working and application of figures in the format demonstrated. Discussion and Demonstration teaching methods. If the teacher is showing the class how to solve an account, he would first explain the format to the students. Put them through on the steps by step procedure of applying it, tell them why it should be applied and then guide them through the critical and fundamental aspects of the account. The students would therefore play their own parts by repeating the performance many times as they put the working together in proper format using sequence and timing. Proper timing should be given to students to practice the account either by themselves or with a partner where necessary (Ubah, 2004). The teacher would then serve as a motivator by walking round the class, making correction and providing necessary encouragement. At the end of the lesson. The students would be required to Discuss points emphasis. The teacher should know the methods available and should consider

the advantage and disadvantage of each of them in order to make the best use of them in teaching Biology.

2.2 Theoretical Framework

This work is based on Bruner Constructivist Learning theory (1967). The theory states that learning is a process in which the learner is able to build on present and previous information through practice and activity. The students should be able to take information, create ideas and make choice by utilizing a thought process. The teacher should therefore encourage students to develop the skills to find out principles on their own. According to him, constructivist learning theory takes places in problems-solving situations where the learners on his or her own past experienced and existing knowledge to discover fact and relationship and new truths to be learned.

As a result, students may be more likely to remember what they see and practice on their own students therefore interact with the world by exploring and manipulating objects, wrestling with questions and controversies or performing experiments.

Proponents of this theory believe that it has many advantages which includes; Encouraging active engagement, promotes motivation, promotes autonomy, responsibility, and independence, promotes activity learning help in development of creativity and problem solving skill, encourages the use of all the five senses in learning and promotes a tailored learning experience.

This research work is related to Jerome Bruner's constructivist learning theory because it has to do with activity learning and this work is also on activity learning.

2.2.1 Piaget's Cognitive of Learning

Cognitive theory of learning believes that children have profound misconception about the world and this misconception appeared to be common to a given level and difference age level yield levels of comprehension and reasoning. Piaget's cognitive theory of learning is referred to as stage theory of cognitive development. According to Piaget, children develop knowledge by inventing or constructing reality out of experience and thus mix their observation with their ideas about how the world works. Piaget observed that certain periods are critical in the child's mental development and this have to be considered during curriculum planning. In addition to this, heredity and environment have effect on the cognitive development of a child. Piaget used the Term Assimilation and Accommodation to explains his views.

Assimilation: in this concept, Piaget means a process of interpreting actions or events in relation to one's scheme (Define sequence of physical and mental actions).

Accommodation: according to Piaget means the modification of existing schemes to fit reality, Piaget pointed out in his work that cognitive development is in stages where each stage has some distinctive properties and structures as can be seen below. The child from birth progresses through cognitive development stages interacting with his/her environment. The four developmental stages of cognitive grown are:-

1. Sensory motor stage (0-2years)
2. Proportional stage (2-7years)
3. Concrete operational stage (7-12)
4. Formal operational stage (12-16)

Sensory Motor Stage (0-2)

This is the first stage of cognitive development and occurs between zero to two years. At this stage the young individuals are bound by their actions and sensations and are capable of very little or no reasoning beyond what they can see or do physically. Learning at this stage is not based on mental exploration or reasoning. The little organism only learns by doing or interacting with the environment.

Proportional Stage (2-7years)

This stage starts at the age of two and ends at seven for most people. It is characterized by emergency of symbolic thought. At this stage, children are able to use symbols to represent ideas, events or objects; within this period thought is separated from action. Children learn the use of language, mental imagery and categories and can use symbols to represent what they learn and the circumstances around them.

Concrete Operational Stage (7-12years)

This stage start at the age of seven and ends at twelve (12) for most people. This stage is characterized by mastery of various logical operations which include measurement, class relationship arithmetic and conception of hierarchical structures, at this stage, children reason along the way things are physically. However, their thinking is still shallow. They cannot think or reason abstractly. Piaget himself observed that children are capable of operation on internal representation of concrete objects in ways that are reversible. According to Piaget, children could imaging performing mental manipulations on a set of objects and could mentally put back the way they got them. Learning at this stage involves the principles of understanding, conservation of number and mass.

Formal operational stage (12-16years)

This stage occurs within the adolescent stages; it begins in most people at the age of 12 and ends at 16 or at the ends of adolescence stage.

At this stage the young individual can start to think more abstractly. This stage of cognitive learning is characterized by ability to manipulate abstract as well as concrete objects, ideas and events. At the formal operational stage, the young individual acquires more ability to deals with abstractions and may engage in hypothetical reasoning based on logic.

The Implication of Piaget theory

Considering the facts that Piaget observed that cognitive development is in stages and each stage has some distinctive properties, Salah (2008) reported that the use of the Piagetian cognitive development stages to select curriculum items for learners will facilitate retention and positive transfer of learning. Base on the knowledge of the developmental stages of the child, that it is important to involve the child in experiences that are appropriate to the level of development and operations of the child.

In recent years many psychologist have been dedicated to a study of learning theories. The interest shown by psychologist in this area is partially as result of the interesting but complex nature of the concept of learning. In simple terms, psychologists are intrigued by how the mind acquire knowledge. It is only if we know how knowledge is acquired that will be able to use appropriate teaching and learning methods in the classroom.

2.2.2 What is Learning

Many researchers have attempted to define the concept of learning and no single definition can be said to be conclusive or correct, however, all attempt shed new light on the subject of learning, for example, according to Wakefield (1996) learning can be described as a relatively permanent change in the behavior of an individual based on his experience or discoveries. Thus the process of experience and discovery lead to a new understanding of the world and ourselves, and enable us to apply the acquired knowledge in new situation. Knowledge acquisition involves processes that transform data from experience into organized information.

2.3 Empirical Studies

For the purpose of this study, the following empirical studies were reviewed:

Raymond and Ogunbameru (2005) carried out a study on a comparative Analysis of two methods of teaching Biology as secondary schools in ondo state. The population of the study comprised of 820 students in okiti-pupa Local Government Area in Ondo State, offering Biology in the secondary schools. SS1 students were randomly chosen for the study. Four research questions were raised and four null hypotheses were formulated. The research adopted quasi experimental pre-test, post-test control group design with randomization. Data was collected and the result was analysed at the alpha level 0.05 using t-test/z-test as the main statistical tool.

The result showed that the use of guided discovery method in place of conventional method improved student's performance in Biology. It was concluded that Discussion teaching method is very effective in teaching Biology. The researcher observed that the sample population of four schools selected were too many due to the fact that it was an experimental research. It would be difficult to control the extraneous variables. Nevertheless, the present study is related to the

previous study because t-test statistics was used. But different because of the level that was used which was senior secondary one (SS1).

Prince (2006) carried out a research on the relevance of inquiry and exposition teaching methods on skill acquisition In teaching Biology in commercial colleges in Anambra state, the objective of the study was to find out the measures of improving students' skill acquisition through effective use of guided discovery and expository teaching in training students. It was also aimed at finding out problems in teaching and learning Biology in commercial colleges in Anambra state. The population consist of 220 students in commercial colleges in Anambra state, and a sample of ninety (90) students was used. Four research questions were raised and four Null hypotheses were formulated. Quasi experimental pre-test post-test control group design was adopted for the study.

After four weeks (4) of treatment, a test was conducted and the result were analysed at the alpha level of 0.05, using t-test statistical method. The study revealed that students cram facts and principles, most of which they don't understand, only to regurgitate during examinations. It was concluded that inquiry exposition teaching methods are effective in skill acquisition. Based on the findings, recommendations were given/made to the government, school authorities, lecturers and students, so students who pass through the department will achieve higher skill acquisition in the subject. Nevertheless, the previous study is related to the present study because of the teaching methods used, which is experimental in nature, but different because it emphasized on skill acquisition rather than academic performance.

2.3.1 Academic Achievement

Generally students' Academic performance portrays their general ability in intellectual functioning; According to Burne (2004) examinations have been used as the method of assessing people's aptitude and abilities. That social reality means that there is skewness towards examination results in quantifying academic performance, within this construct, the yardstick for evaluating an individual's knowledge reservoir. Skill level and competence in performing a particular task is normally an examination. As such, students' Academic performances are mostly judge through examinations.

Consequently, examination is the meter used for assessing future social development and this plays a determining role in determining student's academic performance.

David (2007) was in the idea that Academic performance involves the general mental capability to reason, solve problems, think abstractly, learn and understand new material through profiting from past experience, which in turn will be measured against the stated specific objectives. Performance denotes 'Attainment' which draws on a variety of mental processes, including memory, perception, thinking and reasoning (Fan, 2008). Morgan (2010) added that Academic performance is an assessment strategy by which the evidence about students learning is gathered, through students work on a performance task. Therefore is no doubt that much is expected from our educational system in terms of preparing future citizens, workers and leaders to perform better David (2007) defined Academic achievement in three categories which includes;

1. **Cognitive Skill and Attitudes**

Cognitive skills and attitudes include both basic cognitive abilities, such as executive functioning, attention, memory, verbal comprehension. And information processing, as well as

attitudes and beliefs that influence academic performance, such as motivation. Self-concept, satisfaction, and school connectedness. Studies used a range of measure to define and describe these constructs.

2. Academic Behaviors

Academic behaviors include a range of behaviors that have an impact on students' academic performance. Common indicators include on-task behavior, organization, planning, attendance, scheduling, and impulse control studies used a range of measures to define and describe these constructs.

3. Academic Achievement

Academic achievement includes standardized test scores in subject areas such as reading, math and language, arts; GPAs; classroom test score and other formal assessment. Therefore performance in school is evaluated in a number of ways. For regular grading, students demonstrate their knowledge by taking written and oral test, performing presentation, turning in homework and participation in class activities and discussions. Teachers evaluate in the form of letter or number grades and side notes, to describe how well a student has done. At the state level, students are evaluated by their performance on standardized test geared towards specific ages and based on a set of achievements students in each age group are expected to meet. Some factors that influences student's Academic performance includes;

i. Teaching Method

The primary educational goal for teaching every subject is to teach students both theoretical and practical aspect of the subject Ola (2004). When teaching, there are assortments of styles and

methods a teacher may choose from. These methods are ways of organizing and presenting learning experience to children (Ubah, 2004). The style ranges from a direct teacher-centered approach, to an indirect more students-centered approach. As viewed by Tunde (2005) the students-centered teaching method is more time consuming and requires more preparation by the teacher, however the benefit to be gained from this method is definitely worth the extra time spent in developing the lessons. Teaching method is the first step to improving the level of students' performance.

ii. The Teacher Qualification

In order for students' performance to improve, the teacher's qualification has to be improved; he should therefore undergo series of training in order to become comfortable and successful in teaching using suitable methods. This cannot be done without substantial practice on the part of the teacher. What a teacher does or does not do. Makes a whole lot of difference in whether or not students will learn effectively. Adesola (2005) found out that the level of available resource is indeed a plus to the teacher and goes to show the level of genuity and commitment of the teacher toward effective delivery of lesson. He also document that teacher qualification accounted for approximately 40 to 60 per cent of the variance in average of students' achievement in assessment. Akinsolu (2010) asserted that availability of qualified teachers influence the performance of students in schools. The teacher therefore holds the key to influencing students' performance.

iii. School Environment

This is an important factor that influence students' performance Bandele (2009) noted that the importance of physical facilities cannot be relegated. Facilities like modern laboratories, libraries

and classroom are to be put in place in all our schools. Schools are established for the purpose of teaching and learning. Many educationist, ecologist and sociologist opined that a student performance depends more on school quality, than home background. Karemare (2009) found that student's performance is significantly correlated with satisfaction with academic environment and service received. It is also more important that the teachers and learners are properly accommodated to facilitate the teaching and learning that go on there (Alimi, 2005). Akinfolarin (2008) identified facilities as a major factor contributing to academic performance in the school system. These systems include classroom furniture, recreational equipment among others. Favourable school condition could therefore enable most students to learn well and to get satisfaction from their learning.

iv. Instructional Materials

Instructional materials irrespective of the subject they are used for as aids are always available in different forms. According to Olaitan (2010) instructional materials are of four main types which includes, audio-visual aids, Visual aids and simulated devices. These materials are needed in schools for effective operations of the system, and for the enhancement of teaching and learning in order to improve students' performance.

Edwin, (2011) opined that the right methods of teaching and instructional materials should be used in imparting knowledge also teachers have to be motivated and evaluated in order for them to motivate and evaluate students academically so as to solve most of the problem faced by schools thereby increasing students' level of academic performance.

2.4 Summary of the Literature Reviewed

The review of literature was done to provide the researcher with guidance to arrive at a theoretical and empirical framework for this study. The theoretical review brought to the fore the concept of teaching and the effect of teaching methods which include; to make knowledge possible as well as increase the odds that potential learners would learn. Varieties of teaching methods, discussion method mainly Demonstration method and inquiry method. These teaching methods mentioned are basically grouped into two approaches the child centered approach and the teacher centered approach, both of which contribute their ideas to learning.

In selecting the appropriate teaching method in teaching Biology, there are no preferred methods, rather the choice of method to be used in teaching Biology depends on several factors which includes; the aims and objective, the age of the learners, and the topic. Without the use of format, proper guidance as well as thorough explanation. The use of Discussion and Demonstration methods of teaching Biology won't be effective, and the application of Biology procedure wouldn't be properly achieved, thereby leading to poor performance in the subject. Finally the empirical studies concentrated on other areas in Nigeria which have similar characteristic and background when compared with Niger state. None of the related empirical studies reviewed, stated which teaching method is most appropriate in teaching Biology to the male and female students. However, this study set out to bridge this existing gap by emphasizing the teaching that is most suitable for teaching male and female students.

CHAPTER THREE

3.0 RESEARCH METHODOLOGY

This chapter is concerned with the methodology used in this research and it is discussed under the following headings; Research design, Population of study, Sample and sampling techniques, instrumentation, validity of the instrument, Reliability of the instrument, Method of the Data collection, Method of Data analysis.

3.1 Research Design

The research design adopted for this research is Quasi Experimental design (Non-equivalent, non-randomized, control group design). The experimental group students (were taught using Discussion method) and the control group students (were taught using conventional Demonstration method) and both were examined.

Table 3.1 Research Design Layout

Groups	Pre-test	Research treatment	Post-test	Retention
Experimental Group	O_1	X	O_2	O_3
Control group	O_4	−	O_5	O_6

Where;

O_1, O_4 = Pretest scores of experimental and control groups.

O_2, O_5 = Posttest scores of experimental and control groups.

O_3, O_6 = Retention scores of experimental and control groups.

X = Treatment (CMI)

− = Demonstration

3.2 Population of the Study

The population for the study comprised of all senior secondary school Biology students in Bosso Local Government, Two thousand and eight six (2086)., Niger State. While the targeted population comprised of all senior secondary school one (SS1). Biology students in Bahago Secondary school and Bosso secondary school in Bosso LGA.

3.3 Sample and Sampling Techniques

Out of all the schools in Bosso LGA, two (2) schools were randomly selected for the study. The schools were selected because of their co-educational background. The sample for the study consisted of 110 students who were captured from the two intact classes in the schools used. The chosen schools were randomly assigned into experimental school and control school. The experimental school was taught using Discussion method while the control school was taught using demonstration method.

3.4 Instrumentation

The instrument used for data collection were; treatment instrument and test instrument.

Treatment Instrument: The independent variables of the study are the Discussion and Demonstration instrument (DDI). The topic Ecological concepts was developed and constructed by the research in collaboration with an expert in methods of teaching development. The steps involved in the construction were followed strictly in line with the marking scheme of WAEC question of (essay) 2000-2015.

Test Instrument: The instrument used for data collection was Achievement Test (BAT). The test item used covered the topics which the students had been taught in the class during instruction. The test items were adopted from past West African Examination Council (WAEC) questions. Twenty (20) multiple choice test questions were set on the topic taught with four optional answers in which there is only one correct answer.

3.5 Validity of the Instrument

Though, the questions were adopted from past WAEC questions paper, they were still subjected to expert validation. The validity for the instrument was established prior to data collection. Initially, the researcher developed 30 test questions from the Topic taught. The Biology Achievement Test were validated by the supervisor, Tutors of Biology in other schools among the ones used and other (2) senior Lecturers in the field of Biology in science education department for critique and suggestions which were used to modify the final version of the instrument which were twenty (20) questions.

Table 3.2 Table of specification of BAT Items

Domain level	K	C	A	A	S	E	Total
Topic 1	2	2	1	1	-	-	6
Topic 2	2	2	2	1	-	-	7
Topic 3	2	2	2	1	-	-	7
Total	6	6	5	3	-	-	20

3.6 Reliability of the Instrument

The school used for establishing the reliability of the instrument was taken outside the sample study area (pilot test). Reliability of the instrument was determined using the test-retest method. The test was first administered and then re-administered on the same students after four days interval. The result of the first test and the second test were compared to determine the reliability of the instrument. The scores of the set were correlated using Pearson Product Moment Correlation Coefficient formula (PPMC) and r= 0.70 was obtained; this indicated that the items were reliable and suitable for the purposed for which they are meant.

3.7 Method of Data Collection

An introductory letter seeking for permission to carry out research in the schools sampled was taken to the school by which the research and the permission were granted. (First day of visit). Pre-test was administered to both groups to determine their entry behavior. Two lesson plan was designed by the researcher and the lesson plan was used in teaching both the students that were taught using Discussion (Experimental group) and those taught using Demonstration method (control group). Both were taught for a period of 40mins for two weeks. After a period of one week, the same test (Post-test) was administered to the same group of students but the questions were reshuffled to create difference from the one used in pre-test. After one-week retention was administered to the groups but the questions were also reshuffled, the data was collected and analyzed for the research study.

3.8 Method of Data Analysis

The pre-test Posttest and post-Posttest score collected were analyzed using mean, standard deviation and student's t-test statistic, statically package for social science (SPSS). 20.0 versions were used to analyzed the data collected.

CHAPTER FOUR

4.0 RESULT AND DISCUSSION

This study examined the Effect of Two constructivist base teaching strategies on achievement and retention of Biology student in Bosso Local Government Area of Niger state. This chapter hypothesis that guided the study. The four (4) research questions stated were tested using mean, standard deviation while the four-hypothesis stated were tested using mean, standard deviation and t-test statistics at 0.05 alpha levels.

4.1 pretest Analysis

Table 4.1 ANOVA Result of Prestest scores of Experimental and Control Groups

Group	N	*df*	Mean	SD	t.cal	P-Value
Experimental group	60		7.88	0.86		
		108			3.40	0.000
Control Group	50		3.82	0.80		

S: Significant at p>0.05

Table 4.1 shows the t-test comparisons between the mean achievement scores of control groups and the mean achievement scores of the experimental in the pre-test. The mean and standard deviation of the control group score are 3.82 and 0.80 while that of experimental groups are 7.88 and 0.86 this indicated that there is no significant difference in the score (t=3.40,df=108,p=0.05). hence it was discovered that the score of both experimental and control group where at equal level before the treatment with Discussion and Demonstration method.

Research Question 1: Was there any difference in the achievement scores of students taught Biology using Discussion and Demonstration method?

Table 4.2 Mean and standard deviation analysis of posttest scores of experimental and control group.

Group	N	*df*	Mean	SD
Experimental	60		15.27	1.44
		108		
Control group	50		12.62	1.19

Table 4.2 shows the mean and standard deviation of achievement score of the experimental and control group In the posttest analysis where the mean and standard deviation score for the experiment group are 15.27 and 1.44 while that of the control group are 12.62 and 1.19 respectively. This indicated that there is no difference in the achievement scores.

Research Question 2: Is there any difference in the mean achievement scores of male and female students taught Biology using Discussion and Demonstration method?

Table 4.3 Mean and standard deviation of posttest scores of male and female I the experimental group (Discussion).

Group	N	*df*	Mean	SD
Male	40		15.25	1.24
		58		
Female	20		14.40	1.70

Table 4.3 shows the mean and standard deviation of male and female scores of students taught using Discussion and Demonstration method, the mean and standard deviation score are 15.25 and 1.24 for male while female are 14.40 and 1.70 respectively, having a marginal difference hence, the result indicate that there is no significant difference in their achievement scores.

Research Question 3: Was there any difference in the retention of students taught using Discussion and Demonstration methods?

Table 4.4 mean and standard deviation of retention scores of experimental and control groups

Group	N	*df*	Mean	SD
Experimental group	60		15.27	1.44
		108		
Control group	50		12.62	1.19

Table 4.4 shows the comparison between the mean retention score of the experimental group and the control group. The mean score and the standard deviation of the experimental are 15.27 and 1.44 while the control group are 12.62 and 1.19 respectively this result indicate difference between the two groups.

Research Question 4: Is there any difference in the retention of male and female students taught using Discussion and Demonstration method?

Table 4.5 mean and standard deviation of male and female In the experimental group

Group	N	*df*	Mean	SD
Male	40		15.25	1.24
		58		
Female	20		14.40	1.70

Table 4.5 shows mean and standard deviation comparison between the difference scores of male and female students taught using Discussion and Demonstration method. The mean and standard deviation scores of male are 15.25 and 1.24 while 14.40 and 1.70 for female respectively.

4.2 Hypotheses Testing

HO_1: there is no significant difference in the mean achievement score of students taught Biology using Discussion and Demonstration method.

Table 4.6 t-Test Analysis of Posttest Scores of Experimental and Control Groups

Group	N	*df*	Mean	SD	t-cal	P-value
Experimental group	60		15.27	1.44		
		108			10.3	0.0000
Control group	50		12.62	1.19		

Significant at $p<0.05$

Table 4.6 show that comparison between the mean scores and the comparison between the mean achievement scores of students taught using Demonstration method and the achievement score of students taught using convectional Discussion method. The mean score and standard deviation of

the control group are 12.62 and 1.19 respectively while that of experimental group is 15.27 and 1.44 this result indicated that there is a significant difference in the mean achievement score of students taught using Demonstration and those using Discussion method (t=10.3,df=108,p=0.05). hence the Null hypothesis stated that there is no significant difference between the mean achievement scores of students taught using Demonstration method and convectional Discussion method was therefore rejected, that is, there is significant difference between the two groups on their achievement score in favor of experimental group.

HO_2: There is no significant difference In the mean achievement scores of male and female students taught Biology using Discussion and Demonstration method.

Table 4.7 Analysis of post test score of male and female in Experimental group

Group	N	*df*	Mean	SD	t-test	p-value
Male	40		15.25	1.24		
		58			2.67	0.009
Female	20		14.40	1.70		

S: Significant at P>0.05 alpha level

Table 4.7 shows the comparison between the mean achievement score of male students and the mean score of female students which were taught using Discussion and Demonstration method. The mean score and the standard deviation of the male students are 15.25 and 1.24. while those of the female students are 14.40 and 1.70 respectively. The result indicates that there is no significant difference in the mean achievement score of male and female student taught using Discussion and Demonstration method with (t=2.67,df=58,p=0.009). at p=0.05. hence the null

hypothesis stated above is thereby rejected, this means that there is significant difference between the two groups on their respective achievement.

HO_3: There is no significant difference in the mean retention scores of students taught using Discussion and Demonstration method.

Table 4.8 t-test Analysis of Retention Score of Experiment and Control Group

Group	N	*df*	Mean	SD	t-cal	P-value
Experimental Group	60		15.27	1.44		
		108			10.3	0.0000
Control Group	50		12.62	1.19		

S= Significant at $p<0.05$ alpha level

Table 4.8 shows the t-test comparison between the mean retention score of students taught using Discussion and Demonstration and the mean retention score of those taught using conventional method. The mean score and standard deviation of the control group are 12.62 and 1.19 while that of experiment group is 15.27 and 1.44 respectively. This result indicated that there is significant difference in the mean achievement score of the students taught with Discussion and Demonstration and those taught using conventional method of teaching (t=10.3,df=108,,p=0.05). Hence the null hypothesis stated above was rejected in favor of experimental group.

HO_4: There is no significant difference in the mean retention score of male and female students taught Biology using Discussion and Demonstration method.

Table 4.9 t-test Analysis of Retention Scores of male and female in the Demonstration Control Group

Group	N	*dt*	Mean	SD	t-cal	P-value
Male	40		13.13	1.36		
		58			0.74	0.46
Female	20		12.85	1.27		

NS: Not significant at p>0.05 alpha level

Table 4.9 shows t-test comparison between the mean retention scores of male and female students taught using Discussion and Demonstration method. The mean score and standard deviation of male students are 13.13 and 1.36 respectively, while those of the female students are 12.85 and 1.27 This result indicated that there is no significant difference in the mean retention scores of male and female students taught using Demonstration (t=0.74,df=58,p=0.05). Hence the null hypothesis stated above is thereby accepted.

Discussion of Results

The main objective of the research is to determine the Effect of Two constructivist-based teaching strategies on Biology student's achievement and retention in Bosso Local Government Area of Niger State.

The study also examines the effect of Discussion and Demonstration on gender differences of the students. The pretest score in table 4.1 shows that the control group (mean of 3.82 and standard deviation of 0.80) and experimental group (mean of 7.88 and standard deviation of 0.86) are not equivalent because the p-value is less that the alpha level of significance (p=0.000 less than 0.05

alpha level), this means the experimental and control group are not equal in terms of their entry behavior before the application of the treatment. The result of the t-test as shown in table 4.6 shows that the computed t-value at df(108) is 10.3 while the p-value (0.0000) is less than the 0.05 alpha level of significance. The results show that the experimental group performed better than the control group. This means that the use of Discussion method can enhance performance in Biology at the senior secondary school level. The result was in line with findings of previous studies (Novak, Gowon and Johansen 1983; Okebukola 1986 and 1990), which provided evidence attesting to the efficacy of Discussion and Demonstration method in facilitating meaningful learning. Esiobu and Soyibo (1995) also found that the effect of Discussion and Demonstration method on students' achievement was significant in Ecology and Genetics in Nigeria. Novak and Godwin (1994) came into conclusion that those who utilize Discussion and Demonstration method promotes learning.

The result of the t-test as shown in table 4.7 show that the compared t-value at df (58) is 2.67 while the p-value (0.000) is less than the 0.05 alpha level of significance. Therefore, there is significant difference in the mean achievement scores of male and female Biology students taught with Discussion and Demonstration method. This means that Discussion and Demonstration method of teaching can enhance both male and female academic performance. This finding is in line with that of Aiyedum (2000). He found out that there is no significant difference in the performance of male and female students.

The result of the t-test as shown in table 4.8 shows that the computed t-value as df (108) is 10.3 while the p-value (0.0001) is less than the 0.05 alpha level of significance. The result show that the experimental group performed better than the control group in terms of their retention capability because of the Discussion and Demonstration method used which helps the students to

recall fast as what was taught is fresh to the memory, this means that use of Discussion and Demonstration can enhance students' performance in Biology at the senior secondary school level. This was in line with the findings of Eze (2008) found out that students exposed to demonstration method retain contents taught more better than the students who were taught with conventional discussion method.

The result of the t-test as shown in table 4.9 show that the computed t-value at df(58) is 0.74 while the p-value (0.46) is greater than the 0.05 alpha level of significance therefore, there is no significant difference in the mean retention score of male and female taught Biology using Demonstration method. This means that Demonstration method cannot be used to enhance both male and female academic performance. This findings is in agreement of Maishinkafa (2010), which found that there is no significant difference between male and female students in their retention abilities when taught Biology using Discussion and Demonstration methods, and also asserted that the retention levels of the male and female students taught with metacognitive teaching strategies when learning Physics is not significantly affected by gender.

CHAPTER FIVE

5.0 SUMMARY, CONCLUSION AND RECOMMENDATION

This part involves the summary, significant discoveries of the research work, recommendation for further studies, conclusion and suggestion of the examination studies.

5.1 Summary

This study analyzes the effect of two constructivist based teaching strategies (Discussion and Demonstration) method on students' academic achievement and retention in Biology among senior secondary school students in Bosso Local Government area of Niger state. In completing the Examination find out exploration inquiries and two theories were Defined and tried utilizing the mean, standard deviation and t-test investigation. An example of one hundred and ten (110) students made up of sixty (60) Experimental group school and fifty (50) control group school, the class used was secondary school 1 (SSS1) from two (2) senior secondary schools in Minna were utilize for the study. The students were arbitrarily relegated to test (those exposed to the use of Discussion) as the Experimental group and (those exposed to the Demonstration method) as the control group for the study.

The instrument utilized for information gathering is the Biology Achievement Test (BAT) which was created by the researcher and accepted by the supervisor and two different science Education Lecturers, Federal University of Technology, Minna. The instrument was selected using pilot test to gauge the inward consistency before undertaking for Data accumulation. The information was gathered for the pre-test and post-test. The information gathered were analyzed utilizing the mean, standard deviation and t-test Examination. The results showed that students exposed to

Discussion method of teaching in Biology performed better than those exposed to Demonstration method. The results likewise showed that Discussion and Demonstration exercises sex correspondence among the students. The result has suggested for Educators, Understudies, Teachers, Folks, Government and other Examination Organizations.

5.2 **Contributions of the Study to Knowledge**

Some contribution of the study to knowledge includes the following;

i. The utilizing of Discussion method of teaching will reduce the abstract of some concepts in Biology, therefore making learning more stimulating to students.

ii. The discoveries likewise showed that males and female students have the same opportunity to perform better when presented with Discussion method of instruction.

iii. It will save the teachers time and energy that would have been used in writing o chalkboard for students to see and comprehend.

5.3 Conclusions

Inline of the research discoveries as identified with the speculations formed and tried, the accompanying conclusions were made: Exposing students to Discussion and Demonstration instruction will enhance easy assimilation and recall of student's memory in Biology. The understudies would perform better if Discussion and Demonstration are empowered in schools. This study will also help educators invest more of a chance with the understudy, having an individual association with every understudy, knowing their qualities and their shortcoming and

developing on them in this way enhancing the Biology instructor's quality as far as instructing viability.

5.4 Recommendation

In view of the findings of this research work, the accompanying proposal were made for the study:

i. Teachers should be sent on service training to study educational technology where they can learn the design and construction of instructional materials.

ii. School principals need to support and give fundamental backing to instructors for maximum usage of special and additional instructional materials in showing and learning.

iii. There should be reinforcement of teacher's dedicated to work through prize awarding and special training seminar.

iv. Schools should help instructors understand how important Discussion method can impart better achievement and retention on students.

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APPENDIX I

LESSON PLAN FOR EXPERIMENTAL GROUP

SCHOOL:	BAHAGO SECONDARY SCHOOL BOSSO MINNA
CLASS:	S.S 1
DATE:	12/10/2019
DURATION:	40 MINUTES
GENDER:	MIXED (Male & Female)
NUMBER OF STUDENTS:	70
SUBJECT:	BIOLOGY
TOPIC:	ECOLOGICAL CONCEPTS
SUB-TOPIC:	ECOSYSTEM
METHOD:	DISCUSSION
BEHAVIORAL OBJECTIVES:	By the end of the lesson, the student should be able to

1. Define ecosystem
2. List and explain the components of an ecosystem
3. List four abiotic factors in an ecosystem
4. Explain the following

i. Producers
ii. Consumers
iii. Decomposers

PREVIOUS KNOWLEDGE: The students have been taught ecological concept in previous class

INTRODUCTION: The teacher introduces the lesson by asking questions base on previous

Knowledge. List five ecological concepts.

PRESENTATION: The teacher presents the lesson in logical steps as follows:

STEP I The teacher Define Ecosystem.

An ecosystem refers to community of plants and animals functioning

Together with their non-living environment. In other words, ecosystem

Consist of the living factors (plants & animals) interacting with the

Non-living factors in an environment.

STEP II

The teacher mentions the components of an ecosystem which are:

i. Biotic Components
ii. Abiotic Components

-Biotic components includes the living things plants & Animal) which

Can be group into

i. Producers
ii. Consumers
iii. Decomposers

-Abiotic components of an ecosystem include the non-living things which include:

i. Climatic Factors

ii. Inorganic Materials and Nutrients

III. Edaphic Factors

IV. Other Factors like Dust, Storm, Fire, and Water

STEP III

The teacher mention and explains the Biotic components:

i. Producers: Producers are autotrophs (green plants and some microorganism) Which can manufacture their own food from simple inorganic materials during the process of photosynthesis and chemosynthesis.
ii. Consumers: Consumers are the heterotrophs (animals and some plants) which cannot manufacture their own food but depends directly or indirectly for their own food. They may be primary, secondary or tertiary.
iii. Decomposers: Decomposers are bacteria and some fungi which break down dead plants and animals in order to feed on them and in the process, nutrients are released to the soil for use by the producer.

STEP IV	The teacher explains abiotic factors. i. Climate factors like Temperature, wind, humidity, sunlight and rainfall. ii. In organic materials and Nutrients suh CO2, O, N, Ca e.t.c iii. Edaphic factors like soil, rock, and topography iv. Other factors like Dust, storm, fire, and Water
EVALUATION	The teacher asks the students base on Topic treated in class such as: i. What is an ecosystem? ii. What component of the ecosystem are called the living components.? iii. List the three groups of biotic components. iv. List the abiotic components you know.
SUMMARY:	The teacher summaries the lesson y stressing areas of much importance
CONCLUSION:	The lesson was concluded with a take home Assignment.
REMARK:	The lesson was Satisfactory.

APPENDIX II

LESSON PLAN FOR CONTROL GROUP

SCHOOL:	BOSSO SECONDARY SCHOOL MINNA
CLASS:	S.S 1
DATE:	12/10/2019
DURATION:	40 MINUTES
GENDER:	MIXED (Male & Female)
NUMBER OF STUDENTS:	56
SUBJECT:	BIOLOGY
TOPIC:	ECOLOGICAL CONCEPTS
SUB-TOPIC:	ECOSYSTEM
METHOD:	DISCUSSION
Behavioral Objectives:	By the end of the lesson, the student should be able to 5. Define ecosystem 6. List and explain the components of an ecosystem 7. List four abiotic factors in an ecosystem 8. Explain the following iv. Producers v. Consumers vi. Decomposers
PREVIOUS KNOWLEDGE:	The students have been taught ecological concept in previous class
INTRODUCTION:	The teacher introduces the lesson by asking questions base on previous Knowledge. List five ecological concepts.
PRESENTATION:	The teacher presents the lesson in logical steps as follows:
STEP I	The teacher Define Ecosystem. An ecosystem refers to community of plants and animals functioning

Together with their non-living environment. In other words, ecosystem

Consist of the living factors (plants & animals) interacting with the

Non-living factors in an environment.

STEP II

The teacher mentions the components of an ecosystem which are:

iii. Biotic Components
iv. Abiotic Components

-Biotic components includes the living things plants & Animal) which

Can be group into

iv. Producers
v. Consumers
vi. Decomposers

-Abiotic components of an ecosystem include the non-living things which include:

i. Climatic Factors

ii. Inorganic Materials and Nutrients

III. Edaphic Factors

IV. Other Factors like Dust, Storm, Fire, and Water

STEP III

The teacher mention ands explains the Biotic components:

iv. Producers: Producers are autotrophs (green plants and some microorganism) Which can manufacture their own food from simple inorganic materials during the process of photosynthesis and chemosynthesis.
v. Consumers: Consumers are the heterotrophs (animals and some plants) which cannot manufacture their own food but depends directly or indirectly for their own food. They may be primary, secondary or tertiary.
vi. Decomposers: Decomposers are bacteria and some fungi which break down dead plants and animals in order to feed on them and in the process, nutrients are released to the soil for use by the producer.

STEP IV	The teacher explains abiotic factors. v. Climate factors like Temperature, wind, humidity, sunlight and rainfall. vi. In organic materials and Nutrients such CO2, O, N, Ca e.t.c vii. Edaphic factors like soil, rock, and topography viii. Other factors like Dust, storm, fire, and Water
EVALUATION	The teacher asks the students base on Topic treated in class such as: v. What is an ecosystem? vi. What component of the ecosystem are called the living components.? vii. List the three groups of biotic components. viii. List the abiotic components you know.
SUMMARY:	The teacher summaries the lesson y stressing areas of much importance
CONCLUSION:	The lesson was concluded with a take home Assignment.
REMARK:	The lesson was Satisfactory.

APPENDIX III

Biology Achievement Test (Pretest)

Answer All Questions

GENDER MALE { }, FEMALE { } CLASS SS1

1. A component of ecosystem that is concerned with plants and animal is called.?
   (a) Biotic
   (b) Abiotic
   (c) Miotic
   (d) Systematic
2. In any Food chain, the first member must be a.....?
   (a) Carnivore
   (b) Autotroph
   (c) Herbivore
   (d) Zooplankton
3. Ecosystem is defined as……?
   (a) Interaction between animals
   (b) Interaction between living and non-living
   (c) Interaction between Plants
   (d) Integration between fungi and Viruses
4. An organism is considered heterotrophy when it……?
   (a) Feeds on organic food
   (b) Feeds on already manufactured food
   (c) Fixes atmospheric nitrogen
   (d) Manufactures its own food
5. Which of the following process is not due to interaction between biotic and abiotic component of an ecosystem…….?
   (a) Soil nutrient depletion
   (b) Condensation
   (c) Photosynthesis
   (d) Osmosis
6. Important abiotic factors in ecosystem includes which of the following…….?
   I. Temperature II. Water III. Wind
   (a) I, II, and III
   (b) III only
   (c) I only
   (d) I, II only

7. The entire habits and habitat of an organism can be described as its……..?
   (a) Abiotic factor
   (b) Biotic factor
   (c) Habitat factor
   (d) Ecological niche
8. Which of the following is an abiotic factor that affects population……?
   (a) Predator
   (b) Parasite
   (c) Producer
   (d) Consumer
9. Which of the following is an abiotic factor……?
   (a) Rainfall
   (b) Predator
   (c) Gazing
   (d) Cropping
10. Biosphere is based described as…….?
   (a) All parts of the earth where life exist
   (b) All component of an ecosystem
   (c) The non-living parts of an ecosystem
   (d) All members of a single species in a habitat
11. A stable self-sustaining environment produced by an interaction between biotic and abiotic component is best described as…….?
   (a) A niche
   (b) A habitat
   (c) An ecosystem
   (d) Population
12. In an ecosystem, the organism that is capable to change light energy into stored chemical energy is the…….?
   (a) Consumer
   (b) Decomposer
   (c) Producer
   (d) Herbivore
13. Ecology can be defined as ……?
   (a) Study of life
   (b) Study of human beings
   (c) Study of living things in relation to their environment
   (d) Study of plants
14. Organism that manufacture their food are known as……..?
   (a) Autotrophs
   (b) Heterotrophs
   (c) Hydrotrophs
   (d) Mesotrophs

15. In complex food relationship in a community, the primary, secondary and tertiary consumers are referred to as……..?
    (a) Autotrophs
    (b) Heterotrophs
    (c) Symbiosis
    (d) Omnivores
16. Ecology as a discipline directly deals with all of the following levels of biological organisation except……..?
    (a) Cellular
    (b) Population
    (c) Community
    (d) Ecosystem
17. Which of the following organism is a primary consumer……?
    (a) Dog
    (b) Grass
    (c) Fungus
    (d) Sheep
18. Which of the following statement about ecosystem is false…….?
    (a) The primary producer provides energy for herbivore
    (b) Ecosystem must start with the capture of energy by autotrophs
    (c) Energy transfer from one trophic level to the other is not 100%
    (d) All the energy entering the ecosystem is passed onto decomposer
19. Which of the following organism will not bring about decomposition ……?
    (a) Earthworm
    (b) fungi
    (c) Spirogyra
    (d) Bacterium
20. Which of the following is not a biotic factor……?
    (a) Parasite
    (b) Predators
    (c) Grazers
    (d) Pressure

APPENDIX IV

ANSWERS TO PRETEST QUESTIONS

1. B
2. B
3. B
4. B
5. A
6. A
7. A
8. A
9. A
10. C
11. C
12. C
13. C
14. A
15. A
16. A
17. D
18. D
19. D
20. D

APPENDIX V

Biology Achievement Test (Posttest)

Answer All Questions

GENDER MALE { }, FEMALE { } CLASS SS1

1. Which of the following process is not due to interaction between biotic and abiotic component of an ecosystem…….?
   (e) Soil nutrient depletion
   (f) Condensation
   (g) Photosynthesis
   (h) Osmosis
2. Important abiotic factors in ecosystem includes which of the following…….?
   II. Temperature II. Water III. Wind
   (e) I, II, and III
   (f) III only
   (g) I only
   (h) I, II onl
3. The entire habits and habitat of an organism can be described as its……..?
   (e) Abiotic factor
   (f) Biotic factor
   (g) Habitat factor
   (h) Ecological niche
4. Which of the following is an abiotic factor that affects population……?
   (e) Predator
   (f) Parasite
   (g) Producer
   (h) Consumer
5. Which of the following is an abiotic factor……?
   (e) Rainfall
   (f) Predator
   (g) Gazing
   (h) Cropping
6. A component of ecosystem that is concerned with plants and animal is called.?
   (e) Biotic
   (f) Abiotic
   (g) Miotic
   (h) Systematic
7. In any Food chain, the first member must be a.....?
   (e) Carnivore
   (f) Autotroph
   (g) Herbivore
   (h) Zooplankton

8. Ecosystem is defined as……?
   (e) Interaction between animals
   (f) Interaction between living and non-living
   (g) Interaction between Plants
   (h) Integration between fungi and Viruses
9. An organism is considered heterotrophy when it……?
   (e) Feeds on organic food
   (f) Feeds on already manufactured food
   (g) Fixes atmospheric nitrogen
   (h) Manufactures its own food
10. Organism that manufacture their food are known as……..?
   (e) Autotrophs
   (f) Heterotrophs
   (g) Hydrotrophs
   (h) Mesotrophs
11. In complex food relationship in a community, the primary, secondary and tertiary consumers are referred to as……..?
   (e) Autotrophs
   (f) Heterotrophs
   (g) Symbiosis
   (h) Omnivores
12. Ecology as a discipline directly deals with all of the following levels of biological organisation except……..?
   (e) Cellular
   (f) Population
   (g) Community
   (h) Ecosystem
13. Which of the following organism is a primary consumer……?
   (e) Dog
   (f) Grass
   (g) Fungus
   (h) Sheep
14. Which of the following statement about ecosystem is false…….?
   (e) The primary producer provides energy for herbivore
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   (g) Energy transfer from one trophic level to the other is not 100%
   (h) All the energy entering the ecosystem is passed onto decomposer
15. Which of the following organism will not bring about decomposition ……?
   (e) Earthworm
   (f) fungi
   (g) Spirogyra
   (h) Bacterium

16. Biosphere is based described as…….?
    (e) All parts of the earth where life exist
    (f) All component of an ecosystem
    (g) The non-living parts of an ecosystem
    (h) All members of a single species in a habitat
17. A stable self-sustaining environment produced by an interaction between biotic and abiotic component is best described as…….?
    (e) A niche
    (f) A habitat
    (g) An ecosystem
    (h) Population
18. In an ecosystem, the organism that is capable to change light energy into stored chemical energy is the…….?
    (e) Consumer
    (f) Decomposer
    (g) Producer
    (h) Herbivore
19. Ecology can be defined as ……?
    (e) Study of life
    (f) Study of human beings
    (g) Study of living things in relation to their environment
    (h) Study of plants
20. Which of the following is not a biotic factor……?
    (e) Parasite
    (f) Predators
    (g) Grazers
    (h) Pressure

APPENDIX VI

ANSWERS TO POSTTEST QUESTIONS

1. A
2. A
3. A
4. A
5. A
6. B
7. B
8. B
9. B
10. A
11. A
12. A
13. D
14. D
15. D
16. C
17. C
18. C
19. C
20. D