

**EFFECTS OF ADVANCED ORGANIZERS ON RETENTION AND PERFORMANCE
IN CONSERVATION CONCEPTS AMONG SECONDARY BIOLOGY STUDENTS IN
JAHUN, JIGAWA STATE, NIGERIA**

BY

Auwal Kassim ABUBAKAR

B.Sc (Ed) Biology, ABU 2011

P13EDSC8029

**DEPARTMENT OF SCIENCE EDUCATION,
FACULTY OF EDUCATION
AHMADU BELLO UNIVERSITY, ZARIA
NIGERIA**

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**A Dissertation Submitted to the School of Postgraduate Studies, Ahmadu Bello University,
Zaria in Partial Fulfillment of the Requirements for the Award of Master Degree in
Science Education.**

**Department of Science Education,
Ahmadu Bello University, Zaria
Nigeria**

January, 2017

DECLARATION

I hereby declare that this Dissertation titled, Effects of Advanced Organizers on Retention and Performance in Conservation Concepts among Secondary Biology Students in Jahun Jigawa State, Nigeria is written by me. It is a record of my own research and has not been presented in any previous application for a higher degree. All quotations and sources of information are fully acknowledged by means of references.

Auwal Kassim ABUBAKAR

P13EDSC8029

Signed and Date

CERTIFICATION

This Dissertation titled Effects of Advanced Organizers on Retention and Performance in Conservation Concepts among Secondary Biology Students in Jahun Jigawa State, Nigeria by P13EDSC8029 Auwal Kassim ABUBAKAR meets the regulation governing the award of Masters Degree in Science Education, Ahmadu Bello University, Zaria and is approved for its contribution to knowledge and literary presentation.

Dr. S.S. Bichi

Chairman, Supervisory Committee

Date

Dr. (Mrs) J.O. Olajide

Member, Supervisory Committee

Date

Prof. .Mamman Musa

Head of Science Education

Date

Professor K.Bala

Dean, School of Postgraduate Studies

Date

DEDICATION

This Dissertation is dedicated in memory of my late mother Malama Aisha Hamza, my beloved father Alhaji Salisu Abubakar who made efforts for me to attain the right attitude and basic education early in life.

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OPERATIONAL DEFINITION OF TERMS

Academic Performance is an observable or measurable behaviour of a person or animal in a particular situation usually experimental situation.

Advanced Organizers An advanced organizer is information that is presented prior to learning that can be used by the learner to organize and interpret new incoming material

Biology the science of life or living matter in all its forms and phenomena, especially with reference to origin, growth, reproduction, structure, and behavior

Conservation is the act of preserving, guarding or protecting; wise use of a resources

Natural Resources useful items extracted from, land, forests, mineral deposits, water, etc

Retention is the ability to learn and recall with ease.

LIST OF ABBREVIATIONS USED

F.M.E	Federal Ministry of Education
WASSCE	West African Senior Secondary School Certificate Examination
UTME	Unified Tertiary Matriculation Examination
FEPA	Federal Environmental Protection Agency
UNCBD	United Nation Conservation of Biodiversity
UNCCD	United Nation Conservation to Convert Desertification
UNESCO	United Nation Educational, Scientific and Cultural Organization
FAO	Food and Agricultural Organization
CCPT	Conservation Concept Performance Test
IUCN	International Union for Conservation of Natural Resources
MDGs	Millennium Development Goals
SDGs	Sustainable Development Goals

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ABSTRACT

This study investigated effects of advanced organizers on retention and performance in conservation concepts among secondary Biology students in Jahun, Jigawa State, Nigeria. One hundred and thirty seven (137) students were randomly selected from eleven (11) senior secondary schools that constituted the sample for the study from a total population of one thousand two hundred and twenty five (1225) SSII students in Jahun zone. The study adopted the pretest, post test and post-post test quasi experimental and control group design. The students in experimental group were taught using lecture method enriched with advanced organizers while those in control group were taught using lecture method for the period of six weeks. The topic taught was conservation of natural resources from senior secondary school curriculum. The instrument used for data collection was Conservation Concept Performance Test (CCPT) with reliability coefficient of 0.89. Four Research questions and four null hypotheses were formulated and tested using independent t-Test at 0.05 level of significance. Pictorial and textual advanced organizers were developed, also a lesson plan was developed for experimental and control groups. The major findings from the study include: obtaining a significant difference between the mean academic performance scores of students taught conservation concepts with advanced organizers and those taught without advanced organizers in favour of the former. There is also a significant difference between the mean retention scores of students taught conservation concepts with advanced organizers and those taught without advanced organizers in favour of the former. Another finding is that there is no significant difference between the mean academic performance scores of male and female students taught conservation concepts with advanced organizers. There is also no significant difference between the mean retention scores of male and female students taught conservation concepts with advanced organizers. Based on the findings it was recommended that advanced organizers be used by biology teachers to teach in senior Secondary Schools among others.

CHAPTER ONE

THE PROBLEM

1.1 Introduction

Science is a tool for national development and growth of nations. Odunusi (2001) observed that the economic and political strength of a country is always assessed in term of her achievement in science and technology. This is why the National Policy on Education (FME, 2014) emphasized on the provision of science education at all levels of education in Nigeria. The emphasis placed alongside with the important role it plays towards national development make it pertinent and practically necessary for science to be taught in an organized and well-structured pattern involving activities for both teachers and students (Ibrahim, 2012).

Science and Technology are used to solve human problems. Science is an active pursuit of empirical knowledge via the scientific method. Conant (1951) defined science as an interconnected series of concepts and conceptual schemes that have developed as a result of experimentation and observation. Ogunniyi (1986) viewed science as a field of study that is concerned with producing a scientifically literate society. It is an organized body of knowledge searching for meaning and explanation of events in nature. Abdullahi (1982) defined science as an activity culminating into testable, falsifiable and veritable body of

knowledge. Also, Shaibu (2014) see science as a human activity that leads to production of a body of universal statements called laws, theories or hypotheses which serve to explain the observable behaviour of the universe or some aspect of the universe. The above definitions showed that science is not just collection of data and facts neither is it an assembly of sterile body of knowledge but that, it involves engaging in certain activities as well (Usman, 2000). It also helps us to understand the world around us. Science has many segments such as Chemistry, Physics, Mathematics and Biology.

Biology is a life science that involves the study of plants and animals. The content ranges from microscopic organism to the biosphere in general, encompassing the earth's surface and all living things. Some of the branches of biology include anatomy, morphology, cytology, genetics, entomology, parasitology among others. Ali (2006) opined that the teaching and learning of biology is very important to the development of any nation. Developing a nation involves the preparation of the populace for important careers in medical, paramedical, agricultural, industrial, population, wildlife control and environmental management, to mention but a few. Biology is the science that contributes to most of the major discoveries of 20th century and still will continue to do so in the 21st century as emphasis moves towards understanding of biological approaches and more eco-friendly synthetic systems such as forensic biology, environmental, soil and water biology (Webster, 2009). Neteinyin (2005) and Abubakar (2012) observed that Biology as a discipline has contributed tremendously to financial, physical and aesthetic benefits of mankind and to nation building.

Despite the importance of biology as a science subject, Nurudeen (2011) opined that the statistics of grades obtained by candidates in the West African Examination Council (WAEC) especially in Biology examination in recent years have not been encouraging. The West

African Examination Council (WAEC) Zonal Coordinator reported that 57% of candidates that sat for West African Senior Secondary School Examination (WASSCE) in the year 2012/2013 failed Biology. This also agrees with the report of Registrar and Chief Executive of National Examination Council (NECO) who said that 71% of candidates who registered for science subjects failed Biology. The importance of Biology as a valuable science subject is further emphasized in the Joint Admissions and Matriculation Board syllabuses (JAMB, 2010/2011), it is stipulated that a minimum of credit pass in Biology is required as one of the criteria for admitting candidates aspiring to study science and science-related courses in tertiary institutions. Unfortunately, the numbers of candidates with a minimum of credit pass in Biology have not been encouraging. This has denied many Nigerian students the opportunity of getting admitted into higher institutions to study science and science related courses. Students' failure trends in Biology at SSCE level is illustrated in Table 1.1

Table 1.1 NECO Examination Results for Biology Students from 2010-2014.

Years	Total	% with A1-C6	% with D7-F9
2010	1,249,028	57.27	42.73
2011	1,268,213	47.04	52.96
2012	1,348,528	41.95	58.05
2013	1,306,535	42.98	57.02
2014	1,508,965	52.17	47.83

Source: National Examination Council, Jigawa (NECO, 2014)

Some of the reasons for failure of students in examination were attributed to the methods of teaching adopted by the teachers in teaching Biology, which is mostly lecture method, and it is not recommended for teaching science (Lakpini, 2012). This is because

lecture method entails one way flow of communication from the teacher to the students and it is teacher - centered approach where by most of the talking is carried out by the teacher while the students remain passive listeners taking notes, thereby denying the students the opportunity to develop the required manipulative skills needed in learning science (Fubert & Wheeldon , 2009). The use of lecture method is attributed to the fact that the school calendar in Nigeria is often interrupted by industrial actions and public holidays, and there is a need for completion and covering of the syllabus to prepare the students for both external and internal examinations, hence the use of lecture method which is less time consuming and it can be used to teach large and small class size (Ashaolu, 2014). Other factors contributing to the failure may be connected to the way in which the teachers introduce their lesson at the beginning of each topic or unit, hence the need by the teachers to change their pattern of introduction, lack of or insufficient laboratory facilities and equipments, psychological factors such as anxiety, low self-esteem among others (Olatunji, 2015). Ausubel (1963) believed that lecture method was effective for verbal presentation of concepts and ideas to the students. Despite all these problems associated with lecture method, many researchers have found combining lecture method with other strategies to be very effective in improving students' performance.

Olajide (2010) found enriching lecture method with analogy to be effective in improving student's performance and retention of biological concepts. Oyarole (2014) combined lecture method with collaborative learning strategy and it proved to increase student's performance. Enhancing of lecture method with concepts mapping strategy also improves students retention, anxiety and motivation (Ado, 2013). Therefore this study used advanced organizers, which is a kind of enrichment to the lecture method that serves as a link between what the

learners know at the beginning of the lesson and the intending learning outcomes to be taught for meaningful learning to occur as well as enhancing retention of the concepts by the learners.

Table 1.2 Number of Questions Asked on Conservation Concept in NECO Examinations from 2010-2014

Year	Objective questions	Essay Questions
2010	09	01
2011	08	01
2013	11	01
2014	08	01

Source: NECO past Questions and Answers 2000-2014

Although, the questions from conservation concepts in the biology examination were not enough to conclude that the failure in the national examination was due to failure in conservation concepts, but due to the relevance of conservation to life, it become imperative to intimate the students in a way that they will understand very well about the consequences of exploiting the natural resources in the environment, this prompted the researcher to make use of advanced organizers in teaching the students the concepts of conservation.

Conservation is the act of wise and sustainable use of resources available in a given environment (Tiseer & Bello, 2011). Natural resources are useful and finite attribution of environment. They are like money in the bank: they are available for human use if they are withdrawn (Etim, 2006). The Natural resources may be renewable and non-renewable in

nature; they include Forest, Soils, Water, Air, Solar energy, Fossil fuel, Biodiversity among others (Tiseer& Bello, 2011). The notion of natural resources is however reflective of the economic social and cultural scientific and technology advancement of a given society (Etim2006). Planning or conserving is one of the mechanisms to facilitate such withdrawing and prudent planning must be predicated on or understanding of the characteristic of the research themselves. Conservation of natural resources is part of environmental education. Obianuju (2011) sees environmental education as a process that equips students or learner with knowledge, skills, values and practices needs to live in their environment. Human activities cause serious damages to earth environment including the resources and threaten the future of human and other species.

Poopola (2010) defined academic performance as an expression used to present students' scholastic standing and which is a function of various factors such as method of teaching, teacher qualifications, students home background, school environment, attitude, interest among others. Performance is defined as the observable or measurable behaviour of a person an animal in a particular situation usually experimental situation. This means that performance measures the aspect of behaviour that can be observed at a specific period. To determine performance, a performance test is conducted. Abu rabia (2013) defined performance test as the type of mental test in which the subject is asked to do something rather than to say something. Performance test is the type of test which throws light on the ability to deal with things rather than symbols (Diver, 2012). Aikenhead (2005) and Usman (2008) observe the degree of Academic performance of a student is directly related to the quality of teaching technique they receive and it determine the quality of knowledge impacted and material learned. Lakpini (2006) observed that a good number of teachers are

highly deficient in the subject they teach and hence leads to poor performance and retention of concepts.

Retention is the ability to store things experienced or learned. It can also be described as a form of reaction which has been presented in the past. In other words it is a result of orientation or attitude which marks an ongoing perception (Bawa, 2011). According to Olanrewaju (2012), retention is the ability to store learned concepts which can be easily be recalled from the short and long term memory. Appropriate coding of information provides the index that may be consulted so that retention takes place without an elaborate search in the memory lane (Saidou, 2013). Retention according to Isah (2014), Wachanga (2013) and Agbeyenku (2011) has been found to improve the academic achievement of students in Mathematics, Chemistry and Biology. Advanced organizers help in the retention of learned concepts by providing anchorage between what the students already know and the intending learning task to be presented the learner, it is also a gender friendly.

Gender is one of the factors affecting the performance of students in science. Studies confirmed the superiority of female students' performance over male student (Shaibu & Mari; 1997). Yet others found no significant difference between male and female students performance (Prince, 1993; Bello 1996; Nussbaum, 2000; Danmole and Addayi; 2004 ;). Wachanga et al. (2003) also observed that there is a significant different in the performance of male and female when expose to advance organizer. Adegwe (2000) attributed differences in learning ability of boys and girls to socialization process because girls are denied out of school and pre-school experience. Ali (2006) argued that female students learn concepts better than boys when the concepts are supported by pictures and graphs. This research

intends to use statement and pictorial advanced organizers on learning of conservation concepts to see if there will be any effect between male and female performance.

The concept of Advanced Organizer refers to information presented by an instructor that help the students organize new incoming information (Mayer & Richard, 2003).

Ausubel (1968) as cited in Kirman & Shaw (2007) defined advanced organizers as:

Appropriate, relevant and inclusive introductory materials... introduced in advance of new learning... and presented at a higher level of abstraction, generality and inclusiveness. Then the information presented after it... The organizers serve to provide the ideation scaffolding for the stable incorporation and retention of the more detailed and differentiated materials that follow.

Ausubel (1968) also explained that advanced organizers are not the same as summaries or overviews, which comprise text at the same level of abstraction as the material to be learned, but rather are designed to bridge the gap between what the learner already knows and what he needs to know before he can successfully learn the task at hand. An advanced organizer is a statement of inclusive concepts to introduce and sum up material that follows (Woolfolk, 2011). An advanced organizer is information that is presented prior to learning that can be used by the learner to organize and interpret new incoming material (Mayer, 2003). According to Kirkman & Shaw (2007) there are two categories of advanced organizers: expository and comparative organizers. Expository organizers function to provide the learner a conceptual framework for unfamiliar materials and comparative organizers are used when the knowledge to be acquired is relatively familiar to the learner. Hence, familiarity with the new materials is key to determining which type of organizers you will want to use. Dell (2007) pointed that advanced organizers whether expository or comparative can take many forms these includes text-based advanced organizers, visual or graphic advanced organizers. Advance organizer whether expository or comparative can take

many forms. Simple Text or Statement, Graphic/visual organizers, task planner, Behavioural objectives.

1.1.1 Theoretical Framework

The theoretical framework for this study is rooted in David Ausubels' Theory of Meaningful Learning. He put forward that the construction of new knowledge is facilitated by the availability of prior ideas in the cognitive structure. A key concept in Ausubel learning theory (1962; 1963 and 1978) was that new knowledge will mean something to a learner and will be remembered when it is connected to preexisting knowledge (i.e. what is already known by the learner). The presence of relevant, clear and stable prior experience in the learners' cognitive structure facilitates meaningful learning (Ausubel, 1960). In 1968, Ausubel introduced the concept of subsumption model as a pedagogical device in which central and highly unifying ideas are stated in terms of what is already familiar to the learners to which the learner can relate new ideas by subsumption. Ausubel argues that when current knowledge interacts with relevant background knowledge in the cognitive structure and is assimilated it forms a new knowledge structure. This new knowledge based on cognitive structure develops through the process of meaningful learning, thereby becoming more complex and helping students to solve problem. Ausubel proposed the use of advanced organizers in the absence of prior knowledge by the learner. These advanced organizers now serve as a prior knowledge or the pre-acquired ideas that will be a link between a new concept to be learnt and the prior knowledge present in the learner cognitive structure.

Ausubel distinguished two types of learning as “rote” and meaningful learning. According to Ausubel (1963) when one encounters completely new unfamiliar material then rote learning as opposed to meaningful learning take place. Ausubel theory is therefore concerned with how individual learn large amount of meaningful materials from verbal or textual presentation in a school setting. This research work is therefore concerned with the meaningful learning theory of Ausubel by providing advanced organizers to the students and see that if it will enhance the Academic performance and retention in conservation concepts among biology students in jahun educational zone, Jigawa, Nigeria.

1.2 Statement of the Problem

Over the years there has been an upsurge in the number of candidates sitting for national examinations both WAEC and NECO and particularly biology papers as contained in Table 1.1. However the WAEC and NECO result obtained by candidates has been abysmal and do not justify the popularity observed by researchers. The use of talk-and-chalk method of teaching leads to memorization of facts and concepts and there is the need to find out the effectiveness of other teaching methods and strategies, relative to the traditional approach (Mankilik, 2007; Olorukooba, 2002 and Adesoji & Ibrahim, 2009). Ali (2008) feels that the major difficulty in learning science is the method by which the subject is being taught without regard to instructional materials, students’ ability level to understand and to retain. Novak (2005) observed that teaching students to use memory strategies by employing appropriate teaching strategy will not only improve student thinking skill on complex task of production, modeling, experimentation and evaluation, but will also assist learners to attain deep understanding of conceptual knowledge and will result in developing cognitive domain and retention of concepts. Afolabi (2005) and Salawu (2009), Abimbade (2007) and Njoku

(2004) found that use of multimedia learning strategy has been useful in the teaching and learning of science subjects at secondary school level. By teaching students with models, they learn more, interact with each other better and can conceptualize the concepts better than cooperative learning without models. Omoosewo (2009) concludes that any study carried out on teaching methodology cannot be a wasted effort. This is because the teaching-learning situation must be crowded with reputable method before an effective communication can bring about ideal permanent change. Obiamju (2011) observed that human behavior causes serious damages to environment including the resources which threatens the future of human and other species hence the need for conservation of the resources. Wachanga (2013) observed that many research works on advanced organizer teaching approach have been conducted in Kenya, yet little has been done on it in Nigeria, especially in Biology. This research work therefore, will find out if the application of advanced organizers as enrichment of lecture method will help to improve the performance and retention of senior secondary Biology students whose performances are found to be poor as indicated in Table 1.1.

1.3 Objectives of the Study

The objectives of the study are to:

1. determine the effect of advanced organizers on students' performance in conservation concepts.
2. find out the effect use of advanced organizers on the retention ability of secondary school Biology students in conservation concepts.
3. investigate the difference between the performance of male and female students in conservation concepts when treated with Advanced Organizers.

4. find out the differences between retention level of male and Female students in conservation concepts when treated with Advanced Organizers.

1.4 Research Questions

The following research questions guided the conduct of the study:

1. What is the effect of advanced organizers on the performance of secondary school Biology students in conservation concepts?
2. What is the difference between mean retention scores of students taught conservation concepts with advanced organizers and those taught with conventional lecture method?
3. What is the effect of advanced organizers on the mean achievement scores of male and female students taught conservation concepts using Advanced Organizers?
4. What is the effect of advanced organizers on mean retention scores of male and female Biology students taught conservation concepts with advanced organizers?

1.5 Null Hypotheses

The study has the following null hypotheses formulated to guide the study at $p \leq 0.05$:

H_{O1} There is no significant difference between the post test mean scores of students taught conservation concepts with advanced organizers and those taught using conventional lecture method.

H_{O2} There is no significant difference between the postpost test mean scores of students taught conservation concepts with advanced organizers and those taught using conventional lecture method.

H₀₃ There is no significant difference between the post test mean scores of male and female students taught conservation concepts with advanced organizers?

H₀₄ There is no significant difference between the postpost test mean scores of male and female students taught conservation concepts with advanced organizers.

1.6 Basic Assumptions

The study has the following basic assumptions:

1. That all the students participated in the research have been taught elements of conservation in their Basic science subjects at junior secondary school level.
2. That all the schools under study operate the same curriculum.
3. Qualified teachers teach Biology in all the schools under study.

1.7 Significance of the Study

The findings of this research work will hopefully assist in raising the standard of science education in general and Biology as a subject in particular in the following ways:

1. **Biology Teachers:** The findings of the research will hopefully help them to make effective use of advanced organizers in teaching conservation concepts in accordance with the students level of perception .It will help them to plan sequence and organize properly the concepts of conservation in order to enhance and encourage students to avail themselves to the learning opportunities that are available in the study of conservation of natural resources in their environment.
2. **Curriculum Planners and Administrators:** the study will hopefully avail them with necessary information that may be important when curriculum review is needed.

3. **Professional Organizations:** such as Science Teachers Association of Nigeria (STAN), West African Examination Council (WAEC), National Examination Council (NECO) and Federal Education Resources Centers as well as Federal and State Ministries of Education, will also benefit from this study.
4. **Researchers:** The research findings will hopefully be of assistance in similar area of study and other science subjects to adopt or adapt it for their own studies and come up with additional knowledge by improving on the existing literature.
5. **Environmental Protection Agencies:** The outcome of the research work will also assist various conservation and environmental bodies such as Federal Environmental Protection Agency (FEPA), Federal Ministry of Environment to understand how younger generation understands the concept of conservation for policy and decision making.

1.8 Scope of the Study

In the study, the researcher investigated the effects of advanced organizers on academic performance and retention of senior secondary Biology students in Jahun Educational Zone, Jigawa State. Jahun is one of the 27 local government areas in Jigawa State; it is located in the northern part of the state close to Niger republic where desertification is flowing inward in to the state, as such it is considered as one of the ecologically fragile local governments in the state. pictorial and textual organizers package were developed by the researcher which consists of various maps, pictures and charts related to conservation of resources were used as advanced organizers in the study. All schools to be studied in the Zone were public secondary schools and the participants of the study were senior secondary school II (SS II). This is because SS II students were readily available for the research as SS III students were

preparing for their final examination, Also the SS II curriculum contents has the aspects of ecology in which conservation of natural resources are discussed. The topic chosen was conservation of natural resources; the contents were soil conservation, Biodiversity (Animal species) conservation, Forest and wetlands conservation.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

2.1 Introduction

The focus of this research is to find out effects of advanced organizers on achievement and retention of conservation concepts among secondary school students in Jahun, Jigawa State. This chapter focuses on literature review so as to enable the researcher have a bearing and sense of direction on related issues that have been covered. The related literatures were reviewed under the following sub-headings:

2.2 Biology: An Overview

2.3 Methods of Teaching Biology in Secondary Schools

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2.2 Biology: An Overview of the Subject.

The word biology is derived from two Greek words bios' meaning life and logos meaning study which simply means the study of life, on the other hand it connotes the study of fauna and flora. Biology is one of the natural science subjects taught at secondary schools and tertiary levels of education, and serve as a prerequisite to the study of medicine, pharmacy, agriculture, biochemistry, environmental studies among others. As an academic discipline biology concerns itself with the study of life and living organisms including their structure, function, growth, origin, evolution, distribution and taxonomy (Stone 1999).According to Miffin (2009), biology is the;

- science of life and living organisms, including their structure, function growth, origin, evolution and distribution,
- the life process or characteristic phenomenon of a group or category of living organisms,
- The plant and animal life of a specific area or region.

Michael (2000) viewed biology as a fascinating study that ranges from microscopic and cellular molecules to the biosphere, comprising the earth surface and its living organisms. Although, Biology as a single science subject is often divided for convenience into two main branches which are zoology i.e. study of animals and botany i.e. study of plants. Ramalingam (2002), discussed the sub disciplines of biology which are recognized based on the scale at which organisms are studied and the methods used to study them: Biochemistry examines the rudimentary chemistry of life; molecular biology examines the

complex interactions of systems of biological molecules; cellular biology examines the basic building blocks of all life; the cell physiology examines the physical and chemical functions of the tissues, organs and systems of an organisms; and ecology examines how various organisms interact and associate with their environment. It also includes concepts such as cell theories and biological evolutions. Field (2005), opined that biology is a vast subject containing many sub-divisions, topics and disciplines. Among the most important topics are five unifying principles that can be said the fundamental axioms of modern biology which includes;

- cell as the basic unit of life
- new species and inherited traits are the product of evolution
- genes are the basic units of heredity
- an organisms regulates its internal environment to maintain stable and constant condition
- Living organisms consumes and transform energy.

From the above definitions, one can see biology as a discipline that deals with not only the forms and structure of organisms but also with the understanding of the natural communities of plants and animals in relation to their physiology and anatomy right from cellular level to organism as a whole.

Through biology, and biology alone students understands the natural communities of plants and animals. Biology is a natural science subject consisting of contents from microscopic organisms to the biosphere in general, encompassing the earth's surface and all living organisms (Ibrahim, Baba and Ahmad 2014).

The teaching of biology starts from secondary school to tertiary institution and it is meant to expose the learners to biological nature (facts, principles and concepts), processes

and attitudes as well as equip them with skills of professional biology teacher (Muoneme 2012).The main aim of biology teaching at secondary school level is to develop a conception of life together with the understanding of laws governing life and to foster an attitude of respect for the living world and the mysteries of creation, particularly for the human body. This may lead to discussion on the main problems of life. Other aims includes: to teach learners how to observe accurately and thoroughly; to describe their observations clearly and systematically; to promote a more or less detailed knowledge of living nature through observations and to apply these observations to everyday life. According to National Policy on Education (FRN, 2013) the objectives of biology curriculum includes; Adequate laboratory and field skills in biology; Meaningful and relevant knowledge; Ability to apply scientific knowledge to everyday life on matters, personal and community health and agriculture; Reasonable and functional scientific attitudes.

The most important objectives of teaching biology at secondary schools According to (FRN, 2013) are;

- making the students receptive to impressions from nature, training them to observe biological phenomena and giving them an insight into the stream of life and consequently instilling in their minds a respect of life,
- imparting the students with the knowledge of a man and his status in the biological world,
- giving insight into the interrelations of living and non-living world,

- Preparing the learners for further biological studies for which specific knowledge and general understanding of plants and animals are desirable NABT (2005).
The areas of contribution of biology includes but not limited to the following areas:
- Medicine: Most of the major discoveries in medicine have been developed from practical study of physiological processes.
- Aquaculture: The propagation and management of water bodies and conservation of aquatic flora and faunas, for good, sports and other non-edible products.
- Crime Detection: The knowledge of genetics helps to detect crime using fingerprints and insects (forensic entomology).
- Parasitology: The investigation and control of parasites of man, domestic and wild animals.
- Forestry: Planting culture and development of forest trees for timber, pulps, food and as raw materials.

2.3 Methods of Teaching Biology

Methodology in terms of teaching refers to the study of the various Means or ways of teaching (Ofoegbu 2003). It is also the process of dissemination, transmission and imparting of ideas, facts, information, culture, social ethos and ethics through a design process of communication. It is also a process of giving, exchanging or sharing of facts, information ideas skills behaviour and attitudes that ultimately lead to noticeable and desirable behavioural changes in the individual (Shaibu, 2008). Lunette and Hofstein (2004) postulated some aspects of teaching biology in tertiary level of education which are:

- Teaching should be coordinated with the other sciences such as chemistry, physics etc.

- As in case of the other sciences, part of the teaching time should be spent on practical work
- Encouragement of the self-activity of the pupils, which will imply working according to the inductive method.

In the teaching of Biology concepts, there exist today many approaches / methodologies that can be used depending on the knowledge skills and attitudes intended to be imparted. Some of these methods as identified by (Ezeaghasi 2014, Reid & Shahi (2004). include; laboratory method, lecture method, demonstration method, discussion method, discovery method enquiry method and field trip method among others. These are discussed in details below:

Laboratory Activity Method: is a method of teaching where by tools, apparatus and instructional materials are used to enhance, stimulates the process of learning in a place known as laboratory .Laboratory work in biology involve observation, description or drawing, microscopy, dissection and experimental work (Ezeaghasi 2014). In the teaching and learning of biology scholars Reid and Shahi (2004) hold that laboratory work give the student the opportunity to experience science by using scientific research procedures and also to encourage the development of analytical and critical thinking. It also strengthen theoretical knowledge, experiencing the pleasure of discovery and development of their psychomotor skills, increasing creative thinking skills, higher order thinking skills, developing manual dexterity by using tools and equipment, allowing students to apply skills instead of memorization (Ezeaghasi 2014).

Lecture Method: is a method used primarily to introduce students to a new subject, but it is also a valuable method of summarizing ideas, showing relationships between theories and

practice, and re-emphasizing the main points. Many teachers use this teaching method almost exclusively, as it is considered the simplest, and one can cover large amount of material in a short period of time (Abdullahi, 2012). According to university of Pittsburgh (2006), a lecture can be an effective method for communicating theories, ideas and facts to students. The main aim of every teacher is to make sure that he/she communicates effectively with their students, in order to do so, a lecturer should try to achieve clarity of delivery, clarity of expression and clarity of structure. Mani (2008) postulated some points to be noted if lecture method us to be used which are

- It is to be used by mature students who could jot down few points about the lecture.
- A list of reference books should be provided to help student read further and make notes.
- It is mostly used in the higher educational institutions.

In this method of teaching biology the teacher has to understand the size of the audience, the instructional material to be used, how to maintain an effective class room environment and the interest of the students. The teacher is to organize the instruction to be given to the students so as to avoid complexity and confusion among the students and the presentation of the lessons.

Demonstration Method: is a method of teaching in which sight rather than hearing is the major means of communication. Though, the two are often combined. It is often effective because, most people easily remember what they see than what they read or hear about. It is a method were by the teacher illustrates with demonstrations and relevant examples (Obeka 2010). According to James and Usman (2000), Demonstration method is one of the teaching

methods that involve mental skills for learning by students such as observing, measuring, classifying, formulating hypothesis, experimenting, data collection, data analysis making and conclusion. Demonstration can be carried out by; the teacher alone, the teacher with a student, the student who is knowledgeable in the activity, or an invited guest (NTI 2006). Demonstration requires creativity and conceptualization, it needs full incorporation of all skills of demonstrating as well as showing samples and making displays (Mahuta2013). He went further to say the demonstrator is like a mirror as he shows while students observe. The process of demonstration is a physical display of objects, models, pictures, and diagrams. When students learn through the demonstration method of teaching, the comprehension last longer in the child's memory.

Discussion Method: is another method of developing cognitive and affective strategies in biology teaching .It is a method of teaching where by the teacher and students engage themselves in lively discussion of a topic and both the teacher and students give their views on the topic. According to Dawuda (2014), discussion method is a student centered method of teaching in which students participate actively in the in the discussion process over a subject matter or a topic from various point of view, while the teacher act as a moderator or guide. This method facilitates effectively flow of information from the teacher to the student, from the students back to the teacher and from one student to another (Haas 2002). Sanusi (2012), opined that discussion method is a variety of forums for open ended, collaborative exchange of ideas among a teacher and students or among students for the purpose of furthering students thinking, learning, problem solving, understanding literary appreciation. In using this method Obeka (2013) reflect that the following must be considered; the teacher should have chosen a learners interest-oriented topic, which should also be taught provoking

and argumentative; assign role among participants; the teacher should try as much as possible to decide ahead the type of discussion that the learners will take part in ; the teacher must lead and guide the learners to stick to a particular point in discussion activities; they should make sure that the learners are effectively motivated to be attentive in the discussion. In addition the teacher should encourage the learners to ask questions in the areas where they have problem.

Discovery Method: is a technique that encourages students to be more active in their learning processes, by answering a series of questions and solving problems. Mayer (2003) added that discovery method is based on the notion that learning takes place through classification and scheme formation. Gallenstein (2004), posited that discovery is essential as students are actively involved in the process of learning and topics are intrinsically motivating, context are often meaningful than typical classroom exercise, as study acquires investigative and effective skills, new strategies are learned in the context, and students are more likely to remember concept and information if they discover them on their own.

Enquiry Method: enquiry is a term used in science teaching that refers to a way of questioning, seeking knowledge or information, or finding out about phenomena. it involves investigation, searching, defining a problem, formulating hypothesis, gathering and interpreting data and finally arriving at a conclusion. This method has different names given to it by different scholars, some call it problem solving, critical thinking, reflective inquiry and inductive thinking (Mani 2008).Mahuta (2013) suggested that this method provides the opportunity for the learners to seek for knowledge in a systematic and logical way, also provide the students with opportunity to examine ideas events and problems about a particular behaviour events and concepts. It's a

method of teaching were the learner, with minimum guidance from the teacher, seeks to discover and create answers to a recognized problem through procedure of making a diligent search (Haas 2002). In this method of teaching the teacher does not provide answers to the learner but he tries to direct and guides the learner to get answers accordingly, questions are raised and solutions are provided by the students. Pine, Roth, Jones, Mcphee and Martins (2006) observed that, in enquiry situation, students learn not only theories and principles but self-direction, responsibility and social communication. It also permits students to assimilate and accommodate information.

Excursion/ Field Trip Method; this method is an important component of science teaching which involves taking the students outside the classroom for the purpose of making observations and also for obtaining some specific information. Wakili (2007) opined that it is a method of that involves travelling out of school environment to a place designed or selected for learning purpose , such places may be historical town, an educational environment a game reserve, herbarium, botanical garden, zoo, and other interesting places.. Students often have a long lasting memory when they travel and see events and places for themselves. This is usually arranged and conducted by the school in order to improve the knowledge of the students (Mahuta 2013).

There are variety of resources and strategies which the biology teacher can easily use to enrich learning. These resources and strategies includes the use of advanced organizers inform of models, charts, preserved specimens of plant and animals, herbarium, pictures, Textual materials, hands-on, minds-on activities, Collaborative learning strategies, Use of Analogies and interactive engagement among others. (Olagunju, 2000). Whatever method is adapted for teaching biology; it should be aimed at getting the best out of the students in terms of mental development and mastery of skills for better understanding of biology.

2.4 Ausubel Theory of Meaningful Learning

The theory of meaningful learning was championed by Ausubel (1918-2008) who dedicated much of his professional career to defining and promoting his idea. His theory was first presented in a subsumption theory of meaningful learning and Retention (Ausubel, 1962) and the psychology of meaningful verbal learning (Ausubel, 1963). The two ideas were later represented in two edition of educational Psychology: A Cognitive View (Ausubel, Novak, & Hanesian 1968; Ausubel, Novak, & Hanesian, 1978). The 1978 edition was a Revision of Ausubel's idea based on Research and feedback from students and colleagues. It was this edition that was selected as the primary text to review in the present study along with a subsumption theory of meaningful learning and Retention (Ausubel 1962).

A key concept in Ausubel learning theory (1962; 1963 and 1978) was that new knowledge will mean something to a learner and will be remembered when it is connected or anchored to existing knowledge (i.e. what is already known). To contextualize his theory, Ausubel distinguished two types of learning as "Rote" and meaningful learning. According to Ausubel (1963) when one encounters completely new unfamiliar material then Rote learning as opposed to meaningful learning takes place. This Rote learning may eventually contribute to the construction of new cognitive structure which can later be used in meaningful learning. Ausubel theory is therefore concerned with how individual learn large amount of meaningful material from verbal or textual presentation in a school setting. A first prerequisite for meaningful learning, Ausubel and Robinson (1969) contend in "that the material presented to the learner be capable of being related in some sensible fashion. The new information must be fitted into a larger pattern or whole. Secondly the learner must possess relevant ideas to which the new idea can be related or anchored. The learner must already have appropriate

subsuming concept in his or her cognitive structure. Finally the learner must actually attempt to relate, in some sensible way, the new ideas of those which he presently possesses. If any of these conditions is missing; the end result will be rote learning. Hence a primary process in learning is subsumption in which new materials is related to relevant ideas in the existing cognitive structures on a substantive non-verbatim basis.

Although Ausubel recognized other forms of learning, his work focused on verbal form of learning. He dealt with the nature of meaning, and believes that external world acquires meaning only as it is converted into the content of consciousness by the learner. Ausubel work has frequently been compared with Gagne theory of learning hierarchy. The two held similar view about the hierarchical nature of knowledge, in the sense that, learning is built from simple to complex and that whatever is learnt meaningfully, is based on an existing knowledge. Therefore, when student lack that existing knowledge then the need for advanced organizers is necessary.

Ausubel et al. (1978) observed that both rote learning and meaningful learning could occur in two different modes i.e. Reception and Discovery. Ausubel *et al* (1978) felt that discovery method of teaching hardly constitute an efficient primary means of transmitting the content of an academic discipline this inefficiency was due to the extra effort required by the learner. Where in reception learning the entire content of what is to be learned is presented to the learner in its final form. Discovery learning require a much greater effort on which learners must rearrange a given array of information, integrate it with existing cognitive structure and reorganize or transform the integrated combination in such a way as to create a desired end-product or discover the missing relationship. In the end the discovered content is internalized just as in the reception learning in describing subsumption theory in 1962,

Ausubel provide an interesting explanation for the phenomenon of forgetting, his explanations centers on the concept of memorial reduction, which is the least factor in prior experience. He further explained that the common factor between learning and forgetting is that they both represent a change in availability of learning materials with learning representing an increment and forgetting representing a decrement in availability.

2.4.1 Concept of Cognitive Structure and Meaningful Learning

Every person has a unique framework of knowledge base; such framework of knowledge is called cognitive structure. Ausubel (1962) emphasizes on the learners cognitive structure in the acquisition of new information. New experience is always fitted into what the learner already know (i.e. existing cognitive structure). Ausubel *et.al.* (1978) assumed a model of cognitive organization that supposed the existence of cognitive structure that is hierarchically organized in term of highly inclusive conceptual traces under which are subsumed traces of less inclusive sub-concepts as well as traces of specific informational data. Ausubel et al (1978) described three learning processes by which meaningful learning is fitted into existing cognitive structure:

1. **Subordinate Learning:** Subordinate learning is of two types namely: derivative and correlative subsumption. In derivative subsumption new information is linked to super ordinate idea **A**, and represents another case or extension of **A**. the critical attribution of the concepts **A** are not changed but new examples are recognized as relevant. The correlative subsumption occurs when new information **Y** linked to idea **X** but is an extension, modification or qualification of **X**. The critical attributes of subsuming concepts may be extended or modified with the new correlative subsumption.

2. **Super Ordinate Learning:** In super ordinate learning, established idea a_1 , a_2 and a_3 are recognized as more specific example of new idea **A** and become linked to **A**. super ordinate idea **A** is defined by a new set of critical attributes that encompasses the subordinate ideas.
3. **Combinational Learning:** In combinational learning, new idea **A** is seen as related to existing ideas **B,C** and **D** but is nether more inclusive nor more specific than ideas **B, C, and D**, in this case, new idea **A** is seen to have some criteria attributes in common with preexisting idea.

In all the three types of assimilation learning new information is linked to relevant pre-existing aspect of cognitive structure and both have newly acquired information and the pre-existing structure are modified in the process (Ausubel 1978). He also stressed that the major principle of cognitive organization that makes this possible is the “progressive Differentiation” a situation whereby the most general and inclusive ideas of discipline are presented first, and then they are progressively differentiated in terms of detail and specificity. Three variables determine the extent to which assimilation through progressive differentiation is possible.

- Available subsumers
 - Discriminability
 - Stability and clarity of subsumers
- i. **Available Subsumers:** One important variable effecting the incomparability and longevity of new meaningful material is the availability in cognitive structure of relevant subsuming concept at an appropriately proximate level of inclusiveness to provide optimal anchorage. If relevant subsuming knowledge is present, the learners tend to

criticizes the most relevant and proximate ones that are available. But since that the latter subsumers do not provide optimal anchorage, and since it is highly unlikely that the most relevant subsuming concepts are typically available to learners in most learning situation, it would be seen desirable to introduce the appropriate subsumer and make them part of the cognitive structure prior to actually presentation of the learning task. They introduce subsumers will became efficient. Advance organizers or anchoring foci for the reception of the new learning.

ii. **Discriminability:** This is the extent to which a new material could be enhanced by repetition or by explicitly pointing out similarities and differences between them and their presumed subsumers and cognitive structure.

- **Stability and Clarity of Subsumers:** Longevity of new material in enhanced when the subsumers are clearly formed. In other words Ambiguous and unstable subsumers not only provides work anchored for related and material but also easily discriminated them. Factors influencing the clarity and stability of subsuming concepts include repetition Age, use of examples among others. In this study therefore the effects of advanced organizers on retention and performance of conservation concepts among secondary school biology students will be examine

2.5 Concepts of Advanced Organizers

Advance organizers are model for helping students organize information by connecting it to a longer amount of information in a way that helps the students understand, retain and record it (Kirman & Shaw, 1997). Ausubel *et al* (1978) defined advanced organizer as information presented by an instructor that help students organized new incoming information. This is achieved by directing attention to what is important in the coming

material, highlighting relationship, and providing a reminder about relevant prior knowledge. Ausubel and Robinson (1969) reiterated that advanced organizer makes it easier for new material of a complex or otherwise different nature, provided the following two conditions are made:

- The student must process and understand the information printing in the organizer this increase the effectiveness of the organizer itself.
- The organizer must indicate the relations among basic concepts and terms that would be used.

Curran and Takata (2003) expressed advanced organizer as extremely well designed and thought out unit outline, presented before the actual topic to be learned. It is notable that the advanced organizer are design to prepare student for how to think about the lesson to come given some details about terminologies and connections but not given the entire unit content. Dell (2007) have suggested that the used of advanced organizer has positive effect on promoting understanding of information and recall. Torre and Dunning (2015) have point that particular types of advance organizer have no or only limited effects. (Rinehart *et al*, 1991; Chun & Plass, 1996; Willerman & Mac Herg; 2006; Agbenyeku, 2011) believed that advance organizers are very effective on teaching the students new information. Chun and Plass (2006) reported that the use of visual advance organizers does aid in overall comprehension. Willerman and Mac Herg (2006) conclude that the use of concept mapping as an advanced organizer produce a significant increment in academic gain for the students in eight grads physical science classes. Rinehert *et al* (1991) stated that an advance organizer read orally by the teacher and followed with guided discussion significantly increased recall of concepts by the students. Yivisker and Feeney (2008) revealed the importance of advanced

organizers to the needs of many TBI students. Also Nesbit and Adesope (2008) estimated that more than 500 articles have been published in peer-review Journals, most since 1997 with substantial reference to educational applications.

The respected report of the National Reading Panel (2000) has identified the experimental studies that met stringent methodological criteria and supported the use of advance organizers to facilitate reading comprehension and memory for text. Bulgren and Schumaker (2006) described 19 studies of advanced organizers all with adolescent participants which all reported positive result, interpreted both statistically and clinically, leading the authors to conclude that advanced organizer can substantially improve the learning of adolescent students. The use of advance organizers have no impact on student retention (Gurlitt; Dummel, Schuster and Nuckle 2012; Oloyede 2011; Wachanga et al, 2013 & Domin 2010) have showed the positive impact of advance organizer on student's retention and achievement. Schuster and Nuckle (2011) opined that advanced organizers can be used in all subject with all ages of learners they can also be constructed using visual, graphic, text and a variety of other media. As such they are flexible tools for both students learning and teacher construction and use.

Stone, Weil and Calhorn (2000) as cited in Abenyeku (2011) pointed out three phases of advance organizer mode as:

Phase I: Includes presentation of the advance organizer

- Clarify the aim of the lesson.
- Presentation of the advance organizer.
- Prompting awareness of relevant knowledge.

Phase II: Include making links to the organizer

- Presentation of the learning task or learning material.
- Make organization or logical order of learning materials explicit.

Phase III: Strengthening of cognitive organization.

- Integrative reconciliation and active learning. Example the teacher can ask learners to make summaries, to point at differences, to relate new examples with organizer.
- Elicit critical approach to subject matter that is to have students think about contradictions or implicit inferences in the learning material or previous knowledge. In this research work, the researcher intend to adopt these steps from stones Weel and Colhn (2000), to teach the students the concept of conservation of natural resources to see if it will improve their performance and retention of the learned concepts.

Types of Advanced Organizers

According to Kirman and Shaw (1997) and Woodfolk *et al* (2010) there are two categories of advance organizers: expository and comparative organizers.

Expository Advanced Organizer: This provide the learner conceptual framework for unfamiliar material which a learner need to understand the upcoming information.

Comparative Advanced Organizer: Are used when the knowledge to be acquired is relatively familiar to the learner. The main goal of comparative organizer is to activate the existing schemas. Ausubel (1963) also described comparative organizes as reminder which brings into the working memory of what you may realize is relevant. By acting as reminders the organizers pointed and explicitly whether already established anchoring ideas are nonspecifically or specifically relevant to the learning material (Ausubel & Robinson, 1969).

Schuster & Nuckle (2011) explained that familiarity with the new learning material is key to determining which type of organizer you will want to use, according to him an advance organizer whether expository or comparative can take many forms.

Simple Text or Statement: Advance organizers may simply be a clear teachers instruction on the introduction to a new topic with the goal of giving student overview, connecting new information to what the student already know, and illustrating the organization of the new concept on information to the processed and learned.

- Advance organizer can be a task planner according to Yivisaker and Feenay (2008) designed to orient the learner to a task by providing organizational cues, like a sequence of steps to complete the task or a list of component of the task or by showing what a product should look like.
- **Graphic Organizer/Visual Organizer:** Graphic organizers are vast and more encompassing they includes complex as detailed as flow diagrams, pictures, charts, photographs, actual model of finished products, maps among others. This research therefore will attempt to adopt different advanced organizers using different location during the course of instruction and will strictly be consistent with Ausubel Theoretical position which includes that advance organizers are not made for day to day use. Instead they are used to provide a structure at the beginning of a major unit of study, therefore, advanced organizers are designed in such away as to provide a good link with new concepts to be learnt, and this can not only aid achievement, but also help in retention of concepts to be learnt. Hence for this study appropriates advance organizer will be designed in such a way that it provides a structure for students thinking, not join a structure for lesson, in this way, students are engaged in active

learning, thereby making the learning to be more meaningful and subsequently enhance retention and achievement in conservation concepts.

In this study the researcher will make use of Visual organizers in form of pictorial and statements advanced organizers packages to investigate their effects on secondary school student's retention and performance in conservation concepts in Jahun educational zone, this is because studies have reveal that students perform better when multimedia and pictures are used in the lesson (Muoneme,2014).

2.5.1 Use of Advanced Organizers and Learning Process

Learning is the act of acquiring new, or modifying and reinforcing, existing knowledge, behaviors, skills, values, or preferences and may involve synthesizing different types of information. The ability to learn is possessed by humans, animals, plants and some machines. Progress over time tends to follow a learning curve. It does not happen all at once, but builds upon and is shaped by previous knowledge. To that end, learning may be viewed as a process, rather than a collection of factual and procedural knowledge. Learning produces changes in the organism and the changes produced are relatively permanent.

Types of Learning

Non-associative Learning: refers to a relatively permanent change in the strength of response to a single stimulus due to repeated exposure to that stimulus. Changes due to such factors as sensory adaptation, fatigue, or injury do not qualify as non-associative learning.

On-associative learning can be divided into habituation and sensitization

- **Habituation:** is an example of non-associative learning in which the strength or probability of a response diminishes when the response is repeated. The response is

typically a reflex or unconditioned response. Thus, habituation is to be distinguished from extinction, which is an associative process. In operant extinction, for example, a response declines because it is no longer followed by reward. An example of habituation can be seen in small song birds—if a stuffed owl (or similar predator) is put into the cage, the birds initially react to it as though it were a real predator. Soon the birds react less, showing habituation. If another stuffed owl is introduced (or the same one removed and re-introduced), the birds react to it again as though it were a predator, demonstrating that it is only a very specific stimulus that is habituated to (namely, one particular unmoving owl in one place). Habituation has been shown in essentially every species of animal, as well as the sensitive plant *Mimosa pudica* and the large protozoan *Stentorcoeruleus*.

- **Sensitization:** is an example of non-associative learning in which the progressive amplification of a response follows repeated administrations of a stimulus (Bell et al., 1995). An everyday example of this mechanism is the repeated tonic stimulation of peripheral nerves that will occur if a person rubs his arm continuously. After a while, this stimulation will create a warm sensation that will eventually turn painful. The pain is the result of the progressively amplified synaptic response of the peripheral nerves warning the person that the stimulation is harmful. Sensitization is thought to underlie both adaptive as well as maladaptive learning processes in the organism.

Associative Learning: is the process by which an association between two stimuli or a behavior and a stimulus is learned. The two forms of associative learning are classical and operant conditioning. In the former, a previously neutral stimulus is repeatedly presented together with a reflex eliciting stimuli until eventually the neutral stimulus will elicit a

response on its own. In operant conditioning, a certain behavior is either reinforced or punished which results in an altered probability that the behavior will happen again.

- **Imprinting** is a kind of learning occurring at a particular life stage that is rapid and apparently independent of the consequences of behavior. In filial imprinting, young animals, particularly birds, form an association with another individual or in some cases, an object, to which they respond as they would to a parent. In 1935, the Austrian Zoologist Konrad Lorenz discovered that certain birds will follow and form a bond with a moving object shortly after hatching. Under normal conditions, the object is the mother. Thus imprinting has a survival value because it ensures that the young birds will not wander off away from their mother's protection. Under experimental conditions, however, the young hatchling will imprint on just about any moving object (even human beings), particularly if the object makes sounds
- **Rote Learning** is memorizing information so that it can be recalled by the learner exactly the way it was read or heard. The major technique used for rote learning is learning by repetition, based on the idea that a learner can recall the material exactly (but not its meaning) if the information is repeatedly processed. Rote learning is used in diverse areas, from mathematics to music to religion. Although it has been criticized by some educators, rote learning is a necessary precursor to meaningful learning.
- **Meaningful Learning** is the concept that learned knowledge (e.g., a fact) is fully understood to the extent that it relates to other knowledge. To this end, meaningful learning contrasts with rote learning in which information is acquired without regard to understanding. Meaningful learning, on the other hand, implies there is a comprehensive knowledge of the context of the facts learned.

Ausubel major principle was that the most important determinant of meaningful learning is what the learning already knows. In learning process advanced organizers are used either in form of statements, pictures, graphs, concepts maps, objectives, and are presented in advance of actual teaching. (Atherton 2013). According Ausubel & Robinson (1969) advanced organizers foster meaningful learning by prompting the students regarding pre-existing super ordinate concept that are really in the student cognitive structure , and by otherwise provide a context of general concept into which the student can incorporate progressively differentiated details.

This study is concerned with meaningful learning of all the types of learning mentioned above, this because is only through meaningful learning the students will have a true understanding of concepts, it also make learning more permanent in the cognitive domain of the students. This research work will therefore use advanced organizers in teaching conservation concepts among biology students in Jahun Educational Zone, Jigawa, Nigeria.

2.6 Concept of Conservation of Natural Resources

Natural resources are useful and finite attribution of environment. They are like money in the bank: they are available for human use if they are withdrawn (Etim, 2006). Planning or conserving is one mechanism to facilitate such withdrawing and prudent planning must be predicated on or understanding of the characteristic of the resources themselves. The notion of resources is however reflective of the economic social, cultural, scientific and technological advancement of a given society (Etim 2006). Unfortunately the history of technical and scientific development in Nigeria, replete with instances of

unnecessary degradation and obliteration of valuable local resources. For instance the continued flaring away of our natural gas, Overgrazing of land, Deforestation, Excessive mining of mineral resource, over cultivation of land, Bush burning, Poaching activities, among others are the Major challenges to environmental resources analysis today.

Conservation of natural resources is part of environmental education. Environmental education is the process that increases people knowledge and awareness about the environment and associated challenges, developing the necessary skills and expertise to address the challenges, and fostering attitudes, motivation and commitment to make informed decision and take responsible action (UNESCO, 2013). Obianuju (2011) Viewed Environmental education as a process that equips students or learner with knowledge, skills, values and practices needed to live in their environment. Our environment says, a lot about the individual living on it (Obianuju 2011). Human behavior causes serious damages to earth environment including the resources and threatens the future of human and other species. Much of the degradation of the environment particularly deforestation is largely due to altered/changed human behavior as well as demographic growth (Tiseer& Bello 2011). In recent times the earth human population has increased from approximately 1.5 billion in 1900 to 6.3 billion in 2003 (Cohen, 2003). At the same time technology change the lives of the populace, making them more mobile, more comfortable and more efficient. United Nation Projected that the global population will reach 8.9 billion by 2050 (United nation, 2002).

This projected increase of 2.6 billion people is more than the entire population of the world in 1950 (Cohen 2003). The limit of earth resources are relatively unknown and it is possible that it will be completely depleted (Obianuju 2011), with this population level there has been great pressure on earth natural resources to meet the basic need of waters, food and

shelter. All the needs which result to resources depletion require energy which is generated by burning fossil fuel extracting, processing, transporting and burning fuels produce pollution and negatively affects natural environment. Many of the products produce by burning fuel are use briefly, and then discarded, thereby leading to additional problem of waste and pollution. Hence the need to consume the environmental resources so as to ensure their continuity (conservation). The environment resources are both renewable and non-renewable in nature these include Forest, Soils, Water, Air, Solar energy, Fossil, fuel, Biodiversity, Wetlands among others (Tiseer & Bello, 2011). The concepts of Conservation of natural resources is contained in the SSII curriculum hence the need by the teachers to take advantage in teaching the students on the value and the consequences attached to the over exploitation of the resources.

Major Environmental Threats Due to Depletion of Natural Resources

Soil Erosion: Soil erosion is the best known form of land degradation which is long standing and several environmental problems which affect most part of the world. According to United Nation Convention to Combat Desertification (UNCCD, 2013) land degradation means the reduction or loss, semi and dry area of biological or economic productivity and complexity of rain fed, crop land, irrigated or range, pasture forest and wood land arising from human activities and habitation pattern, such as soil erosion cause by wind, water determination of physical, chemical and biological or economic properties of soil and long-term loss of natural vegetation.

Deforestation: Deforestation is defined as the indiscriminate felling of trees or forest for urbanization purposes or as a fuel for domestic uses (Balarabe, 2009). Deforestation is one of the most important issues of the last ten decades because of its effects on global climate via its

impacts on biogeochemical cycle of carbon. In view of its link with global warming and climate change through the decrease on the global carbon link, deforestation is a regional environmental problem with a global dimension for example Forest, Woodland and Shrub cover decline world wide by 2 percent during 1980s (FAO 2013). The downward trends have persisted since then (Watson et al, 2001). Almost all of this occurred in tropical countries including Nigeria, where forest and woodland decline by 3.6 percent during 1980s (Well, 1996). In Northern part of Nigeria empirical record indicated that vegetation cover has been lost by about 32% – 50% from 1980 (Tisee & Bello 2011). In Africa urban areas are known to depend heavily on forest and woodland for the supply of firewood, ethno-medicaments, food and food supplement. Fuel wood is estimated to account for about 80% of household energy needed in Nigeria. This is without disparity to social status (Tiseer & Suleman 2008).

Biological Diversity Loss

Biological diversity is a term usually employed in the abbreviated form of “biodiversity” Article 2 of the United Nations Convention on Biological Diversity (UNCBD, 2012) define biodiversity as the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystem and the biological complexes of which they are part. This include diversity within species, between species and of ecosystem, Faulker (2004) Poff, Bledsoe & Chulasian (2006) have associated poor Agricultural and urbanization practices as a leading cause for environmental degradation and biodiversity loss. Dellaney 1995, Zedler 2003 opined that urbanization result in clearance of large area of land which happen to be the habitant of thousands of species of animals.

Drought and Desertification

Drought and Desertification are also among the major environmental problems of the world. The United Nations Convention to Combat Desertification (UNCCD 2013) defined drought as the naturally occurring phenomenon that exist when precipitation has been significantly below normal recorded level, causing serious hydrological imbalance that adversely affect land resources productive system. Desertification according to (UNCCD, 2013) is the land degradation in the arid and semi-arid and dry areas resulting from various factors including variation and human activities. According to the National report on implementation of the (UNCCD 2013) it has been estimated that between 50% and 75% Bauchi, Borno, Gombe, Jigawa, Kano, Katsina, Kebbi, Sokoto, Yobe and Zamfara States in Nigeria are being affected by desertification. These states with a population of about 35 billion people account for about 35% of the country total area. In addition seven adjacent state to the South are reported to have about 10% to 15% of their land areas threatened by process of desertification it is estimated that the nigeria is losing about 351,000 hectare of the land mass to desert condition annually and such conditions are reported to be advancing south and at the rate of 0.6km per year in the absence of concrete remedial and meditative measures, it is estimated that that the total cost of environmental degradation in Nigerian will amount to about 110billion per annum out of which land degradation alone accent for about 73%

In Nigeria according to UNCCD (2013) population pressure compounded by connoted influx of migrant from Neighboring countries, result in overgrazing, and continuous overexploitation of marginal lands this has in turn aggravated the problem of desertification and drought. Villages and major areas roads have been buried under sand dunes in the extreme northern part of Borno, Jigawa, Katsina, Sokoto and Yobe State. The pressure of migrating human and livestock population from this area are been absorb by pressure point Buffer states

such as Adamawa, Benue, Kaduna, Kwara, Niger, Plateau and Taraba State. This action leads to an intensive use of fragile and marginal ecosystem resulting further degradation even during years of normal rain fall

Flood: Flood like drought and desertification is a natural hazard which occur as an extreme hydrological (run off) events. Flood either in form of exceptionally high rate of discharge water cause or as inundation of hitherto normal dry land area is a serious environmental problem in the world.

Looking at the dangers and threats to our fragile environments and its resources, the research work therefore sought to adopt the use of advanced organizers in teaching the students the concepts of conservation of resources to see if it will have any effect on their retention and performance on these concepts.

2.7 Academic Performance in Science

Aikenhead (2005) and Usman (2008) observed that the degree of Academic performance of a student is directly related to the quality of teaching technique they receive and it determine the quality of knowledge impacted and material learned. Performance is defined as the observable or measurable behaviour of a person an animal in a particular situation usually experimental situation. This means that performance measures the aspect of behaviour that can be observed at a specific period. To determine performance, a performance test is conducted. Singer (2013) defined performance test as the type of mental test in which the subject is asked to do something rather than to say something. Performance test is the type of test which throws light on the ability to deal with things rather than symbols (Drever, 2012).

2.8 Gender Differences in Learning Science

Gender is one of the factors affecting the performance of students in science. Studies on gender have been unresolved on their conclusions (Nussbaum, 2000). Some researchers found that male students performed better than female students (Novak & Mosunda, 2010; Danmole, 1998; Usman 2000). Other studies confirmed the superiority of female students' performance over male student. Yet others found no significant difference between male and female performance (Prince, 1993; Bello 1996; Nussbaum, 2000; Danmole and Addayi; 2004 ;). Wachanga et al. (2003) also observed that there is a significant different in the performance of male and female when expose to advance organizer. Adegwe (2000) attributed differences in learning ability of boys and girls to socialization process because girls are denied out of school and pre-school experience in problem solving specially those involving visual activity. Olanrewaju (2004) reported insignificant differences between boys and girls achievement in knowledge of Biological concepts. Dahiru (2004) also reported that there is no significant difference relationship between gender and selection of science subject. Okebukola (2002) explained that teachers who understand the academic strength of their learners and strive for instructional variety in instruction methodology will actually value encourage and achieve academic excellence in class room.

Hence this study would look at effort of Gender differences in learning conservation concept among senior biology students in Jahun Zone.

2.9 Retention of Learned Concepts in Science

Retention is defined by Kundu and Tutoo (2002) as a preservative factor of the mind. The mind acquires the material of knowledge through sensation and perception. These acquired materials in the mind need to be preserved in form and images for knowledge to develop. Whenever a simulating situation occurs retained images are received or reproduced to make memorization possible. Agbeyanku (2011) explained that Retention of concept learnt would help in reflective thinking and the use of the retained concepts be used in creative way to solve day to day problem. Goldstain (2010) associated Retention with long term memory according to him retention focus not only on its functionality but on its duration as well because long term memory is involved with the long storage of manipulation and efficient processing of information. Martinez (2000) conceived retention as a process in which information is encoded, saved and retrieved. Encoding or registration allow information that is from outside world to reach our senses on the form of chemical and physical stimuli, it involves receiving, processing and containing of received information.

Retention was seen by Beer (2010) as a tool employed by learners to assist them performs efficiently and effectively in all aspect of life and particularly in the school. This essential tool is needed by learners to maintain and manipulate information in the mind for a brief and long period of time. Abu Rabia (2003) posited that Retention is the ability to actively hold information in the mind needed to the complete task such as active thinking comprehension and learning. Martinez (2000) explained that the in depth retention and achievement in science, technology and mathematics is an important need that is becoming highly felt by the Nigerian populace. Baddeley (2000) suggested that retention is related to academic performance on the domain of physical sciences and used academic achievement in enhanced by a number of abilities, storage, capacities, processing efficiency, the ability to

combine storage and processing the ability to inhibit irrelevant information, the quality of knowledge representation and the ability to use efficient strategies in the face of interfering processes and distraction.

The level of retention is determined by the nature of material coded (Agbeyenku, 2011; Bichi, 2002). This appropriate coding of incoming information provides the index that may be consulted so that retention takes place without an elaborate search in the memory (Bichi, 2002). The Retention according to Cano (2005) takes place when learning is coded into memory and that understanding and retention are produced of meaningful learning. So when teaching is effective and meaningful to the student, it inclines to build and maintain memory for a task. This memory according to him is characterized by a large capacity; it can hold and accept a large amount of new information at one time the capacity of the memory makes it convenient to assimilate a large chunk of information simultaneously (Martinez 2000). Learners at school need this memory on a daily basis for Variety of task and may assist in remembering task, irrelevant information and improve performance on cognitive task. Novak & Musanda (2010) observed that teaching students to use memory strategies by employing appropriate teaching strategy will not only improve student thinking skill on complex task of production, modeling, experimentation and evaluation, but will also assist learners to attain deep understanding of conceptual knowledge and will result in developing cognitive facilities domain. Harrey (1993) as cited in Agbeyenku (2011) outlined the following factors affecting student's retention in relation to their academic achievements in sciences as:

- Thinking style of the individual learners
- The age of the learners

- Nature of materials to be learned
- Teacher's method of teaching.

Various research works including Hudson and Keraro (2009), Oloyade (2011), and Wachanga *et al* (2013) revealed that the use of advanced organizers enhances student's retention and achievement. Hence conservation concepts need to be presented to learners in a way or method that touches their sub consciousness which can trigger quick recalling of concepts being taught or learnt. This study therefore, intends to employ the use of advance organizers to determine its effects on student's retention and academic achievement in conservation concepts.

2.10 Overview of Similar Studies

A number of studies have been carried out by many researchers that are relevant to this study. This section gives an overview of such studies.

Chen (2007) conducted a research on the effects of advance organizers on learning and retention from a fully web-based class in health care college students in Orlando, Florida. The population of the study consists of 500 college students and a sample of 166 students participated in an online class in their junior or senior year. Survey research Design was used. The instrument used for the research was interview, a survey, multiple choice question quizzes and a set of scenario-based essay question. Descriptive statistics of Mean and Standard deviation was used to analyze the data .The findings from this research do not demonstrate significant effect of advanced organizers among the treatment groups and control group, the study also reiterated the proposition that students of lower learning abilities benefits more from using an advanced organizers for online learning than those of higher learning abilities. Chen used survey research design which involve the use of questionnaires

and interviews, it is proven that the use of these instruments may lead to wrong data collection and consequently to wrong data analysis and hence rendering the result invalid. In this research work quasi experimental design was used which has the tendency of minimizing the researcher and respondents' biasness in data generation and more reliable statistical tool (t-test) was employed in data analysis as compared to descriptive statistics used by Chen.

Gurlitt *et al* (2011) carried out a research work on differently structured advanced organizers leading to different initial schemata and learning outcomes in Germany. The population of the study consists of 48 undergraduates of German University, using expo-factor research design. The instrument used was 14 items multiple choice questions. The data collected were analyze using ANOVA. The result show that advanced can support the generation of proto-schemata and this can be more than the activation of existing concepts in long term memory. Gurlitt *et.al* found the effect of advanced organizers on the undergraduate students using expo factor research design, this research work therefore had used secondary students with quasi experimental research design

Wachanga, Anthony, and Mbugua (2013), has investigated into the effects of advanced organizers teaching approach on students' achievement in chemistry. The study involve secondary schools in Mara district, Kenya with a target population of 13,036 secondly schools. The sample of the study was 3,540 form three chemistry students. The research design used was quasi experimental and a Chemistry achievement test (CAT) was administered to the students and the result was analyzed using inferential statistics of ANOVA, t-test and ANCOVA. The findings indicated significant effects of use of advanced organizers in the performance of chemistry students who are taught using advanced organizers and those who were taught with conventional method only. The findings also

indicates that gender has no effects on chemistry achievement test score in chemistry learning using advance organizers are used.

Hudson and Keraro (2009) carried out a study on the use advanced organizers to enhance students motivation in learning biology in Kenya, using a population of 408 students and a sample of 166 form three (Third grade in secondary school cycle) student using quasi experimental Design. Data were collected using students motivation questionnaire (SMQ), their result were analyzed using t-test, one way ANOVA and ANCOVA statistical techniques. Their finding indicated that students taught using advance organizers had a higher level of motivation than those taught using conventional method. The findings further indicated that male students had a significantly higher level of retention than their female counter parts. Hudson had found the effect of Advanced organizers on motivation in learning biology only ignoring other important variables such as academic performance, attitude, retention among others, this give his work light weight. In this research work the researcher had investigated the effect of advanced organizers on academic performance and retention so as to add to the existing literature.

Oloyede (2011) investigated the effects of pictorial and written advanced organizers on students' achievement in senior secondary schools chemistry, with the total population of 1,167 senior secondary school two (SS 2) chemistry students on the concept of energy change in Bauchi state. 138 students were randomly selected to be the sample of the study. Quasi experimental research design was adopted for this study. A chemistry achievement test (CAT) was used to collect data, consisting of 50 multiple choice items on concept of energy change. The result shows that advanced organizers enhances the achievement and retention of learning material in chemistry by the students. The study also revealed that a pictorial

organizer was found to be more effective in facilitating student achievement and retention in chemistry than written organizers. There were no significant differences between achievement of male and female chemistry students taught with pictorial and written organizers. This research work had shared many similarities with that of oloyede (2011) in the use of pictures and text/statement in the presentation of the advanced organizers to the students, as the pictures are known to attract the student's attention and consequently leads to the retention of the learned concepts.

Agbeyenku (2011) examine the effects of advanced organizers on performance and retention of ecology concepts among senior secondary school students in Giwa Local Government Educational Zone, Kaduna, Nigeria. The study consists of 145 students. The research design used was quasi experimental design. Ecology concepts achievement test (ECAT) was used to collect data and t-test statistics were used to analyze the data. The finding shows that there is a significant difference in mean academic performance scores of experimental and control groups. There is difference in retention level of students taught using advanced organizers compared to those taught using lecture method only. The use of advanced organizers favored female students than male students. Agbeyenku had investigated the effects of advanced organizers on retention and performance on ecological concepts, he also gave out the advanced organizers to the students two weeks before the actual teaching this may put the control group at higher disadvantage. In this research work the researcher had administered the advanced organizers just some hours to the actual class instruction to reduce the exposure time.

From the various studies reviewed both in biology and other fields showed that study on advanced organizers is relatively new. Therefore, in this study the effect of advanced

organizers on retention and performance of conservation concepts among secondary biology students will be examined.

2.11 Implications of the Related Literature Reviewed for the Present Study

Relevant literature has been reviewed and findings from the reviewed literature reveal various results on the use of advanced organizers. The literature also revealed and explains clearly the concepts of advanced organizers. Hudson and Keraro (2009) carried out a study on using advanced organizers to enhance student's motivation in learning biology in Kenya. His findings indicates significant difference between students taught concepts using advanced organizers and those taught with without using advanced organizers. Chen (2007) conducted a research on the effects of advance organizers on learning and retention from a fully web-based class in health care college students in Orlando, Florida. His findings do not demonstrate any significant differences among the groups of his study. Wachanga, Anthony, and Mbugua (2013), has investigated into the effects of advanced organizers teaching approach on students' achievement in chemistry their findings indicates significant differences in the mean retention level between male and female students. Agbeyenku (2012) examine the effects of advanced organizers on performance and retention of ecology concepts among senior secondary school students in Giwa Local government educational zone, Kaduna, Nigeria. The finding shows that there is a significant difference in mean academic performance scores of experimental and control groups. There is difference in retention level of students taught using advanced organizers compared to those taught using lecture method only.

From all the literature reviewed, it was observed that advanced organizers are used as a link in the cognitive framework of the learners to provide a connection between

what the learner have known and the intending learning task which is the principal cardinal point of this research work and these advanced organizers are presented in advanced of actual teaching time. Moreover most of the researchers used only textual advanced organizers with few using graphic organizers. However, it has also been observed that most of the research works reviewed presents the advanced organizers to the experimental students some weeks or days ahead, this may tend to put the control group at high disadvantage. More so, majority of the research work reviewed were from outside Nigeria and in subjects other than biology. The review also revealed that the research design mostly used by majority of the researchers was quasi experimental design because mostly intact classes were used with few adopting survey research design. The researchers mostly used test as the instrument for gathering data.

This research work therefore, intended to presents the advanced organizers to the students few hours to the actual teaching time to reduce the effect of time between the control and experimental groups. Also a Pictorial and statements advanced organizers package was used for this study on the concept of conservation of resources. Quasi experimental design was also used and t test was use in analyzing the data. During the course of instruction, the researcher was strictly consistent with Ausubel theoretical position which includes that advance organizers are not made for day to day use. Instead they are used to provide a structure for students thinking, in this way, students are engaged in active learning, thereby making the learning to be more meaningful and subsequently enhance retention and performance in conservation concepts.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

In this chapter the methodology for conducting the study is described. Specifically, the chapter is presented under the following sub-headings:

3.2 Research Design

3.3 Population of the Study

3.4 Sample and Sampling Techniques

3.5 Selection of Topics to be Taught

3.6 Instrumentation

3.6.1 Validity of the Instrument

3.6.2 Pilot Study

3.6.3 Items Characteristics of the Instrument (CCPT)

3.6.4 Reliability of Instrument

3.7 Administration of the Treatment

3.8 Data Collection Procedure

3.9 Procedure for Data Analysis

3.2 Research Design

The research design employed in this study was pre-test, post-test quasi-experimental design using intact biology classes, as it is not always possible to have complete randomization of the subjects as this will disrupt school organization, also the researcher does not have a total

control over the population as in the case of pure experimental design. The sample was grouped into two: the control and experimental group. To carry out this research work, the Conservation Concept Performance Test (CCPT) was designed using questions from the West African Examination Council Question papers (2009-2014). The instrument was administered to the sample as pre-test, before treatment to determine their equivalence in ability, and the scores from the pre-test was used to place the students in the same prior knowledge level. The experimental group (X_1) was taught using advanced organizers while the control groups (X_2) were taught using conventional lecture method without any enhancement. The same test was administered as post test after six weeks and postpost test after the period of two weeks . The design of the study is represented in Figure 1:

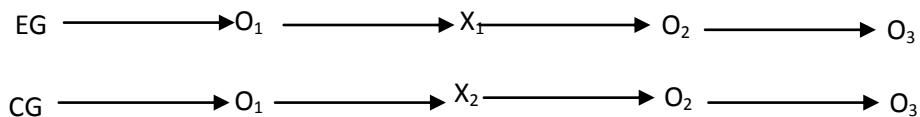


Figure 1. Research Design Illustration

Where:

EG Experimental Group

CG Control Group

O₁ Pre-test administration

X₁ teaching students conservation concepts using advanced organizer (treatment)

X₂ teaching students conservation concepts using conventional lecture method (control)

O₂ Post-test administration

O₃ Post-post-test administration

3.3 Population of the Study

The population of this study consists of all Senior Secondary School students II (SSII) of Jahun Educational Zone who offer Biology as a subject. There are eleven (11) senior secondary schools in the zone with a total number of One thousand two hundred and twenty five students (1225) of 17-18years average age. Out of which 334students were girls and 891 were boys. Three out of the eleven schools in the Zone were co-educational. The population of the study is shown in Table 3.1.

Table 3.1 Population of the Study

Schools	Male	Female	Total
GSS, Aujara	423	-	423
GDSS,Kale	62	-	62
GSSS, Jahun	-	278	278
GDSS, Gunka	32	-	32
GDSS, Miga	36	13	49
GDSS, Harbo	78	-	78
GDSS, Tsakuwawa	46	-	46
GDSS, Jahun	44	20	64
GDASS, Jahun	50	23	73
GDSS, Zareku	55	-	55
GDSS, Dangyatin	65	-	65
Total	891	334	1225

Source: Jahun Educational Zone, (2015)

3.4 Sample and Sampling Technique

Purposive sampling technique was used to select three (3) coeducational schools out of the eleven schools. Purposive sampling technique is one of the non-probability sampling techniques based on the judgment of the researcher. Gender is part of this research, as such the researcher set out the following criteria for the selection of the sampled schools:

- The schools must be coeducational
- Must offer Biology as a subject
- Must have qualified Biology teachers.

In determining the educational qualifications of the biology teachers, the researcher collects the staff data from the school principal. And only those teachers with Bsc, PGDE, B. (ed), and Bsc. (ed) were considered to be qualified and hence they are the ones chosen.

Based on these criteria, three (3) schools were found to satisfy these criteria and are chosen as study samples. The three schools were pre tested and the scores of the pretest were subjected to statistical analysis using ANOVA and later to scheffes' test. Two schools were selected based on the result of the pretest the schools chosen were Government Day Secondary School Jahun, and Government Day Arabic Secondary School Jahun. This is because the two schools do not differ significantly in their performance from the pretest given. SSS II students were selected for the study because their syllabus contained conservation concept to be taught in the research. Intact classes were chosen by flipping a coin and are assigned as experimental and control group respectively with Sample sizes of at least 30 students, and a class size of at least 30 students are required in each group for quasi

experimental research (Mugenda & Mugenda, 2003). Details of the sample are shown in Table 3.2

Table 3.2 Sample for the Study

Schools	Male	Female	Total
GDSS Jahun	50	23	73
GDASS Jahun	44	20	64
Total	93	44	137

3.5 Selection of Conservation Concepts to be Taught

The main concepts in the study are Conservation of natural resources which is contained in the SS2 Biology syllabus. The topic chosen is conservation of natural resources; the contents were soil conservation, Biodiversity (Animal species) conservation, Forest and wetland conservation. The choice of the topic is due to the fact that many environmental issues are contemporary issues of serious concern in Nigeria, also with current world transition from realization of Millennium Development Goals (MDGs) to Sustainable Development Goals (SDGs); environmental protection is one of the top priorities. So environmental issues have to be understood and addressed at the grassroots, which is secondary school level so as to help in the realization of these goals.

3.6 Instrumentation

The instrument that was used for this research work was Conservation Concept Performance Test (CCPT) developed by the researcher using past question papers of West African Examination Council (WAEC) 2009-2014, school certificate examination. The CCPT consists of 30 multiple choice Biology test item with four options (A-D) from which the students selects the correct answers. The test item covered all the topics taught for the

duration of the research. The Topics are: Forest Conservation, Species Conservation, wetland Conservation and Soil Conservation. The table of specification and item specification for the topics were made; Details are in Table 3.3 and 3.4 respectively.

Table 3.3: Table of Specification for CCPT

Contents	Knowledge	Comprehension	Application	Total
Conservation of resources	10,21,22,23	5	19	6
Forest conservation	3,4,16,25,28,12	6,8,13,24	11,26	12
Soil conservation	17,20	1,30,29	7	6
Animal Species Conservation	2,18,27	9,14,15	-	6

Source: Researcher, 2015

3.6.1 Validation of the Instrument

The Conservation Concept Achievement Test was validated by two senior lecturers teaching science education Ahmadu Bello University and one Senior lecturer teaching English at Sule Lamido University, Kafin-Hausa. Two senior secondary schools teachers were also involved.

They were asked to study the items and certify:

- If the questions are considered to be testing what they are meant to test,
- Check for possible errors in the suggested answers.
- Whether the questions are clear, precise and free from ambiguity
- Whether the level of difficulty of the questions match the ability of students

The experts made constructive criticisms in area of language level and content area of the (CCPT) instrument and the corrections were effected.

3.6.2 Pilot Testing

Pilot testing was carried out using SSS II students of GDSS Tsakuwawa which is part of the population for this study, 46 students participated in the study. The aim was to determine the characteristics of the test item (Conservation Concept Performance Test). which include the Facility and discrimination indices, the reliability strength of the instrument before administration,, determine appropriate time duration which the students would need to answer the question properly, and identify problems that may affect the administration of the instruments during the actual experiment with a view to eliminating them.

3.6.3 Reliability of the Instrument

To determine the reliability of instrument, a test- retest method was employed; the first test was given to the students of a school that did not form parts of the sample used for the study. After a two weeks interval the 2nd test was administered to the same students in line with Sambo (2008) recommendations on the use of two week interval for test-retest method. Pearson- Product Moment Coefficient (PPMC) statistic was used to analyze the reliability of the instrument, based on the data obtained from the pilot testing of the instrument, reliability coefficient was found to be $r = 0.89$, using the reliability coefficient scale of 0-1, 0.89 is strong and reliable, and thus could be used for the study, Sambo (2008).

.3.6.4 Items Characteristics of the Instruments (Conservation Concept Performance Test)

Items analysis was carried out on the scores obtained from the pilot study to determine the facility and difficulty indices of the items in the CCPT the facility index (FI) according to Wood (1990) is the percentage of students that gets an item right it is determined by using formula

$$F.I = \frac{R}{T} \times 100$$

Source: Wood (1990)

Where R= Number of correct responses.

T = Total Number of students.

Agbeyenku (2011) and Usman (2008) recommended values within the range of 0.3 to 0.7 for good test items value in assessing the performance of the students.

Discrimination index: indicates the discriminating power of each of the test items or is the ability to sort between high and low ranking students in the whole test. The score was done using the scores of the top 27% and bottom twenty score (27%) of the total respondents. This was calculated using formula given by (Furst in Olorukooba, 2001)

$$D.I = \frac{Ru - Ri}{1/2N}$$

Where D.I = Discriminating index

Ru= Number of candidates that got item correct among upper 27% of respondent

Ri = Number of candidates that got item correct among lower 27% of respondent

N = total Number of respondents

The D.I, which ranges from 0.3 to 0.7 is regarded as moderately positive and is good for selecting the items of the CCPT

3.7 Administration of Treatment

During the period of the administration of the treatment, the experimental group was presented with advanced organizers before the lecture began. The presentation of the advanced organizers was in line with model adopted from Stone, Weil and Calhoun (2000) which has three phases of activities.

Phase I: This includes presentation of the advanced organizers

- Clarify the aim of the lesson
- Present the advance organizers
- Prompt awareness of relevant knowledge

Phase II: This include making link to the organizers

- Present the learning task or learning material
- Make organizational and logical order of learning materials explicit

Phase III: Strengthening of cognitive organization

- Integrative reconciliation and active learning. Example a teacher can ask learner to make summaries, to point out differences or relate new examples with organizers
- Elicit critical approaches to subject matter that is to have students link about contradiction or implicit inferences in the learning materials or previous knowledge

The control group was taught using only conventional lecture method. After six weeks of treatment, a post-test was administered to both experimental and control group (Tuckman, 1972). A post-posttest was administered after a period of 3 weeks to determine the students' level of retention (Agbenyeku, 2011 & Wachanga et. al 2013).

The data collected was used to answer research questions and test the hypotheses formulated in chapter one.

3.8 Data Collection Procedure

The Conservation Concept Performance Test was administered to the sample first, as pre-test by the researcher. After six weeks period of instruction by the researcher, the CCPT was administered to the two groups in form of examination as a post-test. The CCPT item was graded by the teacher and the scores was used to determine the level of students' performance. After 3 weeks duration a postpost-test was administered by the researcher to find out the retention level of the students.

3.9 Procedure for Data Analysis

Mean and standard deviation was used to answer the research questions. Each of the hypotheses was restated along with the appropriate statistical tool for testing at significance level of $P \leq 0.05$ as follows;

H₀₁ There is no significant difference between the post test mean scores of students taught conservation concepts using lecture method enriched with advanced organizers and those taught using conventional lecture method.

Paired t-test was used to test this hypothesis.

H₀₂ There is no significant difference between the postpost test mean scores of students taught conservation concepts using lecture method enriched with advanced organizers and those taught using conventional lecture method.

Paired t-test was used to test this hypothesis.

H₀₃ There is no significant difference between the post test mean scores of male and female students taught conservation concepts using lecture method enriched with advanced organizers and those taught using conventional lecture method.

Independent t-test was used to test this hypothesis.

H₀₄ There is no significant difference between the postpost test mean scores of male and female students taught conservation concepts using lecture method enriched with advanced organizers and those taught using conventional lecture method.

Independent t-test was used to test this hypothesis.

CHAPTER FOUR

DATA ANALYSIS, RESULTS AND DISCUSSION

4.1 Introduction

This study was carried out to investigate effects of advanced organizers on retention and performance of conservation concepts among senior secondary biology students in Jahun Educational Zone, Jigawa State, Nigeria. This chapter gives the analysis and presentation of results as well as the discussion of the findings under the followings subheadings:

This chapter is presented under the following subheadings:

- 4.2 Data Analysis and Result Presentation
- 4.3 Summary of Major Findings
- 4.4 Discussion of Results

4.2 Data Analysis and Result Presentation

The data collected from the study using Conservation Concept Performance (CCPT) Test were analyzed and used to answer the research questions and test the Hypothesis.

4.2.1 Answering the Research Questions

Research Question One: What is the effect of advanced organizers on the performance of secondary school biology students in conservation concept?

To answer this research question means and standard deviations of performance scores were considered. The post test mean scores of experimental and control groups were subjected to descriptive statistics. Mean and standard deviation were computed and used to draw Table 4.1

Table 4.1 Mean and Standard Deviation of Post Test Scores of the Experimental and Control Groups.

Groups	N	Mean	Std. Deviation	Mean Diff.
Experimental	73	21.17	5.89	9.28
Control	64	11.89	3.46	

Results from Table 4.1 show that the academic performance mean scores for the experimental and control groups were 21.17 and 11.89 respectively. The standard deviation for the experimental and control groups were 5.89 and 3.46 respectively. The mean difference was 9.28. This means the experimental group achieved higher than the control group, and this can be attributed to the treatment. i.e. the use of advanced organizers.

Research Question Two: Is there any difference in the postpost test mean scores of students taught conservation concepts with advanced organizer and those taught with lecture method?.

To answer this research question, mean and standard deviations of performance scores were considered. The postpost test scores of experimental and control groups were subjected to descriptive statistics. Mean and standard deviation were computed and used to draw Table 4.2

Table 4.2 Mean and Standard Deviation of the Postpost Test Scores for the Experimental and Control Groups

Groups	N	Mean	Std. Deviation	Mean Difference
Experimental	73	19.61	5.91	10.13
Control	64	9.48	2.65	

Results from Table 4.2 showed that the postpost test mean scores for the experimental and control groups were 19.61 and 9.48 respectively, with the mean difference of 10.13 and the

standard deviations for the experimental and control group were 5.91 and 2.65 respectively. This means the experimental group achieved higher retention level than the control group, and this can be attributed to the treatment. i.e. the use of advanced organizers.

Research Question Three: What is the effect of using advanced organizers on the mean performance scores of male and female students taught conservation concepts?

To answer this research question mean and standard deviations of performance scores were considered. The post test scores of experimental and control groups were sorted according to gender and subjected to descriptive statistics. Mean and standard deviation were computed and used to draw Table 4.3

Table 4.3 Mean and Standard Deviation of Post Test Scores of Male and Female Taught Conservation Concepts with Advanced Organizers.

Groups	N	Mean	Std. Deviation	Mean Diff.
Male	50	21.24	5.808	0.19
Female	23	21.04	6.19	

Results from Table 4.3 show that academic performance means scores for the male and female students were 21.24 and 21.04 respectively. The mean Difference was 0.19. This means that male students achieved very slightly higher than the female students and this can be attributed to the treatment. i.e. the use of advanced organizers. The differences appear to be negligible.

Research Question Four: what is the effect of using advanced organizers on mean retention scores of male and female students taught conservation concepts?

To answer this research question mean and standard deviations of performance scores were considered. The postpost test scores of male and female students were subjected to descriptive statistics. Mean and standard deviation were computed and used to draw Table 4.4

Table 4.4: Mean and Standard Deviation of Postpost Test Scores of Male and Female Students Taught Conservation Concepts with Advanced Organizers.

Groups	N	Mean	Std. Deviation	Mean Difference
Male	50	19.59	6.02	0.07
Female	23	19.66	5.81	

Results from Table 4.4 show that the postpost test mean scores for the male and female students were 19.59 and 19.66.respectively with the mean Difference of 0.07 and the standard deviation for the experimental and control group were 6.02 and 5.81 respectively. This means that the female students retained very slightly higher than the male students, and this can be attributed to the treatment. i.e. the use of advanced organizers. The difference appears to be negligible.

4.3 Hypotheses Testing

After answering the research questions, the stated null hypotheses were tested at $p \leq 0.05$

Level of significance:

H₀₁ There is no significant difference in the mean performance scores of students taught conservation concept with advanced organizers and those taught same concepts without advance organizers.

To test this hypothesis, the mean academic performance scores of students in experimental and control groups were subjected to t- test statistic and summary of analysis are shown on Table 4.5.

Table 4.5: Summary t-test Analysis of Academic Performance Mean Scores of Experimental and Control Groups

Groups	N	Mean	S.D	Df	t-Value	p-value	Decision
Experimental	73	21.17	5.89	135	11.04	0.00	Significant
Control	64	11.89	3.46				

Significant at $\alpha = P \leq 0.05$

The experimental group has higher mean scores of 21.17 as compared to that of control group with mean scores of 11.89. The p- value is 0.00 which is less than 0.05 level of significance at 135 degree of freedom. Hence the null hypothesis was rejected. This means teaching with advanced organizer is effective in enhancing student's performance in conservation concepts.

H₀₂: There is no significant difference in the mean retention ability of students taught conservation concept using advanced organizers and those taught with lecture method.

To test this hypothesis, the mean academic performance scores of students in experimental and control groups were subjected to t- test statistic and summary of analysis are shown in Table 4.6

Table 4.6 Summary of t- Test Analysis of Postpost Test Scores of Experimental and Control Groups:

Groups	N	Mean	S.D	Df	t-Value	p-value	Decision
Experimental	73	19.62	5.95	135	12.54	0.00	Significant
Control	64	9.48	2.65				

Significant at $\alpha = P \leq 0.05$

The results from table 4.6 shows a t- value of 12.54 and p- value of 0.00 at $p \leq 0.05$ with the degree of freedom of 135. This shows that the experimental group has higher retention ability than the control group, hence the null hypotheses is rejected.

H₀₃: There is no significant difference in the post test mean scores of male and female Biology students taught conservation concepts with advanced organizers.

To test this hypothesis, the mean academic performance scores of students in experimental and control groups were subjected to t- test statistics and summary of analysis are shown in Table 4.7

Table 4.7: Summary of t- test Analysis of Post Test Means Scores of Male and Female Students Taught Conservation Concepts Using Advanced Organizers.

Groups	N	Mean	S.D	Df	t-Value	p-value	Decision
Male	50	21.24	5.80	71	0.13	0.89	N.S
Female	23	21.04	6.19				

Not Significant at $\alpha = P \leq 0.05$

The results in Table 4.7 shows that at df 71, t value =0.13 and P value observed =0.89 is higher than 0.05 level of significance. Consequently the null hypothesis is retained. This implies that advanced organizers are gender friendly in the learning of conservation concepts.

H₀₄: There is no significant difference in the mean postpost test scores of male and female biology students taught conservation concepts with advanced organizers.

To test this hypothesis, the mean postpost test scores of male and female students were subjected to t- test statistics and summary of analysis are shown in Table 4.8

Table 4.8 t- test Analysis of Postpost Test Mean Scores of Male and Female Students in The Experimental Group.

Groups	N	Mean	S.D	Df	t-Value	p-value	Decision
Male	50	19.59	6.02	71	-0.05	0.96	N.S
Female	23	19.66	5.81				

Not Significant at $\alpha = P \leq 0.05$

The t- test analysis from Table 4.8 shows that at df 71 $t = -0.05$ and the p- value is 0.96 the p- value of 0.96 is higher than $P \leq 0.05$ level of significance, Hence the null hypotheses which states that there is no significant difference in the retention level of male and female biology students taught conservation concepts with advance organizer taught is retained.

4.4 Summary of Major Findings:

Based on the outcome of the analysis, the followings are the major findings of this study:

1. There is a significant difference between the mean academic performance scores of student taught conservation concepts with advanced organizers and those taught without advanced organizers in favour of the former.
2. Students between the experimental group retained the learned concepts significantly better than those in the control group.
3. There is no significant difference between mean academic performance scores of male and female students taught conservation concept with advanced organizers.
4. There is no significant difference between the retention level of male and female students taught conservation concepts with advance organizers.

4.5 Discussion of Results

The objective of this study was to investigate the effects of advanced organizers on retention and performance of conservation concept among secondary biology students in Jahun Zone, Jigawa Nigeria. To achieve this aim, students in experimental group were taught conservation concept using advance organizers while students in control group were taught conservation concept without advance organizers. Therefore, the observed differences in the result were due to treatment. The result of the analysis of the data on the research questions and null hypotheses are hereby discussed.

Null Hypothesis One:

The result of analysis presented in Tables 4.1 and 4.5 showed that the students taught conservation concept with advanced organizer had a higher mean score than the students taught using lecture method alone. This result is in agreement with the findings of Chen (2013,), Abba (2011) and Wachanga et al (2014) whose works found that advanced organizer enhances student academic achievement in science subjects. The findings of this study are also in agreement with that of Shihusa and Keraro (2009) that the use of advanced organizer teaching strategy results in higher achievement of students in Biological concepts. However the finding is not in agreement with the finding of Okey and Avwiri (2014) who found no significant differences in performance of mathematics students taught using advanced organizers and those taught without advanced organizers on the concept of electro magnetism. Usman, Choundhary and Qamar (2015) also indicated that there was no significance difference between the mean scores of post-test of students taught with advanced organizers. This significant performance with the use of advanced organizers could be due to the fact that advanced organizers are subsuming bridges between prior knowledge and incoming new knowledge which therefore aids assimilation of a new knowledge. Secondly pictorial organizer could be anchoring devices for enhancing learning so

that student can have easy comprehension of the concepts to be presented. Another reason could be that the advanced organizer especially the pictorial type arouses student's attention to the lesson presented.

Null Hypothesis Two:

The result of the analysis was presented on Tables 4.2 and 4.6. Showed that the experimental group had higher retention ability on conservation concept than the control group. This finding is supported by Oloyede (2009) who found that students taught using advanced organizers had a higher level of retention than their counterparts taught with lecture method. Hashamdar and Ayooobi (2015) findings are in agreement with this finding who established a significant difference between the performance and retention level of students taught with comparative advanced organizer and those taught without advanced organizers. However the finding is in disagreement with the findings of Usman, Choudhary and Qamar, (2015) who found no difference in the mean retention level of the performance of 9th grade science students taught with advanced organizers. The observable difference in retention level of experiment and control group could be due to the fact that advanced organizers provide a stable cognitive structure that enhances anchorage of new materials which led to meaningful learning as opposed to rote learning hence better retention, also the advance organizer particularly pictorial present information to fit in to a system of supporting ideas of students who learn concept through well-organized cognitive system tend to efficiently retain information. While students that learn concept haphazardly tend to forget information. Pictorial advanced organizer help to strengthen the student's cognitive structure in such a way that learning and retention are facilitated. When concepts are properly anchored, students do not only recall concept learnt easily, but concept are meaning fully learned and could be applied to solve problems.

Null Hypothesis Three:

The analysis of the mean performance scores in Tables 4.3 and 4.7 between male and female students showed that the difference was not statistically significant. The findings from this study indicated that gender has no effect on learning conservation concepts with advanced organizers on learning conservation concept with advanced organizer. The result of this finding concur with that of Wachanga et.al (2013) who observed that gender has no significant effect on chemistry achievement test. The result also agreed with that of Njue (2010) who established that gender as no significant effect in chemistry achievement test. This could be due the fact that advance organizers are gender friendly. However, this finding disagree with that of kundu and Tatoo (2002) who found a significant difference in the performance of male and female students taught with advanced organizers

Null Hypothesis Four:

Table 4.4 and 4.8 show the analysis postpost test of the experimental group male and female students. From the analysis there is no significant difference between the mean retention scores of male and female students taught conservation concepts with advanced organizers (experimental group). This finding also revealed that the use of advanced organizers is gender friendly. This result concurs with that of Ruangruchira (2002) and Agbeyenku (2014). Which also stated that no significant difference between the mean retention scores of male and female students taught with advanced organizers (experimental group)? However, this finding disagree with that of kundu and Tatoo (2002) who found a significant difference in the retention ability of male and female students taught with advanced organizers

CHAPTER FIVE**SUMMARY, CONCLUSION AND RECOMMENDATIONS**

5.1 Introduction

This chapter is presented in the following subheadings:

- 5.2 Summary
- 5.3 Major Findings
- 5.4 Conclusions
- 5.5 Contributions to Knowledge
- 5.6 Recommendations
- 5.7 Limitation of the Study
- 5.8 Suggestions for Further Studies

5.2 Summary

This study investigated the effects of advanced organizers on retention and performance inconservation concepts among secondary Biology students in Jahun, Jigawa State, Nigeria. Four research questions and four null hypotheses were formulated and tested using independent t-Test at 0.05 level of significant. in this study also the reviewed related literature based on the followings subheadings: Biology an Overview, methods of teaching science in secondary schools Ausubel subsumption theory of meaningful learning, Concept of cognitive structure and meaningful learning, concepts of advanced organizers, use of advanced organizers in learning, concept of conservation of natural resources, gender differences and performance in science education, retention and academic performance in science, overview o lar Studies and the Implication of Literature Reviewed to the Present Study.

The study adopted the pretest, posttest ; si experimental and control group design. A pretest was administered before tne treatment to establish the equivalence

of the experimental and control groups ability levels. The students in experimental group were taught using Advanced Organizers while those in control group were taught using lecture method for the period of Six weeks. The topic taught was Conservation of Natural Resources from senior secondary school curriculum. The instrument used for the study was Conservation Concept Performance Test (CCPT). One hundred and thirty seven (137) students were randomly selected from the eleven (11) senior secondary Schools constituted the sample for the study from the total population of one thousand two hundred and twenty five (1225) SSII students in the zone. The major findings from the study includes: There is a significant difference between the mean academic performance scores of students taught conservation concepts with advanced organizers (experimental group) and those taught without advanced organizers (control group). There is a significant difference between the mean retention scores of students taught conservation concepts with advanced organizers (experimental group) and those taught without advanced organizers (control group). There is no significant difference between the mean academic performance scores of male and female students taught conservation concepts with advanced organizers (experimental group). There is no significant difference between the mean retention scores of male and female students taught conservation concepts with advanced organizers (experimental group). Based on the findings it was recommended that advanced organizers should be used by biology teachers to teach in senior Secondary Schools among others.

5.3 Major Findings

The followings are the major findings from this study:

1. There is a significant difference between the mean academic performance scores of students taught conservation concepts with advanced organizers (experimental group) and those taught without advanced organizers (control group).
2. There is a significant difference between the mean retention scores of students taught conservation concepts with advanced organizers (experimental group) and those taught without advanced organizers (control group).
3. There is no significant difference between the mean academic performance scores of male and female students taught conservation concepts with advanced organizers (experimental group).
4. There is no significant difference between the mean retention scores of male and female students taught conservation concepts with advanced organizers (experimental group).

5.4 Conclusions

Based on this study, the following conclusions were made:

1. Academic performance on conservation concepts can be enhanced by the use of advanced organizers
2. Advanced organizers promote meaningful learning and retention of conservation concepts of students in secondary schools.
3. The use of advanced organizers is gender friendly as it promotes academic performance and retention of males and females students.

5.5 Contributions to Knowledge

The concern of this study was to explore the effects of pictorial and statement advanced organizers on Academic performance and retention of conservation concepts among secondary biology students in Jahun zone, Jigawa Nigeria. The findings of this study have a significant contributions and great implication for educational practices;

1. The researcher was able to establish that using pictorial and statements advanced organizers to teach students conservation concepts enhances the performance and retention of secondary biology students in Jahun educational zone.
2. The researcher developed a pictorial and statement advanced organizer package that can be used by secondary school biology teachers to improve performance and retention in conservation concepts.
3. This research work is the first of its kind in Jahun educational zone, jigawa Nigeria from the knowledge of the researcher. It could be replicated by other researchers in other zones within and outside the state.
4. The use of advanced organizers is gender friendly as it promotes academic performance and retention of males and females students.

5.6 Recommendations

Based on the findings of this study, the followings recommendations were made;

1. The use of advanced organizers should be encouraged among secondary school Biology teachers in teaching conservation concepts where prior knowledge is

lacking, because from this study, advanced organizers was found to be very effective in enhancing meaningful learning

2. Coeducational schools should encourage the use of advanced organizers as they are gender friendly. All gender could benefit from the use of advanced organizers during instructions.
3. Professional Associations such as Science teachers Association of Nigeria (STAN), Nigeria Educational Research and Development Council (NERDC) should develop a pictorial advanced organizer packages that could be used by science teachers in teaching to bridge the gap between prior knowledge and the new learning materials in other topics.
4. Science teachers should adopt the use of advanced organizers in teaching contemporary topics like conservation of natural resources in environment.
5. Professional bodies, Federal and State Ministries of Education in conjunction with environmental protection agencies like Federal Ministry of Environments should embark on training and retaining of biology teachers to design and use advanced organizers through seminars, workshops on conservation of natural resources

5.7 Limitations of the Study

The limitations of this study are:

- The study was restricted to only SSII students in Jahun Educational zone, Jigawa Nigeria. This makes the generalization of the result fairly narrow and not applicable worldwide

- There are only three coeducational schools in the zone under study and so they were the only ones sampled and pretested.

5.8 Suggestions for Further Studies

The followings suggestions are put forward for further studies:

- Studies of this kind could be extended to other subjects in junior secondary schools, Polytechnics, Monotechnics and Universities as the result obtained here is restricted to senior secondary schools.
- This type of study could be extended to other subjects in science and art discipline
- It could also be extended to other educational zones in Jigawa State, and other state of the federation for wider more generalized result.
- The study could be replicated to include other variables as interest, attitude, self-efficacy of student toward conservation concepts of biology using advanced organizers
- This study should also be extended to the use of different type of advanced organizers such as audio organizers, graphics organizers among others
- Advanced organizers can be combined with other teaching strategies such as discovery, process approach to teach conservation concepts.

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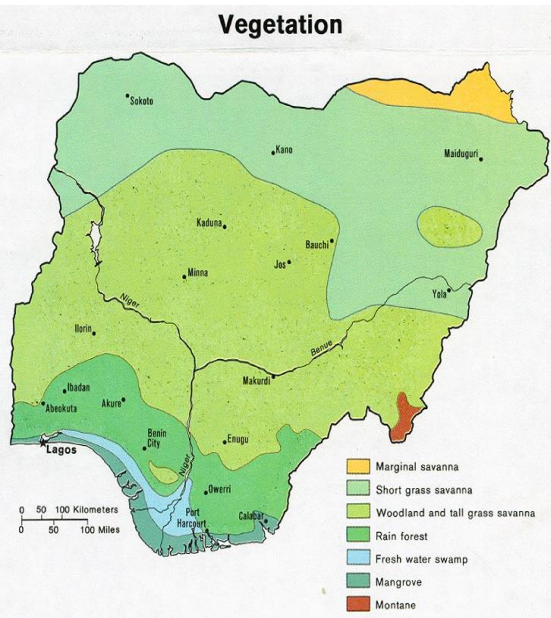
APPENDIX I

Pictorial and Statement Advanced Organizers Package on Conservation of Natural Resources.

Human effort at industrialization and technological development continues to affect the balance in ecosystem. In other words as human problems related to modernization and improvement of life are solved, environmental problems threatening human existence and well – being are on increase. This is due to the uncontrolled use of our natural resource. If all living things, including human must continue to survive and live happily on this earth, there is the need to continue the resources. It should be noted that conservation does not imply that natural resources should not be exploited at all. Rather it's a way of ensuring that a balance is maintained in spite of using the resources sensibly.



a



b

MAMMALS

Species	Location	Reasons for Decline
Ass, African Wild	Somalia, Sudan, Ethiopia	Habitat destruction, inter-breeding with domestic donkeys
Bat	Indiana East & Midwest	Habitat destruction
Cheetah	Africa to India	Habitat destruction, fur trade
Deer, Key	South Florida	Habitat destruction, road kills
Dugong, (sea cow)	Oceans	Hunting (food & leather)
Elephant, Asian	South central & SE Asia	Poisoning of food sources
Gazelle, Arabian	Arabian peninsula, Israel	Poaching
Okobons	China, India, SE Asia	Habitat destruction
Gorilla	Central & West Africa	Habitat destruction, collection of young, poaching
J Jaguarundi	Texas, Asia	Habitat destruction, fur trade
Leopard	Africa, India, SE Asia	Habitat destruction, fur trade
Leopard, snow	Central Asia	Over-hunting for its fur
Lion, Asiatic	India	Over-hunting for its fur, habitat destruction
Monkey, colobus	Africa	Killing for hide
Monkey, spider	Costa Rica, Panama	Habitat destruction
Mouse, salt marsh	California	Habitat destruction
Orangutan	Borneo Sumatra	Habitat Destruction, over-collection of young for zoos
Panda, Giant	China	Restricted habitat
Prairie dog	West US	Habitat destruction, poisoning
Rhino, Black	South Sahara in Africa	Poaching for horn
Rhino, white	Central and East Africa	Poaching for horn
Tiger	Temperate, tropical Asia	Habitat destruction, sport hunting
Whale blue	Oceans	Commercial hunting
Whale, fin back	Oceans	Commercial hunting
Wolf, red	South East US to Texas	Habitat destruction, hunting, trapping, poisoning



c

d

Sources: IUCN, Annual Report, (2010)

- a. People carrying wood to be used as a fuel. African eagle one of the endangered species
- c. Table of species that are declining in the world
- b. Map of Nigeria showing forest distribution

APPENDIX II

Pictorial and Statement Advanced Organizers Package on Conservation of Forest

Resources.

Forests are natural climax vegetation of many part of the world covering, until recent year's a third of the land surfaces. Since prehistoric times, humans have manipulated ecosystem in their search for food, shelter, and fuel, and other resources and by the impact of discarded waste material. As humans societies becomes increasingly civilized, and technically advanced, their impact on the earth ecosystem increased dramatically.

For example, deforestation work in Britain, which began in Neolithic times, expanded rapidly to the point where at the start of twentieth century only 3% of the land surface remained wooded.

Deforestation on a global scale is now an issue of global concern.

The destruction of forest is usually in response to the need for more land for growing crops and rearing live stocks and result in creation of completely, new managed ecosystem, it has been estimated that 12 million hectares of forest, an area size of England are disappearing annually and further 10 million hectares are being degraded by removal of good timber species, inappropriate mismanagement and inattention to conservation needs.



a.

b.



c.



d.

Sources: IUCN, Annual Report, (2010)

a. Yankudu forest

b. Deforested land in Oyeto Village

c. Deforested Savanna in areas

d. Trees caught for timber production

APPENDIX III

Pictorial and Statement Advanced Organizers Package on Soil Conservation.

Soil formation is a slow process. Annually, five million hectares of farmed land are coming out of crop production, worldwide because of erosion losses. Grassland that is overgrazed by livestock frequently loses the plant cover that hold the top soil. Plants are eaten to their root and die, with the result that water running freely across the land surface. Causes sheet erosion, carryout the topsoil, channeled rain water forms gullies which cut off into the land surface. About seven million hectares of grazing land are lost this way each year and much of this will become desert.

Desert may form naturally, for example when rain persistently fails in semi – and areas, but their creation can be accelerated by human’s activity in a process called desertification. This is a general term for degradation of dry land areas so that formerly productive land becomes useless. It usually results from overgrazing, over cultivation, deforestation poor irrigation practice.



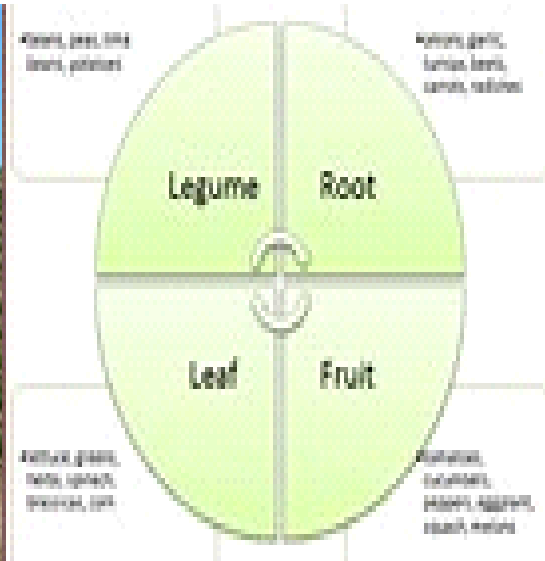
a.



b.



c.



d.

Sources: Biological Science 1 and 2 Textbook

- a. Soil erosion caused by water
- b. Degraded land use for mining
- c. Contour ploughing used to combat soil erosion
- d. Model describing crop rotation technique

APPENDIX IV

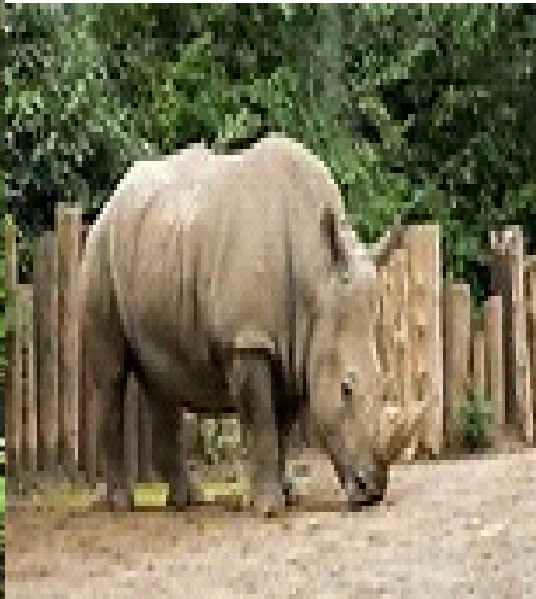
Pictorial and Statement Advanced Organizers Package on Wild Life Conservation.

A case study in specie conservation: African elephant is the main herds of non-domesticated elephants are found in Africa (*loxodontaafricanaafricana*) (bush elephant) and *L. Africana cyclotis* (forest elephant). They have no serious natural predators, yet their numbers are in decline, dropping from 1.2 million in 1981 to 223,000 in 2013. Humans are the main threat to the elephant survival. They compete with the elephant for land, for forestry, agricultural and settlement, destroying their habitant. They kill elephant which threatened crop or property and above all kill elephants for Ivory. It is not just the absolute decline in elephant numbers that is causing concern, but the changing population structure caused by illegal poaching is also a problem. Poachers select the animal with large tusk. Males which have a typical task weight of

9.3kg are eliminated. As a result by 1987, elephants were the main source of ivory in Africa. One tone of ivory represents 113 dead elephants. Survey in Amboseli National park in Kenya 2008 showed that just 22% of elephant population was male: data from Mikimu Reserve in Tanzania showed only 0.4% of the population was male. These data suggest that the long term prospect of elephant population seems very poor some researchers have predicted their extinction by the year 2010 unless effective consideration action is taken. This prediction is not only limited to elephant species but also to other animals including birds.



a.



b.



c.



d.



e.



f.



g.

h.

Sources: IUCN, Annual Report, (2010)

a. Mountain Gorilla in Kenya National Park

f. Docx seed banks, Australia

b. Hippopotamus in Kenya national Park

g. Docx seed banks, Australia

c. Hyena in wire cages

h. Birds preserves in cages

d. Tiger in wire cages

e. Seeds are preserved in vessels

Appendix V

Pictorial and statement advanced organizers package on wetland conservation

A wetland is a place where the land is covered by water, either salt, fresh or somewhere in between. Marshes and ponds, the edge of a lake or ocean, the delta at the mouth of a river, low-lying areas that frequently flood—all of these are wetlands. The destruction of wetlands is a concern because they are some of the most productive habitats on the planet. They often support high concentrations of animals—including mammals, birds, fish and invertebrates—and serve as nurseries for many of these species. Wetlands also support the cultivation of rice, a staple in the

diet of half the world's population. And they provide a range of ecosystem services that benefit humanity, including water filtration, storm protection, flood control and recreation.

Without wetlands, cities have to spend more money to treat water for their citizens, floods are more devastating to nearby communities, storm surges from hurricanes can penetrate farther inland, animals are displaced or die out, and food supplies are disrupted, along with livelihoods. WWF, governments and other organizations have pursued efforts to conserve and protect wetlands for more than 40 years through the Ramsar Convention, the only international treaty devoted to a single ecosystem type. More than 476,000 acres of wetland have been protected through this treaty, saving them and their services for future generation.



Baturiya wetland (Jigawa, Nigeria)



Baturiya wetland (Jigawa, Nigeria)

APPENDIX VI:

LESSON PLAN FOR EXPERIMENTAL GROUP (USING ENRICHED LECTURE METHOD WITH ADVANCED ORGANIZERS TO TEACH CONSERVATION CONCEPTS)

LESSON I

Phase 1: Presentation of advanced organizers on Conservation of Natural Resources

Date –

Subject – Biology

Topic – Conservation

Time 1hr 30min

Subtopic – Conservation of Natural Resources

Class – SS II

Average Ages – 18 years

Instructional Materials – Pictorial Advanced Organizers Package, Comprehensive Certificate
Biology Textbook.

Previous Knowledge – Students have been taught the Basic ecological concepts in SS 1 class.

Behavioral Objective(s) – At the end of the lesson, the students are expected to:

- Define the term Conservation
- Define Natural Resources
- Classify Natural Resources
- Explain the reasons for conserving Natural Resources

Introduction – The teacher will introduce the lesson by asking the students some question on basic ecological terms such as:

- What is Ecology?
- Define environment

Phase II: Making links of the conservation concepts to the organizer by presenting the learning task and logically ordering and linking learning materials to the organizer. This is done by asking students to list different examples of environmental problems that that human existence, it with conservation of resources.

Secondly, by asking the students to mention some examples Natural Resources and then relate it to where are they gotten from.

Presentation: Based on the student's responses the teacher presents the lesson in the following steps:

Step I: (a) Define Conservation as: the rationale use of earth resources to achieve the best sustainable quality of living for mankind.

(b) Mention example of these resources as forest....

Step II: (a) Classify the natural resources as: Renewable and Non-renewable.

(b) Give example of renewable resources as: water, forest, soil, air and wild life.

Give example of Non-renewable sources minerals, fossil, and fuel.

Step III: (a) Identify the reasons for conserving resources as:

- Ethnical reason: for cultural, traditional religious beliefs and political persuasions.
- Aesthetic reason

- Utilitarian reason
- Ecological or scientific reasons.

Phase III: Strengthening the cognitive organization by asking the learners to make summaries by relating the concepts learnt in the learning task to concepts in advance organizers. This is done by taking a statement and pictures from the advanced organizer example environmental problems threatening human existence and wellbeing are on increase, this is due to uncontrolled use of our natural resource and relating them to reasons for conservation of resources.

Evaluation: The teacher evaluates the lesson by asking the followings questions:

- What is Conservation?
- List two classes of Natural Resources and give two examples of each class.
- Mention two reasons for conserving resources.

Summary and Conclusion: The teacher along with the students will highlight main points of the lesson.

LESSON 2 (WEEK 2)

Phase 1: Presentation of advanced organizers on Forest Conservation

Date –

Subject – Biology

Topic – Conservation of Resources

Time 1hr 30min

Subtopic – Forest Conservation

Class – SS II

Sex – Male and Female

Ages – 18 years

Instructional Materials – Pictorial Advanced Organizers Package, Comprehensive Certificate

Biology Textbook

Previous Knowledge – The Students have been taught the concept of Conservation of Resources.

Objective (Behavioural) – At the end of the lesson, the students are expected to:

- Define Forest
- Classify Forest
- Identify Forest Resources and their uses
- Define Deforestation
- Explain the effects of deforestation
- Describe ways of conserving forest resources.

Introduction – Class, in the previous lesson, we discussed on conservation of National Resources. Have you ever heard of the word Forest?

Phase II: Making links of the conservation concepts to the organizer by presenting the learning task and logically ordering and linking learning materials to the organizer. This is done by asking the students to link the pictures on deforestation and the statement that says “destruction of forest is usually in response to the need for more land for growing crops and rearing of livestock’s and relate it with importance of forest resources and the effects of deforestation.

Presentation: Based on the pupil’s responses the teacher presents the lesson in the following steps:

Step I: (a) Define forest as an ecosystem consisting of trees, shrubs, herbs, plants and animals all of which live interdependently.

- Went further to classify forest trees based on size on trees, shrubs and herbs.
- Identify forest resources as timber production, paper and pulp production, conserve genetic biodiversity, game viewing, construction purposes, others dye and drugs, shelter, belts, pasture among others.

Step II: (a) Define Deforestation as: the process of clearing forest for a variety of purposes such as lumbering, fuel wood, farming, mining, industrialization and settlement without an immediate replacement of trees.

- Explain further the importance of forest in maintaining balance in Natural cycles such as water cycle, carbon cycle.

(b) Explain the effects of deforestation as:

- It leads to explosive of soil to wind and water erosion
- Destabilizes natural cycles
- Cause soil erosion and desertification
- Species loss among others

Step III: (a) Discusses ways of conserving the forest resources: example:

- Afforestation: planting of trees
- Public enlightenment on dangers of illegal felling of trees
- Laws and enactment by government among others.

Phase III: Strengthening the cognitive organisation by asking the learners to make summaries by relating the concepts learnt in the learning materials to concepts in the advance organizers. This is done by relating the statements which says 12 million of Hectares of forest are disappearing annually to the effects and importance of forest resources to human life.

Evaluation: The teacher will evaluate the lesson by asking the followings questions:

- Make a classification of forest based on size.
- Outline three importance of forest to man
- List five ways to conserve forest resources

Summary and Conclusion: The teacher evaluates the lesson by highlighting the major points from the lesson.

LESSON PLAN 3

Phase 1: Introduction of the advanced organizers on soil conservation

Date –

Subject – Biology

Topic – Conservation

Subtopic – Soil Conservation

Time 1hr 30min

Class – SS II

Average Ages – 18 years

Instructional Materials – Pictorial Advanced Organizers Package, Comprehensive Certificate

Biology Textbook

Behavioural Objective(s) – At the end of the lesson, the students are expected to:

- Define soil
- List types of soil and their characteristics
- Identify forms of soil degradation such as soil erosion, desertification
- Describe ways of conserving soil

Previous Knowledge – The Students have been taught of forest conservation.

Introduction: The teacher will introduce the lesson by asking the students some questions about the previous discussion on forest conservation.

Phase II: Making links of the conservation concepts to the organizer by presenting the learning task and logically ordering and linking the learning materials to the organizer. This

is done by asking the students to look at the pictures of degraded land areas in the advanced organizers and ask them to start why are they so?

Presentation: Based on the student's response the teacher will present the lesson in the following steps.

Step I: (a) Define soil as: soil is the weathered top layer of the earth's crust on which plants grow and from which they derive their nutrients. It is made up of mineral inorganic matter, organic matter, air, water and living organisms.

- List the type of soil as clay, loamy and sandy soils mentioning their characteristics.

Step II: (a) Identify various forms of land or soil degradation as:

- Desertification
- Soil erosion including their causes and effects

Step III: Describe various ways of conserving soil such as:

- Terracing: construction of series of flat areas called terraces across slope
- Ridge cultivation
- Planting of cover crops
- Afforestation
- Contour ploughing
- Strip cultivation
- Crop rotation

- Control grazing etc.

Phase III: Strengthening cognitive organization by asking the learners to make a summary by relating concepts presented in the learning materials and the pictures and statement in the advanced organizers example annually five million hectares of farm land are lost for crop production worldwide because of erosion and relate it with overgrazing, poor agricultural practices and the effects of land degradation.

Evaluation: The teacher will evaluate the lesson by asking the following questions:

- Define Soil
- List three types of soil you know
- Identify two forms of soil degradation you know
- Mention four ways to conserve soil resources.

Summary and Conclusion: The teacher concludes the lesson by revising all that he has taught.

LESSON PLAN FOUR (4)

Phase I: Presentation of advanced organizers on Animal Biodiversity Conservation

Date –

Subject – Biology

Topic – Conservation of Resources

Time 1hr 30min

Subtopic – Animal Biodiversity Conservation

Class – SS II

Average Ages – 18 years

Instructional Materials – Pictorial Advanced Organizers Package, Comprehensive Certificate

Biology Textbook

Objective (Behavioural) – At the end of the lesson, the students will be able to:

- Describe Wild Animals
- Explain the concepts of:
 - Extinction
 - Threatened species (endangered species)
 - Rare species
 - Vulnerable species

Previous Knowledge – The Students have been taught about Conservation of Soil Resources.

Introduction: The lesson will be introduced by asking the students give their meaning of wild animals.

Phase II: Making a link of the conservation concepts to the organizer by presenting the learning task and logically ordering and linking the learning materials to the advanced organizers.

Example: Human are the main threat to the elephants and other wild animal survival they complete with the elephant for land agriculture and forestry and relate it with to the concept of extinction and threatened species.

Presentation: Based on the student's response the teacher will presents the lesson in the following steps.

Step I: (a) Define wild animals as: Animals that have not been domesticated or made to live under human structures wild animals includes birds, large animal's reptiles and fishes which provide important Natural Resources.

Step II: Describe the concept of:

- Extinction: species which cannot be found on areas they recently inhabited e.g. Abdim's stork.
- Rare species: species with small population either restricted geographically with localize habitat.
- Vulnerable species: species under threat of or actually declining in member. Example Mountain Gorilla.
- Endangered species: species will low population numbers that are in considerable danger of becoming extinct e.g. African Elephant.

Phase III: Strengthening of cognitive organization by asking learners to make summaries by relating concepts to advanced organizers. Example survey in Ambroseli

National Park showed that just 22% of elephant populations are male, and the long term prospects of elephant population will be very poor and relate it with species extinction.

Evaluation: The teacher evaluates the lesson by asking the followings questions:

- What are Wild Animals?
- Describe the following concepts giving.

Example each:

- Threatened species
- Extinct species

Summary and Conclusion: The teachers conclude the lesson by revising what he has taught in the lesson.

LESSON PLAN FIVE (5)

Phase I: Presentation of advanced organizers on wildlife storage facilities

Date –

Subject – Biology

Class – SS II

Topic – Conservation of Natural Resources

Time 1hr 30min

Subtopic – World life storage facilities

Average Ages – 18 years

Instructional Materials – Pictorial Advanced Organizers Package, Comprehensive Certificate

Biology Textbook

Behavioural Objectives – At the end of the lesson, the students are expected to:

- Identify the forms of wild life storage facilities
- Give example of ex-situ conservation and in-situ conservation facility.
- Identify various agencies responsible for Conservation of Natural Resources

Previous Knowledge: The student have learnt about wild life conservation strategies

Introduction: The teacher will introduce the lesson by asking the students some questions such as: give example of extinct species you know, how can we preserve wild life?

Phase II: Making link of the conservation concepts to organizer by presenting the learning task and logically ordering and linking learning materials to the Organizers. Example the teacher will ask the students to look at the pictures of animals of conserve in the various facilities and relate it to either in-situ or ex-situ conserving facilities.

Presentation: Based on the student's responses the lesson will be presented as follows:

Step I: (a) Explain what storage facilities are?

- In-situ facility: where animals occur natural examples National Parks, Game reserves, Sanctuaries.
- Ex-situ facilities: example Zoos, Seed Banks, Field Gene Bank, Botanic Garden, Cryopreservation.

Step II: Explain various Agencies responsible for conservation of Natural Resources

- International Union of Conservation of Nature and Natural Resources (IUCN).
- World Wildlife Found (WWF)
- Nigerian Conservation Fund (NCF)
- Federal Environmental Protection Agency (FEPA)

Phase III: Strengthening the cognitive organizations by asking the learners to make summaries by relating pictures in the advance organizers and the concepts in the learning task. Example look at the pictures in the advanced organizers presented and relate it to the type of storage facility it belongs.

Evaluation: The teacher will evaluate the lesson by asking the followings questions:

- Give example of ex-situ storage facility

- Write four agencies responsible for conserving natural resources.

Summary and Conclusion: The teacher will conclude the lesson by making a summary of what he taught the students

LESSON PLAN SIX (6)

Phase I: Presentation of advanced organizers on wetland conservation

Date –

Subject – Biology

Class – SS II

Topic – Conservation of Natural Resources

Time 1hr 30min

Subtopic – Wetland conservation

Average Ages – 18 years

Instructional Materials – Pictorial Advanced Organizers Package, Comprehensive Certificate

Biology Textbook

Behavioural Objectives – At the end of the lesson, the students are expected to:

- Define wetland
- Identify the various types of wetland.
- States the functions of wetland
- Identify ways of conserving wetlands.

Previous Knowledge: The student have learnt about wild life conservation strategies

Introduction: The teacher will introduce the lesson by asking the students some questions such as: give example of extinct species you know, how can we preserve wild life?

Phase II: Making link of the conservation concepts to organizer by presenting the learning task and logically ordering and linking learning materials to the Organizers. Example

the teacher will ask the students to look at the pictures presented in the organizers and make some comments on them.

Presentation: Based on the student's responses the lesson will be presented as follows:

Step I: (a) Explain what wetlands are?

- Is the ecological communities that are inundated either year around or seasonally?
- They are areas where water covers the soil or is present either at or near the surface of the soil or is present either at or near the surface of the soil all year or for varying period of time during the year.

Step II: Explain the various types of wetland as:

- Swamps: is a wetland permanently saturated with water and dominated by woody plants
- Marshes: are wetlands dominated by soft stemmed plants.
- Bogs: are fresh water wetland often formed in old glacial lakes characterized by spongy peat deposit, evergreen trees, and shrubs.

Step III: Explain the importance of wetland as:

- Prevention of flood
- Fish feeds in water due to release of vegetative matter
- Habitat for migrating animals such as herons and amphibians
- Cleansing effects on water
- **Step IV:** Explain various ways of conserving wetlands

Phase III: Strengthening the cognitive organizations by asking the learners to make summaries by relating pictures in the advance organizers and the concepts in the learning task. Example look at the pictures in the advanced organizers presented and relate it to the type wetlands.

Evaluation: The teacher will evaluate the lesson by asking the followings questions:

- Give example of wetland
- Write three importances of wetlands.

Summary and Conclusion: The teacher will conclude the lesson by making a summary of what he taught the students.

APPENDIX VII:

LESSON PLAN FOR CONTROL GROUP (TEACHING CONSERVATION CONCEPTS USING CONVENTIONAL LECTURE METHOD ONLY)

LESSON I

Date –

Subject – Biology

Topic – Conservation

Time ---- 1hr 30min

Subtopic – Conservation of Natural Resources

Class – SS II

Average Ages – 18 years

Instructional Materials –Comprehensive Certificate Biology Textbook.

Previous Knowledge – Students have been taught the Basic ecological concepts in SS 1 class.

Behavioural Objective(s) – At the end of the lesson, the students are expected to:

- Define the term Conservation
- Define Natural Resources
- Classify Natural Resources
- Explain the reasons for conserving Natural Resources

Introduction – The teacher will introduce the lesson by asking the students some question on

basic ecological terms such as:

- What is Ecology?

- Define environment

Presentation: Based on the student's responses the teacher presents the lesson in the following steps:

Step I: (a) Define Conservation as: the rationale use of earth resources to achieve the best sustainable quality of living for mankind.

(b) Mention example of these resources as forest....

Step II: (a) Classify the natural resources as: Renewable and Non-renewable.

(b) Give example of renewable resources as: water, forest, soil, air and wild life.

Give example of Non-renewable sources minerals, fossil, and fuel.

Step III: (a) Identify the reasons for conserving resources as:

- Ethical reason: for cultural, traditional religious beliefs and political persuasions.
- Aesthetic reason
- Utilitarian reason
- Ecological or scientific reasons.

Evaluation: The teacher evaluates the lesson by asking the followings questions:

- What is Conservation?
- List two classes of Natural Resources and give two examples of each class.
- Mention two reasons for conserving resources.

Summary and Conclusion: The teacher along with the students will highlight main points of the lesson.

LESSON 2

Date –

Subject – Biology

Topic – Conservation of Resources

Time ---- 1hr 30min

Subtopic – Forest Conservation

Class – SS II

Sex – Male and Female

Ages – 18 years

Instructional Materials –Comprehensive Certificate Biology Textbook

Previous Knowledge – The Students have been taught the concept of Conservation of Resources.

Objective (Behavioural) – At the end of the lesson, the students are expected to:

- Define Forest
- Classify Forest
- Identify Forest Resources and their uses
- Define Deforestation
- Explain the effects of deforestation
- Describe ways of conserving forest resources.

Introduction – Class, in the previous lesson, we discussed on conservation of National Resources. Have you ever heard of the word Forest?

Presentation: Based on the pupil's responses the teacher presents the lesson in the following steps:

Step I: (a) Define forest as an ecosystem consisting of trees, shrubs, herbs, plants and animals all of which live interdependently.

- Went further to classify forest trees based on size on trees, shrubs and herbs.
- Identify forest resources as timber production, paper and pulp production, conserve genetic biodiversity, game viewing, construction purposes, others dye and drugs, shelter, belts, pasture among others.

Step II: (a) Define Deforestation as: the process of clearing forest for a variety of purposes such as lumbering, farming, mining, industrialization and settlement without an immediate replacement of trees.

- Explain further the importance of forest in maintaining balance in Natural cycles such as water cycle, carbon cycle.

(b) Explain the effects of deforestation as:

- It leads to explosive of soil to wind and water erosion
- Destabilizes natural cycles
- Cause soil erosion and desertification
- Species loss among others

Step III: (a) Discusses ways of conserving the forest resources: example:

- Afforestation: planting of trees
- Public enlightenment on dangers of illegal felling of trees

- Laws and enactment by government among others.

Evaluation: The teacher will evaluate the lesson by asking the followings questions:

- Make a classification of forest based on size.
- Outline three importance of forest to man
- List five ways to conserve forest resources

Summary and Conclusion: The teacher evaluates the lesson by highlighting the major points
from the lesson.

LESSON PLAN FOR WEEK 3

Date –

Subject – Biology

Topic – Conservation

Time ---- 1hr 30min

Subtopic – Soil Conservation

Class – SS II

Average Ages – 18 years

Instructional Materials –Comprehensive Certificate Biology Textbook

Behavioural Objective(s) – At the end of the lesson, the students are expected to:

- Define soil
- List types of soil and their characteristics
- Identify forms of soil degradation such as soil erosion, desertification
- Describe ways of conserving soil

Previous Knowledge – The Students have been taught of forest conservation.

Introduction: The teacher will introduce the lesson by asking the students some questions about the previous discussion on forest conservation.

Presentation: Based on the student's response the teacher will present the lesson in the following steps.

Step 1: (a) Define soil as: soil is the weathered top layer of the earth's crust on which plant grows and from which they derive their nutrients. It is made up of mineral inorganic matter, organic matter, air, water and living organisms.

- List the type of soil as clay, loamy and sandy soils mentioning their characteristics.

Step II: (a) Identify various forms of land or soil degradation as:

- Desertification
- Soil erosion including their causes and effects

Step III: Describe various ways of conserving soil such as:

- Terracing: construction of series of flat areas called terraces across slope
- Ridge cultivation
- Planting of cover crops
- Afforestation
- Contour ploughing
- Strip cultivation
- Crop rotation
- Control grazing etc.

Evaluation: The teacher will evaluate the lesson by asking the following questions:

- Define Soil
- List three types of soil you know
- Identify two forms of soil degradation you know

- Mention four ways to conserve soil resources.

Summary and Conclusion: The teacher concludes the lesson by revising all that he has taught

WEEK FOUR (4)

Date –

Subject – Biology

Topic – Conservation of Resources

Time ----- 1hr 30min

Subtopic – Animal Biodiversity Conservation

Class – SS II

Average Ages – 18 years

Instructional Materials –Comprehensive Certificate Biology Textbook

Objective (Behavioural) – At the end of the lesson, the students will be able to:

- Describe Wild Animals
- Explain the concepts of:
 - Extinction
 - Threatened species (endangered species)
 - Rare species
 - Vulnerable species

Previous Knowledge – The Students have been taught about Conservation of Soil Resources.

Introduction: The lesson will be introduced by asking the students give their meaning of wild animals.

Presentation: Based on the student's response the teacher will presents the lesson in the following steps.

Step I: (a) Define wild animals as: Animals that have not been domesticated or made to live under human structures wild animals includes birds, large animal's reptiles and fishes which provide important Natural Resources.

Step II: Describe the concept of:

- Extinction: species which cannot be found on areas they recently inhabited e.g. Abdim's stork.
- Rare species: species with small population either restricted geographically with localize habitat.
- Vulnerable species: species under threat of or actually declining in member. Example Mountain Gorilla.
- Endangered species: species with low population numbers that are in considerable danger of becoming extinct e.g. African Elephant.

Evaluation: The teacher evaluates the lesson by asking the followings questions:

- What are Wild Animals?
- Describe the following concepts giving.

Example each:

- Threatened species
- Extinct species

Summary and Conclusion: The teachers conclude the lesson by revising what he has taught in
the lesson

LESSON PLAN FIVE (5)

Date –

Subject – Biology

Class – SS II

Topic – Conservation of Natural Resources

Time 1hr 30min

Subtopic – World life storage facilities

Average Ages – 18 years

Instructional Materials –Comprehensive Certificate Biology Textbook

Behavioural Objectives – At the end of the lesson, the students are expected to:

- Identify the forms of wild life storage facilities
- Give example of ex-situ conservation and in-situ conservation facility.
- Identify various agencies responsible for Conservation of Natural Resources

Previous Knowledge: The student have learnt about wild life conservation strategies

Introduction: The teacher will introduce the lesson by asking the students some questions such as: give example of extinct species you know, how can we preserve wild life?

Presentation: Based on the student's responses the lesson will be presented as follows:

Step I: (a) Explain what storage facilities are?

- In-situ facility: where animals occur natural examples National Parks, Game reserves, Sanctuaries.

- Ex-situ facilities: example Zoos, Seed Banks, Field Gene Bank, Botanic Garden, Cryopreservation.

Step II: Explain various Agencies responsible for conservation of Natural Resources

- International Union of Conservation of Nature and Natural Resources (IUCN).
- World Wildlife Found (WWF)
- Nigerian Conservation Fund (NCF)
- Federal Environmental Protection Agency (FEPA)

Evaluation: The teacher will evaluate the lesson by asking the followings questions:

- Give example of ex-situ storage facility
- Write four agencies responsible for conserving natural resources.

Summary and Conclusion: The teacher will conclude the lesson by making a summary of what he taught the students.

LESSON PLAN SIX (6)

Date –

Subject – Biology

Class – SS II

Topic – Conservation of Natural Resources

Time 1hr 30min

Subtopic – Wetland conservation

Average Ages – 18 years

Instructional Materials – Pictorial Advanced Organizers Package, Comprehensive Certificate

Biology Textbook

Behavioural Objectives – At the end of the lesson, the students are expected to:

- Define wetland
- Identify the various types of wetland.
- States the functions of wetland
- Identify ways of conserving wetlands.

Previous Knowledge: The student have learnt about wild life conservation strategies

Introduction: The teacher will introduce the lesson by asking the students some questions such as: give example of extinct species you know, how can we preserve wild life?

Presentation: Based on the student's responses the lesson will be presented as follows:

Step I: (a) Explain what wetlands are?

- Is the ecological communities that are inundated either year around or seasonally?

- They are areas where water covers the soil or is present either at or near the surface of the soil or is present either at or near the surface of the soil all year or for varying period of time during the year.

Step II: Explain the various types of wetland as:

- Swamps: is a wetland permanently saturated with water and dominated by woody plants
- Marshes: are wetlands dominated by soft stemmed plants.
- Bogs: are fresh water wetland often formed in old glacial lakes characterized by spongy peat deposit, evergreen trees, and shrubs.

Step III: Explain the importance of wetland as:

- Prevention of flood
- Fish feeds in water due to release of vegetative matter
- Habitat for migrating animals such as herons and amphibians
- Cleansing effects on water

Step IV: Explain various ways of conserving wetlands

Evaluation: The teacher will evaluate the lesson by asking the followings questions:

- Give example of wetland
- Write three importance of wetlands.

Summary and Conclusion: The teacher will conclude the lesson by making a summary of what he taught the students.

APPENDIX VIII

CONSERVATION CONCEPTS PERFORMANCE TEST (CCPT)

SECTION A; (Biodata of Respondents)

Location of school; _____

Class; _____

Gender; _____

Age; _____

SECTION B; Test

Instruction; choose and shade on the answer sheet the appropriate option that best answers the questions below

Time allowed: 1 hour

1. Which of the following is true about sandy soil?
 - A. Has limited air space
 - B. Is light and easy to dig
 - C. Drains slowly
 - D. Is heavy and poorly aerated.
2. A species whose population has become small that it may become extinct if not protected is a/an:
 - A. Special species
 - B. Dangerous species
 - C. Endangered species
 - D. Important species.

3. Which of the followings is not function of wetland?
- A. Prevention of flood
 - B. Harbors migrating birds and amphibians
 - C. Cleaning of water
 - D. Overgrazing
4. All of these are ways of protecting wetlands except?
- A. Use of chemicals in fishing
 - B. Construction of embankment
 - C. landscaping
 - D. legislation against poaching in wetlands
5. The main reason for conservation of wild life is to
- A. create a national park for recreation
 - B. maintain ecological balance in a community
 - C. prevent hunters from being cruel to animals
 - D. save some species from extinction
6. The following effects are associated with deforestation except:
- A. Gully erosion
 - B. Extinction of plant species
 - C. Migration of wildlife
 - D. Increase in rainfall.

7. Which of the following practices does not improve crop yield in clay soil? Adding of
- A. More water and humus.
 - B. Lime and fertilizers
 - C. Weedicides and manure
 - D. continuous cropping and bush burning
8. Which of the following activities promotes forest conservations?
- A. Lumbering
 - B. Use of fire wood for cooking
 - C. Afforestation
 - D. Production of paper
9. The primary cause of species endangerment is
- A. Disappearing of habitat
 - B. Increase in temperature
 - C. Acid rain
 - D. Exposure to hazardous wastes.
10. Conservation is best describe as:
- A. Over exploitation of resources in the environment for man use
 - B. Continuous use of natural resources to maximize benefit.
 - C. Protection, preservation, restoration and wise management use of natural resources.
 - D. None of the above.

11. Which of the following is not importance of forest as a resource?
- A. Production of timber for conservation.
 - B. Help in ecological studies to prevent certain species from extinction.
 - C. Production of food and shelter.
 - D. Provision of hides for bag making.
12. Forest can be protected through the following ways except:
- A. Establishment of forest reserve.
 - B. Replacing felled matured tree by seedling in plantation
 - C. Prevention of forest fires.
 - D. Deforestation.
13. Which of the following statement is not true about wetlands?
- A. They are ecological communities.
 - B. They are covered by water all the year round
 - C. All are dominated by woody plants
 - D. It could be fresh water or salt water
14. Which of the following human activity will help to prevent endangered species from extinction?
- A. Uncontrolled killing of species
 - B. Regular clearing of forest vegetation.
 - C. Temporary maintenance of species in zoological gardens.
 - D. Regular irrigation of their natural habitat.

15. The following factors is responsible for the decline in abundance and variety of wildlife

except:

- A. Commercial hunting
- B. Industrialization and urbanization
- C. Bush burning
- D. Establishment of game reserves

16. One of the followings is not type of wetland?

- A. Swamp.
- B. Bogs.
- C. Savanna
- D. Marshes

17. The importance of practicing crop rotation is to:

- A. Control of erosion.
- B. Maintain the fertility of the soil.
- C. Increase the nutritional value of the crops
- D. Ensure growth of the cash crop.

18. Wild life conservation is enhanced by:

- A. enacting laws to encourage poaching
- B. discouraging elimination of endangered species
- C. Encouraging the creation of satellite hunting unit
- D. Suppressing the activities of wild life conservation agencies

19. All of the following are use in preserving species except?

- A. Seed banks
- B. Botanical gardens
- C. Game reserves.
- D. Social centers

20. Which of following practice reduces soil erosion?

- A. Overgrazing
- B. Deforestation.
- C. Shifting cultivation
- D. Mining activities.

21. I.U.C.N Stands for.....?

- A. Indigenous Union for Converting Nature
- B. International Union for Conservation of Nature
- C. International Unitary Conservation of Nigeria
- D. Internal Unit for Conserving Nature

22. Which of the followings is not a function of protected Areas?

- A. Conservation of Genetic Resources
- B. Education
- C. Recreation and Aesthetic Value
- D. Exposing Animals to danger

23. Conservation of resources can be done in two ways, these are:
- A. Internal and external conservation
 - B. In-situ and ex-situ conservation
 - C. Protected and exposed conservation
 - D. Unprotected and closed Conservation
24. Which of these is important forest management technique?
- A. Afforestation, Deforestation. And aqua system
 - B. Forest Regulation, Selective exploration and Tuangya system
 - C. Bush burning, Deforestation, and Selective Exploration
 - D. Tuangya system, Afforestation, and bush burning
25. Forest Regulations are promulgated through.....
- A. Laws, Legislations and enforcement
 - B. Edicts, Laws and Juries
 - C. Decrees, Edicts and Laws
 - D. Consensus, laws and bye-laws
26. All of the followings are regulations to conserve forest trees except:
- A. Prohibition of bush burning
 - B. Encouraging people to plant trees
 - C. Harvesting of under aged tree
 - D. Discouragement of illegal felling of trees

27. Which of the bird species was extinct in northern Nigeria?
- A. Kiwi
 - B. Abdi's stork
 - C. whitehead Robinson bird
 - D. peacock
28. One of the followings is not a plants conserving facility
- A. Botanical Garden
 - B. Seeds Bank
 - C. Zoological Garden
 - D. sanctuary
29. Good soil Conservation includes the followings Excepts:
- A. Ridging, Terracing and Bush Fallowing
 - B. Terracing, Afforestation and cover cropping
 - C. Deforestation, overgrazing and bush burning
 - D. Shifting cultivation, bush fallowing and planting tree
30. What makes loamy soil good for cultivation?
- A. because it has high water capacity
 - B. it has large air spaces
 - C. it combine the properties clay and sandy soil
 - D. it has capillary action

APPENDIX IX

Conservation Concept Performance Test (CCPT) Marking Scheme

1. B	6. D	11. D	16. C	21. B	26. C
2. B	7. D	12. D	17. B	22. D	27. B
3. D	8. C	13. C	18. A	23. B	28. C
4. A	9. A	14. C	19. D	24. B	29. C
5. D	10. C	15. D	20. C	25. C	30. C

APPENDIX X

Conservation Concept Performance Test Answer Sheet

SECTION A: BIODATA

Name of School _____

Class _____

Gender _____

SECTION B:

Please shade the correct answer appropriately

- | | |
|---------------------|---------------------|
| 1. =A= =B= =C= =D= | 16. =A= =B= =C= =D= |
| 2. =A= =B= =C= =D= | 17. =A= =B= =C= =D= |
| 3. =A= =B= =C= =D= | 18. =A= =B= =C= =D= |
| 4. =A= =B= =C= =D= | 19. =A= =B= =C= =D= |
| 5. =A= =B= =C= =D= | 20. =A= =B= =C= =D= |
| 6. =A= =B= =C= =D= | 21. =A= =B= =C= =D= |
| 7. =A= =B= =C= =D= | 22. =A= =B= =C= =D= |
| 8. =A= =B= =C= =D= | 23. =A= =B= =C= =D= |
| 9. =A= =B= =C= =D= | 24. =A= =B= =C= =D= |
| 10. =A= =B= =C= =D= | 25. =A= =B= =C= =D= |
| 11. =A= =B= =C= =D= | 26. =A= =B= =C= =D= |
| 12. =A= =B= =C= =D= | 27. =A= =B= =C= =D= |
| 13. =A= =B= =C= =D= | 28. =A= =B= =C= =D= |
| 14. =A= =B= =C= =D= | 29. =A= =B= =C= =D= |
| 15. =A= =B= =C= =D= | 30. =A= =B= =C= =D= |

APPENDIX XI
RELIABILITY OF (CCPT) INSTRUMENT FOR THE PILOT TEST

N	X	Y	X ²	Y ²	XY
1.	30	34	900	1156	102
2.	20	25	400	625	500
3.	25	30	625	900	750
4.	40	41	1600	1681	1640
5.	33	35	1089	1225	1155
6.	41	43	1681	1849	1763
7.	32	35	1024	1225	1120
8.	35	37	1225	1369	1295
9.	20	28	400	784	560
10.	10	17	100	289	170
11.	17	28	289	784	476
12.	22	30	484	900	660
13.	42	45	1764	2025	1890
14.	23	33	529	1089	759
15.	37	40	900	1024	1480
16.	23	25	1444	1600	575
17.	30	32	625	729	960
18.	38	40	961	1156	1520
19.	25	27	1521	1764	675
20.	31	34	324	441	1054
21.	39	42	484	576	1638
22.	18	21	961	1089	378
23.	22	24	729	900	528
24.	31	33	361	529	1023
25.	27	30	676	784	810
26.	19	23	361	529	437
27.	26	28	676	784	728
28.	30	34	900	1156	1020
29.	40	43	1600	1849	1720
30.	29	36	841	1296	1044

$$\sum X=831 \quad \sum Y=1001 \quad \sum X^2=24588 \quad \sum Y^2=31407 \quad \sum XY=31485$$

Where:

n = Total number of student for the pilot test (30)

X= test

Y= retest

$\sum X = 831$ (sum of test)

$\sum Y = 1001$ (sum of retest)

$\sum X^2 = 24588$ (sum of sq. of test)

$\sum Y^2 = 31407$ (sum of sq. of retest)

$\sum XY = 31485$ (sum of test and retest)

RELIABILITY

Case Processing Summary

		N	%
Cases	Valid	30	100.0
	Excluded	0	.0
	Total	30	100.0

a. Leastwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.899	2

CORRELATIONS

		Test	Re-test
Test	Pearson Correlation	1	.818**
	Sig. (2-tailed)		.000
	N	30	30
Re-test	Pearson Correlation	.818**	1
	Sig. (2-tailed)	.000	
	N	30	30

** . Correlation is significant at the 0.01level (2-tailed).

Appendix XII

Request Letter for the Validation of Research Instrument

Department of Science Education,
Ahmadu Bello University, Zaria,
October 10, 2015

Professor Isa Alhaji Usman,
Institute of Education, Ahmadu Bello University,
Zaria.

Dear Sir,

**Validating Research Instrument in Respect of
Auwal Abubakar Kassim P13EDSC8029**

The Above M.Ed science education student is researching on the Effects of Advanced Organizers on Retention and Performance in Conservation Concepts among Secondary Biology Students, in Jahun, Jigawa State, Nigreria. He has developed an instrument for data collection.

Kindly go through the instrument and validate it to enable him collect reliable data. Research questions, Objectives of the study and null hypotheses from his chapter 1 are attached here with for your reference.

Thank you.

Yours faithfully,

Dr. S.S Bichi
Student super

Department of Science Education,
Ahmadu Bello University, Zaria,
October 10, 2015

Dr. Umar Saje,
Department of English, Sule Lamido University,
Kafin Hausa.

Dear Sir,

**Validating Research Instrument in Respect of
Auwal Abubakar Kassim P13EDSC8029**

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Thank you.

Yours faithfully,

Dr. S.S Bichi
Student supervisor

Department of Science Education,
Ahmadu Bello University, Zaria,
October 10, 2015

Dr. Binta Abdulkareem,

Department of Science Education, Ahmadu Bello University,
Zaria.

Dear Madam,

**Validating Research Instrument in Respect of
Auwal Abubakar Kassim P13EDSC8029**

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Thank you.

Yours faithfully,

Dr. S.S Bichi
Student' supervisor

**Appendix XIII
Standard Deviation and t-Test Means Scores for the Pretest
of Experimental and Control Groups**

Standard Deviation and t-Test Means for the Pretest Scores of Experimental and Control Groups

Pretest	N	Mean	Std Deviation	Mean difference
Experimental	73	7.13	3.12	
Control	64	7.42	3.03	0.29

T-test means Scores for the Pretest of Experimental and Control Groups

PRETEST	N	Mean	Std. Deviation	Df	t-Value	p-value	Decision
Experimental	73	7.13	3.12	135	-0.53	0.59	Not significant
Control	64	7.42	3.03				