EFFECTS OF COLLABORATIVE CONSTRUCTIVISM ON ACADEMIC PERFORMANCE IN BIOLOGYAMONG STUDENTS OF DIFFERENT COGNITIVE STYLES IN COLLEGES OF EDUCATION, NORTH-EAST, NIGERIA.

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A THESIS SUBMITTED TO THE SCHOOL OF POSTGRADUATE STUDIES IN PARTIAL FULFILLMENT FOR THE AWARD OF MASTERS DEGREE IN SCIENCE EDUCATION.

DEPARTMENT OF SCIENCE EDUCATION. FACULTY OF EDUCATION
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AUGUST 2014

DECLARATION

I hereby declare that this thesis titled' ***Effects of Collaborative Constructivism on Academic Achievement of Biology Students of Different Cognitive Styles in Colleges of Education***" has been performed by me in the Department of Science Education ABU Zaria. The information derived from the literature has been fully acknowledged in the text and a list of references provided. No part of this thesis was previously presented for another degree or diploma at any University.

_____ _____

Muhammad ADAMA **Date**

DEDICATION

This work is dedicated to my father, HonourableAdama and his friend, the great teacher Sheik Adam, both of blessed memory. May Allah grant them Al-JannahFirdauisi (Ameen).

CERTIFICATION

This thesis entitled "***Effects of Collaborative Constructivism on Academic Achievement of Biology Students of Different Cognitive Styles in Colleges of Education North Eastern Nigeria***" By Muhammad ADAMA meets the regulations governing the award of degree of Master in Science Education of Ahmadu Bello University, Zaria and is approved for its contribution to knowledge and literary presentation.

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OPERATIONAL DEFINITION OF TERMS

Collaborative Constructivism: An approach to science teaching where by students and teachers not only actively collaborated in learning but construct knowledge together. It emphasizes social negation in knowledge construction devoid of competition. Teachers serve as guide and facilitators while students construct meaning (knowledge) from their experience as they are involved in active learning through sharing ideas.

Academic Achievement: A measure of level of accomplishment as knowledge gained by learners. It refers to the level one does something successfully with an effort and skill.

Cognitive Styles: A psychological construct that describes how individuals acquires knowledge. It refer to mental behavior which individuals apply habitually when they are solving problems. Cognitive styles is the mode by which individuals perceive information, synthesize and present that results in learning such as field dependent and field independent.

Field Dependent: This refers to individuals that perceive the world globally and find it difficult to solve problems.

Field Independent: This refers to individuals that view the world analytically rather than globally and find it easier to solve problems.

Collaborative learning: Is a situation in which two or more people learn or attempt to learn something together by sharing knowledge and the skills from each other

ABBREVIATIONS

ANOVA	-	Analysis of Variance
BAT	-	Biology Achievement Test
ECPM	-	Environment Consult Project Management
FD	-	Field Dependence
FI	-	Field Independence
FME	-	Federal Ministry of Education
FRN	-	Federal Republic of Nigeria
NCE	-	Nigeria Certificate in Education
NECO	-	National Examination Council
NPE	-	National Policy on Education
WAEC	-	West African Examination Council
SSCE	-	Senior Secondary School Certificate Examination

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ABSTRACT

This study investigates the impact of collaborative constructivism on academic achievement of biology students of different cognitive styles in colleges of education comparatively. The population of study consisted of five thousand two hundred and three (5,203) students drawn from ten Colleges of Education in the North-East Geo-political Zone of Nigeria. subjects were randomly assigned to experimental and control groups using table of random numbers. Cognitive styles inventory by Paragon (2011) was used to classify subjects to field dependent and field independent cognitive styles. The experimental group was treated with six weeks of teaching using collaborative constructivism approach. The control group were exposed to six weeks of teaching the same topic using lecture method. A pretest was conducted for the two groups. After treatment, a posttest was administered to both groups using Biology Achievement Test (BAT) Research questions included; what is the effect of collaborative constructivism on the academic performances of field dependent and field independent biology students taught desertification using constructivism and lecture methods. Research hypotheses include; there is no significant difference in the academic achievement of field dependent and field independent biology students taught using different methods. A One- way Analysis of Variance at P. value of 0.05 revealed that the field independent members of the experimental group performed excellently. The field dependent members also performed better than the control group. Recommendations include (i) organization of workshop and conferences where teachers could be exposed to collaborative constructivism approach for science teaching (ii) Also emphasis on the use of collaborative constructivism by teachers to take care of individual differences is advocated, among others.

CHAPTER ONE

THE PROBLEM

1.1 Introduction

Science has been defined by various authors Pindar and Sale (2002) define science as Product theories, laws, principles concepts. Process of science-involving observation, classification measurement, inference, prediction, experimentation, hypothesizing as well as attitude humility, honesty and curiosity. Science consists of Chemistry, Physics, and Biology. Biology as a Science subject according to Anene (1999) is a life science that deals with plants and animals, their structure, function, growth, and their relationships with environment. It is a subject that permeates all other sciences and explains the fundamentals of every living organism.

The knowledge of biology enables students to understand the structure and function of the different parts of the body, the environment in which they live in and how best to conduct themselves therein (Ramalingam, 1999). Osisioma (2005) observes that biology education establishes the fundamental relationship between man and his environment and best working relation. For instance, biology can best solve the problems associated with population growth resource depletion, pollution, food shortages, desertification, and all forms of technological impact on the environment. Biology is very important at all levels of education. The role of biology has been identified as enshrined in the National Policy of Education (FME, 2004} for all levels of education.

According to Esiobu and Soyibo, (1995), and Umeh, (2002) teaching/learning of biology must be relevant to the child's environment such as problem of biodiversity conservation and desertification among others. It is dynamic with new elements like desertification, biodiversity conservation, pollution, erosion global warming. Desertification encroaches at an alarming rate at the frontiers of Northern Nigeria particularly at the North Eastern zone where this research

is carried out (Gbamanja, 1999). Environmental sustainability is threatened for both the flora and fauna within this area. Despite this, teachers do not seem to bother by way of effectively impacting environmental education relating to desertification and biodiversity conservation (Gbamaja 1999).

According to Gbamaja (1999) Nigeria environmental problems include soil degradation, water pollution, soil waste disposal and desertification. According to Anene (2009) the population of students, offering biology in most cases are disproportionate to the number of teachers handling them. Many researchers including Balogun (1982) in Soyibo and Ezeiroma (1987) have shown that student's academic achievement to a large extent is affected by the quality, inadequacy and dedication of teachers and the negative attitude of students towards biology.

Ndu (1999) opines that the science laboratories are inadequately equipped and the facilities for teaching and learning are inadequate, even though the present condition of large classes can hardly be implicated for adverse effect on students academic performance (Alonge, 1995, Haddad 1990), yet they are difficult to manage and limit students practical activities because the materials cannot go round. Based on this, teachers resort to the use of lecture method leading to poor performance as observed by (Jegede & Okebukola 1991, Obe 1998, Kibikiwa, 1998). Teachers have used conventional methods to teach ecological concepts like biodiversity conservation and densification over the years. However, a lot of other methods like inquiry, discovery, demonstration, collaborative learning, field trip strategy, concept mapping etc abound with teachers taking no advantage of them. Lecture method cannot bridge the lacuna existing between the abstract concept of biodiversity conservation and desertification discussed in the classroom and the reality of life in the deserts. Collaborative constructivism on the other hand has the potential of providing the necessary experience and

interaction with the environment in an outdoor laboratory to enhance effective and meaningful learning (Ausubel, 1967).

According to (Haruna, 1992, Okebukola 1997) and Environmental Consultancy and Projects Management (ECPM 2006), in spite of the numerous teaching strategies propounded to cope with the in various curriculum structure for schools, most teachers still adopt the traditional chalk and talk approach. According to Dallatu (2008), lecture method does not give students opportunity to participate in lesson process by learning of science Nwagbo (2005) opines that effectiveness in biology teaching is necessary in order to cope with the large number of students offering the course at the various level of education.

Okeke (2005) stated that effective biology teaching equips the learners with potential and capabilities for self actualization and ability to transfer skills acquired from the schools not only to industries but also to all spheres of life. In view of the above, it is clear that concepts like ecology cannot be taught using lecture method alone rather it requires more effective and pragmatic approaches that are activity based to enhance effective performance by students especially in biodiversity conservation and desertification studies.

Various educationists have different views of cognitive styles of individuals. Mike (2006) identified individual learning styles to include the following:

i. Activist

ii. Reflectors

iii. Theorists and

iv. Pragmatists.

In view of the uniqueness of learners, Finder and Sale (2006) stated that lesson should be organized to ensure that all receive appropriate balance of challenge and support discipline problems can arise when pupils feel insufficiently challenged and also when they

feel insufficiently supported. There are different dimensions of cognitive styles. Cognitive styles are psychological constructs which describe individuals mode of information perception, organization and presentation (Murkherjee 1978). The cognitive variables considered in this study are the field dependent (FD) and field independent (FT).

Study by Witkin Moore and Cox (1977) revealed that field dependent learners perceive the world globally, found it difficult to solve problems, tended to favour spectator approach to learning and adopt the organization of information to be learnt. Conversely field independent learners view the world more analytically, found it easier to solve problems and are more likely to favour inquiry approach and independent study. They also tend to provide their own structure to facilitate learning. The need to understand the cognitive styles of learners cannot be over emphasized. If cognitive styles of learners are taken into consideration in the delivery of lesson. meaningful learning could be enhanced. Most researches done in biological science do not take cognizance of cognitive styles of students. (Ogunleye, 2010)

Some results of studies related to cognitive styles showed that field independent learners are generally superior to their field dependent counterparts in academic performance e.g. (Sale, 1983 and Okwo and Obubah 2010). Considering the need for various strategies needed to effectively teach biology to individuals of different cognitive styles, this study therefore intends to study the effects of collaborative constructivism on the performance of students with different cognitive styles with a view to ameliorating the short comings of the field dependent learners. This is as a result of paucity of studies on the use of collaborative constructivism strategy on students performance and cognitive styles particularly in teaching biodiversity conservation and desertification.

1.1.1 Theoretical Framework

According to Johnson (2011) collaborative constructivism is a teaching strategy that enables students to interact freely with teaching materials while collaborating with each other to create meaning (knowledge). This research is laid on the foundation of cognitive constructivism. This approach to teaching and learning emerged from the work of psychologists and educators such as Piaget (1967), Okebukola (1991) and Okafor (1996).

According to Johnson (2010) characteristics of constructivism approach include:

Constructivism provides learning environment such as real world setting or case based learning instead of pre-determined sequence of instruction. There are different types of constructivism teaching strategies. Some of them include social constructivism (deals with language development) and psychological constructivism. Collaborative constructivism forms part of psychological constructivism that deals with the way and manner by which students perceive information, processes it to create meaning. There are different dimensions of cognitive styles. These include, reflective/impulsive, scanning/focusing, verbal/imaginary, global/articulated.Levelers/sharpners, (sara, 2010).

Umar (2011) outlined the following: visual/haptic, visualizers /verbalizers, serialist/holist. However, according to Simon (2010), the field dependent/independent by Witkin (1977) is the most popular, of the studies done in cognitive styles.

- Support collaborate knowledge construction through social negotiation not competition among learners for recognition.
- Constructivism enables context and content dependent knowledge construction. It is learner centered. It encourages thoughtful reflection. Constructivism emphasizes construction instead of knowledge reproduction

- Constructivism allows multiple representation of reality. Constructivism avoid over simplicity of the real world.

In this study collaborative constructivism teaching strategy was used to investigate its impact on Nigeria Certificate in Education (NCE) biology student's academic achievement and cognitive styles, with a view to improve students' performance in relation to their cognitive Reference.

1.2 Statement of the Problem

Several studies such as that of Akpan (1993), Okoye and Sam, (2010) have been carried out in order to improve the teaching and learning of biology. Despite this, the inadequacy of laboratories facilitates, - teaching materials, inadequately trained teachers and poor teaching methods have impacted on the educational enterprises resulting in persistent failure in biology at various examinations such as Senior Secondary Certificate Examination (SSCE).It was particularly noted by Ivowi and Soyibo (1984. The Chief examiner of WAEC reported in 2009 that performances of biology students were poor and recommended that activity based method of instruction be used for teaching biology. In addition, the WASC biology examination results are poor and appear to be on the decline WACE Chief report (2009, 2010 & 2011) and have called for attention to this issue of poor performance to be addressing using actively child Centred method of instruction such as collaborative constructivism teaching method advocated by (Nwachukwu& Nwosu, 2010). Therefore, this study intends to investigate the effect of collaborative constructivism on the academic achievement of NCE Biology students with different cognitive styles. This is with a view to enhancing meaningful learning and teaching of biology to enhance and improve their performance.

1.3 Objectives of the Study

The study has the following objectives.

1. determine the effect of collaborative constructivism on Academic performance of biology students in and bio-diversity conservation
2. determine the effect of collaborative constructivism and lecture method on the academic performance of biology students of cognitive styles.
3 to determine the effect of collaborative constructivism on desertification and sensitivity on which are in the correct encroachment are gender in the experimental group.

1.4 Research Questions

The following research questions are formulated for answering.

1. What is the effect are of collaborative constructivism on the academic performance of biology students in and biodiversity conservation?
2. What is the effect of collaborative constructivism and lecture method on biology students academic performance in desert and biodiversity conservation?
3 What is the effect of collaborative constructivism on academic archievement in desert encroachment and gender of the experimental groups.

1.5 Hypotheses

The following hypotheses are formulated for testing at $P \leq 0.05$.

Ho_1: There is no significant difference in the academic performance of biology students in desert encroachment and biodiversity conservation taught with different methods.

Ho_2: There is no significant difference in the academic performance of biology students of different cognitive styles taught with different methods in desert encroachment and biodiversity conservation

$H0_3$: There is no significant difference between the male and female students` academic performance in desert encroachment and biodiversity conservation.

1.6 Significance of the Study

The findings of this study will hopefully be significant to the following. Teachers in secondary schools are expected to benefit from the findings of this research by highlighting needs for collaborative constructivism strategy in teaching students of different cognitive styles of learning.

Students of secondary schools are hopefully expected to benefit from this research as their different cognitive styles shall be incorporated to the teaching strategy to enhance meaningful learning. This will also influence their feeling towards desertification and biodiversity conservation positively to protect our environment.

Curriculum designers shall benefit from the findings as they would highlight the importance of constructivism strategy and students cognitive styles and adjust the current status quo where appropriate. Textbook publishers will include the method of constructivism with reference to students cognitive styles in their publication.

Research fellows will hopefully benefit from the findings of the study by providing empirical evidence of teaching and learning of biology using constructivism with consideration for student's cognitive styles. Students teachers are expected to acquire and demonstrate the intellectual competence and professional skills of teaching biology emphasizing co-operation instead of competition.

1.7 Scope of the Study

This research is delimited to NCE biology students in Colleges of Education within the North Eastern zone of Nigeria. The area comprises of Yobe, Borno, Gombe, Bauchi,

Adamawa and Taraba states of Nigeria. However, due to of constraints, such as time factor and geographical location North-East zone college of education use as samples for the study were drawn from colleges of education in Yobe state.

NCE11 biology students in the colleges of education are considered for this research. This is because they are familiar with the school environment as well as the environmental effects of desertification within the study area. Desertification and biodiversity conservation also forms the bed rock of the ecological studies as outlined in National Commission for Colleges of Education (NCCE) minimum standard syllabus for biology.

The North eastern zone of Nigeria is considered for the purpose of this research because the manifestation and menace of desertification which threaten biodiversity conservation is more paramount here than in any other zone of Nigeria. The zone borders the Sahara desert with its characteristic aridity, extremes of temperature and shrinking vegetation. The zone is most exposed to desertification (NEAZDP, 2005). The topics selected that were taught to the sampled groups are:

Bio- diversity in desert ecosystem

Differences between Plants and Animals

Erosion

Pollution

Types of rocks

Desert features

These topics were selected based on the objectives of this study and they are difficult topics

for the NCE II Students (Okeke 2010)

Cognitive styles of learners have to be considered if meaningful learning is to be achieved. This is because individuals are unique and the way they perceive information, organize and synthesize it differs.

And all embracing teaching strategy such as collaborative constructivism will allow students of different cognitive styles to interact with the environment personally while learning and construct their own meaning (knowledge) through collaboration with other learners. The teacher facilitates and shape the personal knowledge of students in line with the knowledge of the public domain in existence.

1.8 Basic Assumptions of the Study

The study has the following assumptions.

1. The students are taught by qualified biology teachers.
2. The students are taught using National Commission for Colleges of Education (NCCE) minimum standard guideline for Collages of Education in Nigeria.
3. The study sample has been taught biology concept using activity-based method of instruction.
4. The students are familiar with the effects of desertification on the environment.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

In this chapter, literature related to this study will be reviewed under the following sub headings;

- Teaching Ecological Concepts at Senior Secondary Schools Level;
- Science Teaching Methods;
- Collaborative Constructivism Approach to Science Teaching
- Related studies on Constructivism Approach in Science Teaching
- Lecture Method
- Lecture Method and Academic Performance in Science Teaching
- Academic Achievement in Science
- Cognitive Styles of Learners and Academic Performance
- Over view of similar Studies on Cognitive styles and academic performance in science
- Implication of Literature Reviewed on the Present Study

2.2 Teaching Ecological Concepts at the Junior Secondary School Level

Lecture method is most commonly used in teaching ecology concept. This is a result of the advantages inherent in its use such as teaching large class and less requirements for teaching aid. However, the most recommended method include various types of inquiry or discovery method. This is because of the activity based nature of the methods suitable to be used at various level of Education (Fafunwa 2009, Okafor 2010 & Okebukola (2011).

By 1981 when the National Policy on Education was revised and with the demands of 6-3-3-4 system, it became necessary to develop new curriculum in every subject area for both junior and senior secondary school levels of education. In science, new curricula were developed in physics, chemistry and biology as volume 3 of the National Curriculum for Senior Secondary Schools. The

entire science curriculum for Senior Secondary Schools originated from the critique of the draft copy of the Nigerian Secondary School Science Project (NSSP) submitted by the Comparative Education Study and Adaption Centre (CESAC, 1968) to the Joint Consultative Committee on Education (JCCE)

Some of the characteristics features of the new senior secondary schools science curriculum are as follows;

i. The spiral or concentric approach to the teaching of concept.

ii. The use of guided discovery method in teaching, a way of ensuring that learning as an activity take place during exploration, experimentation and discussion,

iii. The arrangement of the contents in a logical, developmental and sequential order,

iv. The identification of an array of performance objectives for each tropic of the curriculum.

v. The arrangement of the teaching syllabus into five sections viz;

a. Topics

b. Performance objectives

c. Content

d. Activity

e. Notes. (Okebukola 2011)

Biology curriculum for senior secondary should be the objective of biology curriculum to prepare pupils to acquire the following;

1. Adequate and field skills in Biology

2. Meaningful and relevant knowledge in Biology

3. Ability to apply scientific knowledge to everyday life in matters of personal and community health and agriculture,

4. Reasonable and functional scientific attitudes.

According to Ogunleye (1999) The Biology curriculum recommended guided discovery approach in the teaching of the topics. This approach involves the use of various activities such as demonstration, individual practical work, group discussions fieldwork, project work and building models. According to Odunusi (1993) the content of biology curriculum consist of thirty major topics focused mainly on seven concepts in Biology viz

a. Concept of living

b. Basic ecological concepts

c. Plants and animal nutrition

d. Conservation of energy/matter

e. Variation and variability

f. Evolution

g. Genetics

The ecological concepts include;

i. Environment, lithosphere, hydrosphere, atmosphere, habitats, niche, population, biotic community, ecosystem.

ii. Ecological factors - physical, edaphic.

iii. Local biomes and major biomes of the world.

iv. The functioning ecosystem.

In year 2 the following are studied

i. Habitats - Specific and terrestrial

ii. Ecological succession

iii. Distribution of plants and animals in their respective habitat (marine, estuaries, fresh water, marches, land).

iv. Food shortages and over crowding

In year 3, Regulation of internal environment is studied

2.3 Science Teaching Methods

There are several methods of teaching science. According to Ahmed (2001), teaching is the process through which knowledge, skills, and values are consciously or unconsciously acquired as a result of interaction between the teacher and his pupils. Teaching being one of the oldest, respected, and noble profession plays an important role in any given educational system. The National Policy on Education (FME, 2004) identified the importance of this when it states that "no educational system can rise above the level of its teachers.

According to Atadoga & Onaolapo (2008) science teaching is very complex involving many activities and concepts. In the classroom therefore, there is no one best method of teaching science. Teaching methods and techniques have to be varied and mixed with life situations. In selecting methodology for science lesson, the teacher has to consider the following: age of pupils and their cognitive styles, the topic to be taught, teachers ability to effectively use the method, the timing of lesson and its duration, the class size is also important. The available resources at the teachers disposal should be considered in the choice of teaching method.

On the whole, it is pertinent to say that the classroom environment and the teaching process is dynamic. A variety of methods and techniques are usually involved. However there are several methods that teachers of science employ in the classroom to present facts, information, principles concepts, skills, laws among others to students which can be identified as being different from each other. The frequency of change of method therefore depends on the concepts, skills, laws, facts and information to be taught. And also important is the cognitive styles of the learners in selection of materials and teaching method. Some methods are more specific for some situation while some are more frequently used (Atadoga & onaolapo, 2008).

According to Dike (2008) teaching methods in Nigerian schools include; field trip, inquiry method, class discussion, use of case studies, debates, pictorial presentations, audio visual documentation, use of resource persons/experts role playing. Atadoga and Onaolopo (2008) identified the follow as science teaching methods; lecture or chalk and talk method, demonstration method, discovery or inquiry method, discussion method, project method, laboratory investigative method, individualized learning method and field trips.

2.4 Collaborative Constructivism Approach of Science Teaching

The ecological concepts embedded in the secondary school curriculum such mass habitats, biomes, ecosystem, lithosphere among others would be extremely difficult to teach without consideration for the teaching methods and the cognitive styles of learners (Nwagbo, 2008). In view of the case, the researcher investigates the effect of constructivism approach of science teaching on NCE biology students of different cognitive styles in desertification and biodiversity conservation in colleges of education, north eastern Nigeria.

The teaching of concepts would be extremely difficult without consideration of the teaching methods and the cognitive styles of the learners. In other words, the teaching of this concepts must be activity - based especially guided inquiring as recommended by the curriculum. Constructivism provides the learner opportunity to construct meaning out of their interaction with the environment under the guidance of the teacher.

The teacher must also involve various teaching strategies to take care of the different cognitive styles of his students.

2.4.1 Characteristics of Constructivism Approach

Sandetur (2011) identified changing from a focus on teaching to a focus on learning. In constructivism approach shifting the emphases from teaching to learning creates a more inter-action and it involves a change in the roles of both teachers and students. The role of teacher changes from knowledge transmitter to that of learning facilitator, knowledge guide, knowledge navigator and co-learner with the students. The new roles do not diminish the importance of the teacher but requisite knowledge and skills (Farrel, 2004). Students will have greater responsibility for their learning in this environment as they seek out, find synthesize and share their knowledge with others.

Table 2.1: Changes in Student and Teacher in Learner-Centered Learning Environment Changes in Teachers Role

A shift from	A shift to
Knowledge transmitted, primary source of information, content expect and source of all answers	Learning facilitator, collaborator, knowledge navigator and co-learner.
Teacher controls and directs all aspect of learning.	Teacher gives students more options and responsibilities for their own learning

Source: Farrel,(2004)

Table 2.2: Changes in Student`s Role

A shift from:	A shift to:
Passive recipient of information reproducing knowledge	Active participation in the learning process producing and sharing knowledge
Learning as solitary activity	Learning collaboratively with Others.

Source: Farrel, (2004)

Constructivism approach has two strands the cognitive construction and social construction. Cognitive constructivism is based on the work of (Piaget, 2005). His theory has two major parts "ages and stages" components that predicts what children can and cannot understand at different ages and a theory of development that describes how children develop cognitive abilities. Piaget theory of cognitive development proposes that humans cannot be "given" information, which they immediately understand and use.

Instead, humans must "construct" their, own knowledge. They build their knowledge through experience. Experience enables them to create schemas-mental models in their head. These schemas are changed, enlarged and made more sophisticated through complimentary processes assimilation and accommodation. The main ideas of underpinning constructivism learning theory are not new. They began with the insight of Socrates who claim that there; are basic conditions for learning that are the cognitive of the individuals (Anderson, 2010). If learning is a constructive process, and instruction be designed for such construction, then what can professional development practices bring teachers to teach in students centered ways?

Teachers must first recognize that construction in learning is not just the domain of children but of learners, all earners. Constructivists professional development give teachers time to make explicit their understanding of learning. Professional training must be streamlined in line with

constructivist approach. Training that affects students centered teaching cannot come in one day workshop. Systematic, long term development that allows practice is required (Wasagu, 2010).

Constructivism represents one of the big ideas in education its implication for how teachers teach and learn to teach are enormous. If our efforts in reforming education for all students are to succeed, then we must focus on student. To date a focus on student centered learning may well be the most important contribution of constructivism. In line with this, several studies are carried out on constructivism approach.

2.5.0 Related Studies on Constructivism Approach and Academic Achievement

Constructivism is the label given to set of theories about learning which falls somewhere between cognitive and humanistic views. If behaviorists treat the organism as black box, cognitive theorist recognizes the importance of the mind in making sense of the material with which it is presented. Never the less, it still presupposes that the role of the learner is primarily to assimilate whatever the teacher presents. Constructivism particularly in its social form suggests that the learner is much more actively involved in a joint enterprises with the teacher of creating (constructing) new meaning, We can distinguish cognitive constructivism which is about how the individual leaner understands things in terms of developmental stages and learning styles (cognitive styles). Social constructivism which emphasizes how meaning and understanding grow out of social encounters. According to Vygotsky conversational theory of learning fits into constructivist framework. The emphasis is on the learner as active "maker of meanings" the role of the teacher is to enter into dialogue with the learner trying to understand the meaning that learner of the material to be learned, and to help her/him to refine their understanding until it corresponds with, that of the teacher.

- One form of constructivism may be traced to the writings of John Dewy, who emphasized

the place of experience in education.

- Another starts from the work of Jean Piaget who demonstrated empirically that children's mind were not empty but actively processed the material with which they are presented with and postulated the mechanism of accommodation and assimilation as key to this processing.
- Just like Piaget, Bruner, also emphasized that learners construct new ideas or concepts based upon their prior knowledge and experience. Piaget posited that the existing cognitive structures of the learner determine how new information is perceived and processed. As the child assimilates new information into his mental structures, ideas gain complexity and power and his understanding of the world grows in richness and depth Piaget (2001).

There are several studies done on constructivism in Nigeria some of these works include problems solving, discovery/inquiry; Some worked on the impact of cognitive styles on performances while others worked on the relationship between cognitive styles and academic achievement. However, no work has been done on the impact of collaborative constructivism

approach of science teaching on biology students different cognitive styles and their academic performance. Therefore, the researcher wishes to investigate the impact of constructivism on performances of biology students of different cognitive styles in desertification and biodiversity conservation in colleges of education, north eastern Nigeria.

2.5.1 Overview of Similar Studies on Lecture Method and Academic Achievement

According to Dienye and Gbamanja (1990) lecture method, traditionally, referred to as didactic approach can be defined as a teaching technique in which one person usually the teacher presents a spoken discourse on a particular subject. It is identified as teacher-centered when used in its pure form. The teacher does much of the talking while the learners are passive

receivers of the information passed across by the teacher.

2.5.2 Lecture Method and Academic Achievement in Science

According to National Policy on Education (FRN, 2006) learners performance in science and mathematics are poor because current pedagogies of science teaching are teacher-centered thereby making learners passive and particularly continue to produce negative attitude towards biology. According to Nwosu (2006) science teaching must satisfy the active and dynamic requirements of teaching approaches that are learner centered and problem solving orientedness. Atadoga and Onaolapo (2008) identified the following as advantages of lecture method.

It saves time and energy. It is not expensive as only the chalk board and chalk are required. Good command of English and boldness saves the teachers a lot of challenges in the class. It offers easy, coverage of syllabus and fasten the dissemination of scientific information and facts.

It allows easy handling of large classes without much stress Onaolapo also identified the following as disadvantage lecture method. Meaningful learning of science is never promoted as it appeals to only the sense of hearing.

The different ability groups present in any given class are not taken care of, pull topless those students who will learn better by handling and manipulating of objects are completely left out. This can be frustrating for this groups of students.

It is stressful for students to sit still for a long time at once listening and writing. It can lead to restlessness and disruption of normal class procedure. Lecture method encourages only rote learning without necessarily aiding understanding

2.6 Cognitive Styles and Academic Achievement in Science

Academic achievement in science according to Blair (1975), is to accomplish or gain by effort or do something successfully.Okafor (2006) on the other hand maintained that academic achievement concerns mental health care and has its basics in physical health and intellectual skills

which leads to satisfactory means of adjustment in social sensitivity and adequate self concept cognitive styles of learners and academic achievement in science. According to Mukherjee (2010), cognitive learning styles refers to the entire socialization process ,the acquisition of behaviour patterns and even styles or particular means of tackling issues on problems of everyday life. Bruner and Pask (2010) made distinctions between the words styles and strategy. According to them a learning style may be thought to be equivalent to some characteristic way of thinking while a strategy more specific being a particular approach in tackling a narrower range of problems while learning styles of individuals remain more or less set with their ways of thinking. Strategies may differ for the same individuals confronted with problems and situation of different kind styles. Witkin (2010) made extensive studies on the field dependent vs field independent dimension of perceptual styles of children. Group Embedded Figure Test (GEFT) was used to classify children into field dependent and field independent. Children were asked individually to outline the stimulus figure from the corresponding task figure. Their responses were carefully recorded. It was found that some children were relatively independent of the task figure as a whole (field) and their responses were quicker than others who were not independent of the field. On the basis of this Witkin(2010} classified children into two, field independent and field dependent.

According to Mukherjee (2010) the relevance of field dependent and field independent dimension becomes obvious when we consider the verbal instruction or explanations of teachers in classroom. A diagram drawn on the black board or a passage of the text to be read, are all instances of fields. According to Muhkerjee, it is likely that the children manifesting field independence type of learning styles will stand a better chance of achieving more than their counterpart in academic achievement. Witkin(2010) concluded from the various tests in his experiment that some children are global (field dependent than others and some are mote articulated, field independent, a

global cognitive styles of field dependence needs to rely on the support from teachers and some other external sources. Field -dependent children are more likely to forget their dreams on waking up than field -independent ones. Witkin, Moore, Good enough and Cox (2010) revealed that field dependent learning styles found it difficult to solve problem than their field independent counterparts. Therefore the field-independent achieve better academically than their counterparts (field dependent).

Several research works have been carried collaborative learning bothering on cognitive styles in Nigeria and Africa in general. For instance Ogunleye carried out a study in Ibadan involving one hundred subjects on the effect of collaborative learning on the performance of engineering students at the Polytechnic level. He used students achievement test (SAT) and discovered that students taught using collaborative learning performed better than those taught using traditional lecture method. He recommend that students should be encouraged to learning actively while collaborating without completion. Okebukola (2011) studied the effect of constructivism strategy on 90 students of Integrated Science in Plateau State. He used integrated Science Achievement test (IAT). He discovered that active collaboration during constructivism strategy produced positive result in students' performance in integrated Science. He therefore recommended the use of the strategy and organization of workshop and conferences to train teachers on the usage of the strategy. Ampiah (2007) studied the effect of cognitive styles on the performances of Physics students in Ghana. He used one hundred and sixty students for the study. He discovered that cognitive styles plays a a great role in students performances in Physics by subjects by subjects to Physics Achievement test (PAT). He recommended that teachers should have a fore knowledge of his students cognitive styles in order to plan his lesson using the appropriate materials. He used Witkin embedded figure test (EFT) to carry out the inventory of his students cognitive styles. He recommended that cognitive styles of learning's be

considered in curriculum development so that appropriate teaching method can be used to teach science students. Some of the works dwelled on learning styles and the effect of cognitive styles on academic achievement However, there is lacuna in the impact of collaborative constructivism, and cognitive styles on students' performance. Other works on collaborative constructivism teaching strategy include: Effect of constructivist- based Teaching strategy on Academic performance of students in integrated science at the junior secondary school level by O.Oludipe (2013) constructivism and learning in science by Olorundare (2013) constructivist instructional strategy and pupils 'Achievement and attitude towards primary science. Another related research is effect of constructivism instructional approach on teaching practical skills to mechanical related trade students in western Nigeria technical colleges by Ogundola, Peter, Popoola Abiodun and Oke Jonathan (2013).

However, none of the researches deals with cognitive styles and biology subject in particular. Thus informed my decision to investigate the effect of collaborative constructivism on the academic performance of biology students of different cognitive styles in colleges of education in North-east, Nigeria.

2.7 Implications of the Literature Reviewed on the Present Study

The literature review began with a purview of science teaching methods. The various strategies employed by teachers to enhance learning of science were highlighted. The constructivism approach to science teaching was elaborately described. The various related literatures on the constructivism approach were discussed. The review also described the lecture method of instruction its advantages and disadvantages, explanations on cognitive styles of learners. The review highlighted studies of some scholars prominent such as Witkin.

It has streamlined the pathway of the research i.e. it has provided the research the leeway

to identify methods and materials that will assist in the course of research. The review has provided the present study with a sound theoretical basis for the research. It provides the researcher ability to concur or amend earlier findings if necessary.

Their findings were highlighted with the view that field independent learners are better positioned to achieve more academically than their field dependent counterparts. It is therefore the business of this study to use collaborative constructivism approach and lecture method to teach and investigate its impact on the field - independent and field dependent learners in desertification and bio diversely conservation at NCE level. Collaborative constructivism affords the students to interact freeling in an outdoor laboratory to enhance their academic performance in science.

Field dependent and field independent cognitive styles play a great role on the way and manner by which students perceives information process and analyze to create meaningful knowledge. Desert encroachment being a phenomenon of aggravation can be control through inculcation of the right knowledge, skills and attitude towards the environment.

Academic performances of students in desert encroachment and bio-diversity conservation can generally be improved through the use of appropriate teaching methods in science.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This study was carried out to investigate the impact of constructivism and lecture method on academic achievement of Biology students of different cognitive styles in colleges of Education in North-East Zone, Nigeria, in the chapter methodology, design use the following sub-headings:

- Research Design
- Population
- Sample and Sampling Techniques
- Instrumentation
- Validity of the instrument
- Reliability of the Instrument
- Treatment Administration
- Date Collection Procedures
- Data Analysis

3.2 Research Design

The research design for this study is Quasi-Experimental in nature involving pretest and posttests. The pretest was administered to determine the comparability of ability level of the subjects. Later the groupA was taught using collaborative constructivism approach while groupB was taught the same topics using lecture method. After treatments administration, posttest was given to both groups i.e. groupA and groupB for the purpose of determining the effectiveness or otherwise of the i.e. collaborative constructivism approach and lecture method

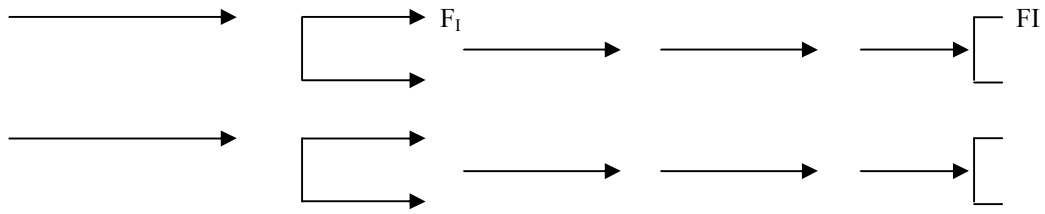


Fig. 1: Research Design Illustration

The symbols were represented thus;

GRA = GroupA (exposed to collaborative constructivism)

GRB = GroupB (exposed to lecture method only)

O_1 = Pretest

O_2 = Posttest

X_1 = Treatment (collaborative constructivism approach)

X_0 = Lecture method

FD = Field dependent

FI = Field independent

3.3 Population of the Study

The population of the study consisted of five thousand two hundred and three biology students of colleges of education in the North Eastern Zone of Nigeria. The students were of average age of twenty years. The subjects had completed their secondary education and were exposed to N.C.E level 1 studies. They consisted of both male and female students.

Table 3.1 Population of the Study

S/No	Name of institution	Location	No of Bio .Students
1	Umar Suleiman C.O.E Gashua	Yobe	239
2	Federal College of educ.(Tech.) Potiskum	Yobe	285
3	Federal College of Educ. Yola	Adamawa	480
4	College of Edu. Jalingo	Taraba	470
5	College of Edu.,Azare	Bauchi	380
6	College of Edu. Hong	Adamawa	700
7	Kashim Ibrahim C.O.E,Maiduguri	Borno	600
8	Umar Ibn El-kanemi C.O.E Bama	Borno	490
9	Fed . C. O. E, Gombe	Gombe	500
10	C.O.E , Waka Biu	Borno	1059
	Total		**5203**

Source Record and Statistics of the Colleges (2011)

Table 3.2 Distribution of Study Sample

S/No	Name of Institution	Location	No of NCE II Bio Students
1	Umar Suleiman College of Education	Gashua	250
2	Federal College of Education (Tech)	Potiskum	270
	Total		**520**

Two colleges of education were randomly selected for the study because of the experimental nature of the study that involves two groups. These colleges in the North East

geopolitical zones of Nigeria are Federal College of Education (Tech) Potiskum with 270 students in NCE II offering biology and Umar Suleiman College of Education, Gashua with 250 students offering biology at NCE II.

The study sample was drawn from this population using table of random numbers.

3.4 Sample and Sampling Technique

Two colleges of education were randomly selected for the purposively of the study. The study sample consist of sixty (60) NCE Biology students. This is because according to Ezejelue and Ogwo (1999) in Toluhi (2001) the most common sample size is $1/10^{th}$ rule which states that the researcher should obtain 1/10 of the population he studies in his sample or 10% of the total population. Tockson (1975) proposed a control limit of thirty study subjects for experimental research. Simple random sample technique was used to pick the required number of subjects involving the use of table of randomization (table of random numbers) for example by picking number that appear in the table of random to set total number of 30 for groupA and 30 for groupB totalling 60. The first thirty subjects made up the groupA consisted of twenty boys and ten girls were exposed to constructivism That was to ensure adequate representation of the population and enable gender related analysis of results. For each of the thirty samples, there were 15 field dependent and 15 field independent subjects. The same applied to groupB exposed to lecture method

The thirty that made up the groupA also consists of twenty boys and ten girls to enable gender related analyses of the results.

Table3.3 Sample for the Study

School	Treatment	No of Students				Total	Group
		Male	Female	FI	FD		
Umar Suleiman College of Education, Gashua	Constructivism	20	10	15	15	30	A
Federal college of Education, Potiskum	Lecture method	20	10	15	15	30	B
Total						**60**	

3.5 Pilot Testing

In the pilot testing, two tests were carried out (i) reliability of instrument (ii) test on ability level of the sample.

3.5.1 Reliability Test of the Instruments

The pilot study was conducted in Umar Suleiman College of Education, Gashua. The subjects used were the preliminary science students. The purpose of the pilot study was to ascertain the feasibility and reliability co-efficient of the adopted instrument (paragon Cognitive Styles Inventory) and Biology Achievement Test (BAT), pretest of experiment and control groups. The pilot test was carried on Ninety students. The groups contained mixed sexes, ability groups among others etc.

The paragon cognitive styles inventory consists of fifteen multiple choice items. Instructions on how to answer the questions were read and explained to students by the researcher. This was done to ensure that the students answer the question on PCSI carefully.

Based on the analysis of score generated from the pretest, the reliability coefficient paragon cognitive styles inventory was confirmed to be 0.89. The reliability of BAT was found to be 0.88 using test-retest and Pearson product- moment correlation coefficient statistics.

A pretest was also administered to three groups consisting of experimental groups: field dependent (30), field independent (30) and control group (30) subjects in order to determine their comparability of their ability levels. One way analysis of variance (ANOVA) was used on the 4 groups and the result showed that there was no significant difference in the ability level of 4 of the groups. Based on this, the 4 groups were selected for the study. i.e Experimental 2 groups consisting Field Dependent and Field Independent students. The control consist 2 groups like the experimental group that is one group field dependent and one group field independent

3.5.2 Instrumentation

Two instruments were used for data collection in this study. They are:

The Paragon Cognitive Styles Inventory (PCSI) and

2. Biology Achievement Test (BAT) developed by the researcher. It consists of one hundred multiple questions drawn from NCE II Biology syllabus and was validated by experts from science education department of ABU Zaria.

3.5.3 Validity of Paragon Cognitive Styles Inventory

The Paragon Cognitive Styles Inventory (PCSI) is a verbal speed test published by Witkin, Ottman and Karp (2011). It consists of fifteen item test with two options (a and b). it is like a weigh balance as a high score on either a-side or b-side indicates the cognitive styles of the individual scores. If candidate scores more between 0-7, he is considered field dependent. A candidate that scores between 8 and 15 is considered field independent.

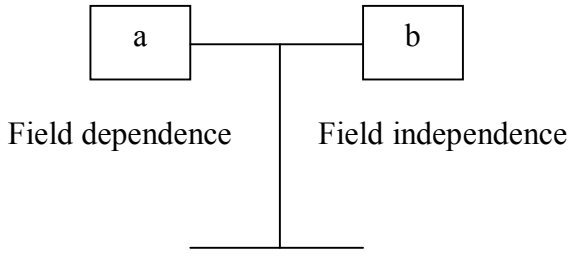


Figure 2. Classification of Field Dependence and Field Independence Source **Paragon (2011)**

3.5.1.1 Validity of Paragon Cognitive Style Inventory (PSCI)

Paragon cognitive styles inventory was validated by experts from Science Education Department of Ahmadu Bello University, Zaria. The experts were PhD holders and are above the rank of senior lecturer. They were employed to determine the converge, spread, relevance conflict validity and other characters of the instrument. It was found that the coverage was adequate and valid for the study.

3.5.1.2 Reliability of Paragon Cognitive Style Inventory

The paragon cognitive styles inventory was adopted from Witkin (2011). It is reported to have a reliability of 0.89 according Witkin, Ottman and Karp (2011). It was retested using preliminary students of Umar Suleiman College of Education, Gashua. Split half method was used. The reliability of paragon cognitive styles inventory was confirmed to be 0.89.

3.5.2 Biology Achievement Test (BAT)

Biology Achievement Test (BAT) was developed by the researcher. It consisted of one hundred test items drawn from NCE II Biology syllabus. The detail of instruments validated and reliability test are as follows

3.5.2.1 Validity of Biology Achievement Test (BAT)

Biology Achievement Test (BAT) was validated by experts from Science Education Department of Ahmadu Bello University, Zaria. The experts were PhD holders and above the rank of senior lecturer. They were emplored to determine the coverage, spread, relevance content validity and other characteristics of the instrument. It was found that the coverage was adequate and valid for the study.

3.5.2.2 **Reliability of Biology Achievement Test (BAT)**

The reliability of Biology Achievement Test (BAT) was found to be 0.88 using test retest method using Pearson Product-Moment Correlation Coefficient Strategy. A test was conducted using preliminary science students after two weeks, the same instrument was retested. The two scores generated were correlated to determine the reliability of the instrument. The reliability coefficient was found to be 0.88. Meaning that the instrument(BAT) is reliable and was used for data collection in this study .

3.6 Treatment Administration

The researcher taught the groups (A& B) for the period of six weeks spending two hours per lesson. The researcher taught groupA with collaborative constructivism and groupB with lecture method. Collaborative constructivism strategy is an approach which allows students to interact with the study material in groups. The groups as well as the individual members construct meanings of what is learnt. The students collaborate by harmonizing what they learn which helps to bring broader meaning to what they have learnt. The Teacher serves as a guide and facilitator in this process. The flow charts for the process of using constructivism approach is presented in figure 2.as follows

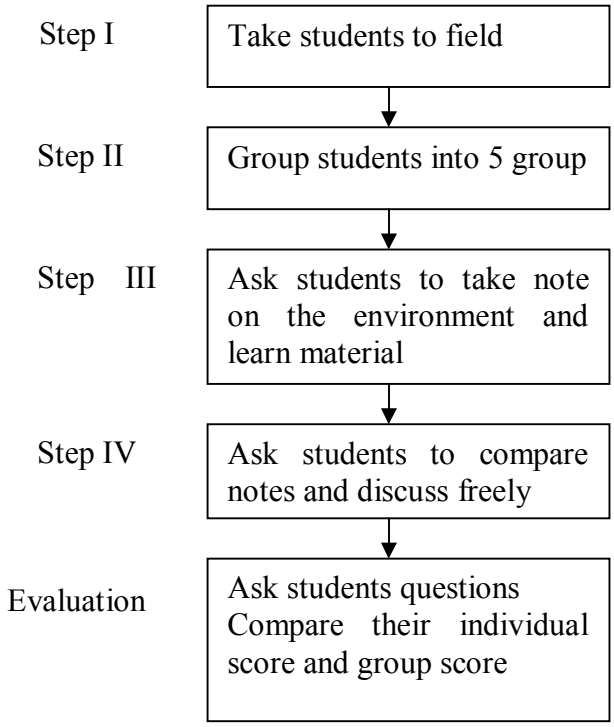


Figure 2: Collaborative Constructivism Flow Chart **Source: Johnanson, (2011)**

3.7 Data Collection Procedure

A pretest was administered to the groups, there after PCSI was administered to separate the subject into field dependent and field independent cognitive styles. Both groups were taught using constructivism approach and lecture method for six weeks involving two hours per week.

Biology Achievements Test (BAT) was administered after treatments as a post test for the two groups. The scores generated from posttest for experimental and control groups based on their learning styles were collected and analyzed. Later the scores of each group were further separated into male and female for gender difference

3.8 Data Analysis

The data collected for the purpose of this study were analyzed as follows;

Research questions 1-3 were analyzed using mean scores and standard deviation

Hypotheses 1-3 were analyzed using ANOVA and t- test at $p \leq 0.05$

Ho1: There is no significant difference in the academic performance of biology students in desert encroachment and biodiversity conservation taught with different methods.

The hypothesis ($H0_1$) was tested using students t-test statistical tool. The mean academic performance of experimental group was used to determine if there is any significant difference in the performance of the two groups of NCE biology students at $P \leq 0.05$.

Ho2: There is no significant difference in the academic performance of biology students of different cognitive styles taught with different methods in desert encroachment and biodiversity conservation

The hypothesis ($H0_2$) was tested using one way ANOVA (Analysis of variance). ANOVA was used to determine if there was any significant difference in the means Academic performance of independent and field dependent members of the experimental as well as control groups at $P \leq 0.05$.

H03: There is no significant difference between the male and female students` academic performance in desert encroachment and biodiversity conservation.

The hypothesis (H03) was tested using student t-test at $P \leq 0.05$.

CHAPTER FOUR

RESULTS, ANALYSIS, AND DISCUSSION

4.1 Introduction

This study investigated the effects of collaborative constructivism on the academic performance of biology students of different cognitive styles in Colleges of Education in North East Nigeria. This chapter is presented under the following subheadings:

- Data analysis and Result presentation
- Summary of findings and
- Discussion

4.2 Data Analysis and Results Presentation

Research Question One

What are the effects of collaborative constructivism on biology students' Academic performance in desert encroachment and biodiversity conservation?

The data obtained for research question one were analyzed using descriptive statistics such as mean and standard deviation.

The summary of the result is presented in Table 4.1a

Table 4.1a: Mean Difference in the Academic performance of those Exposed to Constructivism and those Exposed to Lecture Method

Group	N	$\bar{X}$	S.D
A	30	28.00	7.30
B	30	22.00	4.40

From Table 4.1a there is difference between the academic performance of groupA and groupB with groupA having 28.0 and group B having 22.00 mean scores

Therefore there is difference in the academic performance of the two groups. This result has answered the research question one.

To test significant difference, hypothesis one was tested at P≤0.05 as follows.

4.2.1 Hypothesis I:

$H0_1$: There is no significant difference between the mean academic performance of biology students taught desertification and biodiversity conservation using different methods (collaborative constructive and lecture method).

To test this hypothesis, the post-test scores of students in group A and group B were collected. These were then analyzed using t-test statistical techniques to find out if there is any significant differences in the mean academic performance at P≤0.05. The result is presented in Table 4.1b

Table 4.1b: t-test Analysis of Mean Scores of Experimental and Control groups Academic performance

Subject	N	$\overline{X}$	SD	DF	t-cal	P-value	Remark
Grp A (constructivism	30	28	7.3				
				58	4.0	0.02	*Significant
Grp B (lecture method) co	30	22	4.4				

Significant at p≤0.05

From Table 4.1b, the result revealed that t-cal was 4.0 and a p-value of 0.02 was recorded at df = 58. Since the p-value of p=0.02 is less than 0.05, it implies that there is significant difference between mean academic performance of experimental and control groups. Thus, the

null hypothesis that says there is no significant difference is rejected. Their mean scores of 28 and 22 respectively for experimental and control groups confirmed this significant difference in mean performances in favour of the experimental group.

Research Question Two

What are the effects of collaborative constructivism and lecture method on academic achievement of biology students of different cognitive styles?

The data obtained for research question two were analyzed using descriptive statistics such as mean and standard deviation. The summary of the result is presented in Table 4.2a

Table 4.2a Mean and Standard Deviation of Academic Performance of Experimental and Control Groups

Group		N	Mean $\bar{X}$	SD
A(Construct)	FI	30	41.00	4.03
	FD	30	39.00	4.13
B(Lect.)	FI	30	29.00	3.03
	FD	30	27.00	3.21

From Table 4.2a there is difference between the academic achievement of the field independent and field dependent members of the groupA and field independent and field dependent members of groupB. Field independent members of groupA has a mean of 39.00 while field dependent members of groupB had 29.00 and field dependent members of control group had 27.00. This result has answered research question two. To test the level of significance difference, hypothesis two was tested at $P \leq 0.05$.

Hypothesis Two:

$H0_2$: There is no significant difference in the mean academic performance of NCE biology

students with different cognitive styles (FD and FI) taught with different methods of instruction (collaborative constructivism and lecture method).

To test this hypothesis, the post-test scores of field dependent and field independent members in the experimental as well as control groups were collected and analyzed using one way analysis of variance (ANOVA) at $p \leq 0.05$. The results are presented in Table 4.2b.

Table 4.2b: One way ANOVA Summary of Post test Scores of the four Groups, Experimental (FD and FI) and Control(FD and FI)

Source of variance	SS	DF	MS	F-cal	P	Remark
Between group	856	2	4.28			
				7.5	0.001	*significant
Within group	2369	42	56.4			
Total	3225	44				

The result in Table 4.2b shows that at 0.05 level of significant difference p-value obtained is 0.001. Since P0.001 is less than P≤0.05. This means that there was significant difference in the academic achievement of field dependent and field independent members of experimental as well as control groups. Thus, the hypothesis 2 which states that there is no significant difference in their academic performance is hereby rejected.

Therefore to find out the groups that shows the significant difference Least Significant Difference (LSD), Sheffe's post hoc test was done and presented in Table 4.2c.

Table 4.2c Post Hoc Testing Using (LSD) method among the 4 groups academic achievement.

Groups		Mean Difference	Sig	Rem
	FI	15.90		
A(Contructivism)			0.12	NS
	FD	16.00		
	F1	12.80		
B(Lecture method)			.000	*S
	FD	14.00		

*Significant at P≤ 0.05

The result in Table 4.2c showed that No significant difference exists between the subjects taught with collaborative constructivism and those taught with lecture method with P value 0.000 since .000 in less than 0.05, it implies that there is significant difference between the groups.

Similarly the field independent FI and field dependent of group A exposed to constructivism show no significant. For field independent and field dependence of groupB exposed to lecture method there exist significant difference since the p value of 0.20 was obtained and is greater than 0.05

Research Questions Three

What are the effects of collaborative constructivism strategy on gender?

The data obtained for research question three was analyzed using descriptive statistics such as mean and standard deviation the summary of the result is presented in Table 4.3a

Table 4.3a. Mean and Standard Deviation of Male and Female Students Exposed to Constructivism

Variable	N	$\bar{X}$	SD
Female	10	39.40	4.50
Male	10	41.00	5.00

From Table 4.3a There is no difference between the academic achievement of both male and female subjects of the experimental group. The female subject have a mean score of 39.40 while the male subjects have a mean score of 41.00.Therefore there is no difference between the performance of the two groups. This result has answered research question three.

To test significant difference hypothesis three was tested at $p \leq 0.05$ level significant.

Hypothesis Three:

$H0_3$: There is no significant difference between the mean academic scores of male and female students exposed to collaborative constructivism strategy of teaching desertification and biodiversity conservation.

To test this hypothesis, the mean academic scores of both female and male subjects of experimental group were collected and computed using t-test statistics at $p=0.05$. There results are presented in Table 4.3b.

Table 4.3: A Summary of t-test Analysis of Post test Scores of Male and Female Students Exposed to Constructivism Teaching Strategy

Sex	N	$\bar{X}$	SD	DF	t-Cal	P	Remark
Female	10	39.4	1.4				
				18	0.76	0.068	NS
Male	10	41	4.4				

Not significant at $p \leq 0.05$

From the result in Table 4.3, the t-calculated of 0.76 was observed. The mean score of male is 41 while that of female is 39.4. a P-value of 0.68 tested at $p \leq 0.05$ significant level with df = 18 was also obtained since the p. value of 0.68 is greater than p.0.05. This means that there is no significance difference in the mean academic performance of male and female students in experimental group exposed to collaborative constructivism strategy of teaching desertification and biodiversity conservation. Therefore, the method is gender friendly.

4.3 Summary of Findings

The main findings in this study include:

1. That collaborative constructivism produced a significant positive effect on experimental group as the mean academic performance of the group is higher than the mean academic achievement of the control group.
2. That the field independent members of experimental group performed better. Likewise the field dependent members of experimental group performed marginally better than the field independent members of control group .This proves that collaborative constructivism produced positive effects in both field dependent and field independent members of experimental group.

3. However there was no significant difference in the mean scores of the male and female members of experimental groups. Therefore one can conclude that collaborative constructivism is not sex biased. It can produce positive effect in any student without respect to his/her sex.

4.4 Discussion of Findings

From the result in 4.1a, the study shows that field independence subjects are superior to field dependence subjects. This agrees with the results of field dependent/field independent studies carried out by witkin in (2010) and sale (2011)The analysis in Table 4.1b shows that there is a significant difference in academic achievement of students taught desertification and biodiversity conservation using collaborative constructivism and lecture method. The field independent members of experimental groups performed higher with the mean score of 41. 00. There was a significant difference between the field independent group in the groupA and the field dependent of groupB taught using lecture method. Similarly, the field dependent members in the experimental groupA showed significant difference with the field dependent members in the groupB exposed to lecture method. This finding is supported by Esiobu, (1995); Umeh, (2002); Witkin, (2010); who stated that activity based instruction produces positive effect on student's performance in science.

The result also showed no significant difference between the field independent members and field dependent members of groupA. This is also consistent with the results of Jegede Okebukola, (1991); Obe, (1998) and Kibikiwa, (1998) Nwosu, (2011).

However the study revealed that the findings by Witkin, (2011) Sale, (2011); Nwosu and Obubuah, (2010) that field independent cognitive styles are superior to their field dependent counterpart is at variance with this result. This result shows that the mean scores of the field independent members is not so high than the mean scores of the field dependent members in the

experimental group taught with collaborative constructivism. The short comings of the field dependent members could have been remedied by the active collaboration during the learning process when students learn at their own pace as they construct meaning to what they learn. This result is in line with Nwosu, (20100; and Nwachukwu,(2011); who maintained that collaboration can produce positive effect in the students academic performance.

Hypothesis Three: centered on gender. The result in Table 4.3b revealed that there was no significant difference between the academic performance of male and female students exposed to collaborative constructivism method of teaching densification and biodiversity conservation. This implies that collaborative constructivism enhances the performance of both sexes. This is supported by Bello, (1990); Ukwungu, (2002); Folorunsho and Nwosu, (2005); Bada, (2006); Oluwatoyi (20070; Smeak *et al,(* 2008). Usman (2008), who maintained that activity based instruction produces improved performances in both sexes.

In same vain Onasanya and Omosewa (2010) revealed that students taught with conventional method in physics shows no significant difference in male and female students performance

However, this result is contrary to James, (1991); Aigbomian, (1994) and Aigbomian, (2007); which revealed that boys performed better than girls in activity based instruction. Active collaboration among the experimental group could be responsible for the positive effect of collaborative constructivism on gender.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter presents summary conclusion and recommendations.

5.2 Summary

The study investigated comparatively, academic impact of collaborative constructivism on the performance of biology students of different cognitive styles in colleges of Education. The population of the study consisted of all biology students in colleges of education in North East, Nigeria. The population was 520. The research design was quasi experimental study . The sample of the study is was 60 students in two randomly selected colleges of Education F.C.E.(T) Potiskum and College of Education, Gashua.

Two instruments paragon cognitive styles inventory and Biology Achievement Test (BAT) were used for the study. Student's t-test statistics and one way analysis were used to analyze data obtained. Collaborative constructivism approach of science teaching has yielded positive result as it produced improved performance in biology students. Collaborative constructivism approach gave students opportunity to collaborate while learning actively. This produced a net effect that is wholesome for the class. This is against the previous findings that field independents cognitive styles are superior to their field depends counterparts. There was no gender related differences there was no significant differences between the performances of male and female members of the experimental group. Generally the experimental group performed better that their control group counterparts. Meaning that the field dependents and field independent groups performed better than the lecture method group. This improved performance is attributable to the effect of collaborative constructivism.

Although there was improvement in the performance of both the field dependent and field and field independent members of experimental group the field independent members had a marginal gain ahead of their field dependent counterpart as shown from the finding of this study.

5.3 Conclusion

Therefore collaborative constructivism approach has remedied the short-coming of the field dependent cognitive styles while giving equal opportunity for improvement to both sexes.

5.4 Recommendations

In view of the research findings the following recommendations are hereby put forward to improve the academic achievement of biology students at various examinations.

1. Biology teachers should use collaborative constructivism topics in teaching such as desert encroachment and Biodiversity conservation.
2. Teachers should take cognizance of cognitive styles of their students while teaching biology.
3. Teachers of biology should be encouraged to attend workshops and conference to abreast themselves the opportunity of being familiar with new and effective teaching strategies that would enhance their performance such as collaborative constructivism.
4. Curriculum planners should design curriculum that includes collaborative constructivism approach.
5. National commission for colleges of education (NCCE) should recommend collaborative constructivism in the teaching of biology at college of education to enhance capacity building of the would be teachers.
6. Textbook publishers should incooperate collaborate constructivism in their publication

5.5: Contributions to Knowledge

1. This research has found that the use of collaborative constructivism can improve the academic performance of both sexes
2. The concept of desert encroachment and bio-diversity observation are better understood to enhance knowledge, skills and the right attitudes towards environmental management.

5.6 Limitations of the Study

This study was constrained to the following:

1. The study could not be carried out for the whole Northern Nigeria.
2. The study period was challenging as the crisis in Northern Nigeria and Yobe in particular was at its peak therefore some of the students and teachers were in panic situation.
3. The study was restricted to two college of Education. This narrowed the scope of generalization.

5.7 Suggestions for Further Studies

1. It is suggested that the influence of cognitive styles on student's attitude towards the study of science and technology be studied with a view to improve science and technology education.
2. Related investigation on collaborative constructivism should be carried out for secondary school students with a view to improve their performances in examination.
3. Similar study should also be carried out for physics, chemistry in order to see effect of collaborative constructivism on students' academic performance.

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APPENDIX A

PARAGON COGNITIVE STYLES INVENTORY

(Please answer the following questions as carefully, honestly and quickly as possible and remember, there are no right answers, only your best answers).

1. When you come to a new situation you usually

a. Try it right away, and learn from doing

b. Like to watch first and try it later

2. People should be more

a. sensible and practical

b. imaginative and inspired

3. When you come to an uncertain situation

a. You usually trust your feelings more

b You usually trust your thinking more

4. I see myself as:-

a. A little more serious

b. A little more easy-going

5. I spend most of my time

a. Often in bigger groups and seldom alone

b. in smaller groups or alone

6. It is better to

a. Be able to accept things

b. Want to change things

7. Is worse to

a. Do mean things

b. Do unfair things

8. I prefer things when they are

a. Planned and structured

b. Spontaneous and unplanned

9. After a day spent with a lot of people do you

a. I Feel energized and stimulated

b. I feel drained and like being alone

10. When you need to get something important done, you prefer to

a. do it the way that has worked before

b. do it a new way that you just thought of

11. Which is a bigger compliment?

a. "he/she is really nice"

b. "he/she is really smart"

12. When it comes to time, are you more likely to

a. Usually be on time

b. Be pretty flexible

13. When I am in a group, I usually

a. Do a lot of the talking

b. Mostly listen and talk a little

14. Are you more interested in

a. what really is

b. what can be

15. When you look at two things, you mostly notice bullet

a. How they are the same

b. How they are different

APPENDIX B

Biology Achievement Test (BAT)

INSTRUCTION:

Select the most appropriate option that complete the following sentences.

1. Energy is released from food by the process of _____

   (a). respiration (b). Carboxylation (c). Reproduction d. germination

2. When plants make their food _____ is given off as by product

   (a). protein b. nitrogen (c). Oxygen (d).hydrogen

3. Atmospheric effect is-------but air is invisible.

   (a) noticed (b). Dangerous (c). Observable, (d). inviable

4. Air has--------a. neither nass nor density.

   (b). mass and exert pressure (c). Mass but no volume, (d). no mass but exert pressure.

5. Carbondeoxide is a by product--------

   (a) respiration (b). Photosynthesis (c). Digestion (d). Photolysis.

6. Invisible living things in the soil are called—

   (a) Bacteria (b) humus (c) microbes (d) saprophytes.

7. Soils are classified according to----------

   (a) diameter ranges (b) fertility (c)amount of water content (moisture).

8. Which of the following soil types has the lowest portion of air spaces

   (a) silt (b) gravel (c) sand (d)warm

9. In which of the following states is wind erosion most rampant?

   (a) Delta (b) Edo (c) Yobe (d) Imo.

10. The parent material in a soil profile is found -

(a) Below the sob soil (b) on top of lap soil (c) below water table (d) all of the of the above,

11. The physical and chemical processes by which rocks are broken down into soil is termed

(a) Exfoliation (b) denudation (c) eruption (d) weathering.

12. All of the following are not considered in the classification of rocks except

(a) fertile (b) permeability (c) diameter rangers (d) origins and structure

13. Loamy soil consists of equal volumes of

(a) Gravels and clay (b) silt and clay (c) sand and clay (d) all of the above.

14. Soil texture to.....

(a) Its moisture only (b) relative proportion of various soil type |(c) air space in the soil (d) all of the above

15. Clay soil retains more water than sand because of if s.....

(a) Porosity (b) finer particles (c) large air spaces (d) fertility

16. The planet earth is enveloped in mixture of gashes refers to as.....

(a) Hydrogen (b) nitrogen (c) water vapor (d) atmosphere

17. The proportion of various types of gasses in the air is----------

(a) always constant (b)always changing with time and places (c)inform daily (d) all of the above

18. Soil found in small lumps are referred to as

(a) crumbs (b)sub soil (c)top soil (d)soil per fill in color

19 The upper part of the soil profile is darker in colour because

(a) of higher water content (b)of more oxygen present (c)presence of humus

(d) parent material

20. Noble (inert) gases are found in

(a) pure water (b) the well water (c) sea water (d) atmosphere.

21. When a candle burns in ajar. The amount of water vapour --------

(a) Decreases (b) increases (c) remain the same (d) all of the above

22. Which of the following source of water is least available for man?

(a) Ocean (b) icecap (c) atmospheric water (d) underground water

23. Which of the following instrument used in measuring the humidity of an area.

(a) Wind vane (b) hygrometer (c) barometer (d) speedometer

24. When water is polluted, the proportion of oxy

(a) Increases (b) decreases (c) remain constant (d) all of the above-.

25. When air is passed over heated copper the oxygen contained in air reacts with it to form

(a) Black copper peroxide (b) red copper hydroxide (c) black copper oxide (d) Pure copper sulphate.

26. The air consists of active part called----------.

(a) Intrigue (b) inert gas (c) oxygen (d) water vapour

27. The term environment refers to----------

(a) Living things around us (b) non living things around us (c) every things around us (d) all of the above.

28. The largest proportion of the atmosphere is.

(a) Oxygen (b) nitrogen (c) helium (d) hydrogen.

29. In a poorly ventilated laboratory with many students, the amount of carbon dioxide--------

(a) Increase (b) decrease (c) is the same with outside (d) non of the above.

30. Atmosphere contains-------

(a) Various volume of different gases (b) equal volume of various gases (c) More noble gases than others (d) all of the above.

31. Humus is formed by the process of a

(a) Decomposition of organism (b; chemical weathering (c) physical weathering,

(d) Sedimentation.

32. Bushing burning should be discouraged because.

(a) it leads to vitalization (b) it reduced fertility (c) reduce soil erosion (d) Increase fertility.

33. The finest particle of soil is----

(a) Clay soil (b) gravel (c) silt soil

34. The simple apparatus used to detected the direction of the wind is

(a) Weather vane seismographer (b) anemometer (c) barometer (d) Thermometer.

35. All of following are example of soil erosion except

(a) Rill erosion (b) gully erosion (c) sheath erosion (d) decanting.

36. The process whereby impurities settle down under the influence of gravity is termed------

(a) Filtration (b) purification (c) sedimentation (d) decanting

37. The instrument used to measure the amount of rainfall is

(a) Barometer (b) hygrometer (c) rain gauge (dj spectrometer.

38. The first horizon in the soil profile is called.-------

(a) Sub soil (b) top soil (c) parent material (d) humus.

39. The function of chlorine added to water at water works is to

(a) Help settle impurities (b) decolorize water (c) kill bacteria in water (d) Aid filtration.

40. The instrument used to measure water content of the air is called

(a) Rain gauge (b) hygrometer (c) barometer (d) thermometer.

41. The following factors affect the rate of

(a) Temperature (b) humidity (c) soil colour (d) rain fall.

42. Spaces between soil particles are filled with----------

(a) Mineral salt (b) water and air (c) air spaces (d) smaller particles.

43. Weathering agents include the following except

(a) Snow (b) wind (c) water (d) rock,

44. The reason for organic matter decomposition being faster in lighter soil than heavy soil is.----------

(a) Heavy soil is darker than lighter soil (b) greater attraction occurs in lighter soil than heavy soil, (c) all of the above.

45. The process whereby plant lost water through their lea

(a) Transpiration (b) photosynthesis (c) photolysis (d) respiration,

46. The weathering of top soil is called

(a) Leaching (b) erosion (c) denudation (d) exfoliation.

47. The various ways by which fertility of soil is lost include all the following except----------

(a) Leaching (b) fallowing (c) erosion (d) mix cropping

48. ----------soil forms large sticky mass when wet and become hard a cracked when dry.

(a) Clay (b) silt (c) sandy (d) loamy

49. Which of the following is not source of water pollutants

(a) Agricultural chemicals (b) domestics affluent (c) oil and refineries (d) Groceries.

50. The most important and final process of soil formation is----------

(a) Cooling of molten magma (b) erosion (c) addition of organic materials (d) all of the above.

51. One of the following is used to catch soil organism----------

(a) Quadrants (b) nets (c) pit of all trap (d) all of the above.

52. The process by which soil water raise up the surface of the soil.----------

(a) Capillarity (b) osmosis (c) diffusion (d) all of the above.

53. Plant and animals decays in the soil because of the action of.

(a) Enzyme (b) termites (c) ants (d) microbes.

54. All of the following are qualities of pure water except----------

(a) Boils of 100%c (b) freeze at 100%c (c) colourless (d) tasteless. .

55. The byproduct of photosynthesis is. —.....----------

(a) Oxygen (b) hydrogen (c) helium (d) water

56. The region of atmosphere responsible for weather is ----------

(a) Bar sphere (b) mesosphere (c) troposphere (d) ozone layer.

57. Anemometer measures.----------

(a) Temperature (b) rainfall (c) wind speed (d) wind direction.

58. Weathering agent among the following is----------

(a) Water (b) petrol (c) kerosene (d) firewood.

59. The study interaction between organisms and their environment is called----------

(a) Cytology (b) ecology (c) digestion (d) respiration

60. Any substance that alters the psychological state of an individual is called----------

(a) Acid (b) drug (c) fruit (d) juice.

SECTION B

1. The two qualities of pure water include -----and----------
2. The invisible living things responsible for the crumb like structure of the soil are called
3. The types of soil organisms include ----------and----------
4. One importance of these soil organisms is that they----------
5. Dead bodies are decayed by-------

6. During decay complex chemicals are broken into----------ones

7. Protein are broken down into ---------salt

8. Two agents involved in the weathering of rocks include——and—

9. The purest form of water available to man is----------

10. One method of erosion control is ----------

11. Turbidity of water is cause by—

12. Which one of the two, cold or warm air holds more water vapor

13. Two sources of water pollutants include----------and----------

14. ----------is added to sedimentation tank during purification

15. ---------is a chemical used in the test of water

16. The chlorine added to water at water works kills --------

17. Biological control means using ----- to control destructive animals in the farm

18. Two atmospheric pollutants include -------- and----------

19. One method of controlling free defecation is ---------

20. An example of pest that devour crops include----------

21. The acronym B. O. D. stands for ----------

22. The land surrounding a house should be ----------

23. Water containing domestic and industrial wastes in drain is called ----------

24. The uses of water closets and septic tanks reduced the spread of ----------

25. Two of the green house gasses include-------and----------

26. A small container used in the household for waste and rubbish is called----------

27. A chemical used to kill pests on the farm is called----------

28. A chemical also used to kill herbs is also called----------

29. Disease causing organism are called ----------

30. The causative agent of malaria is called----------

31. The mass of minerals matter which form part of the earth is called ----------

32. Geology is the science of the origin, structure and history of earth and its inhabitants as record in ----------

33. The literal structure of the earth consist of ----------

34. The earth is enveloped by a mass of mixture gases called ----------

35. Rocks are classified generally according to their ----------

36. The most important mineral we have in Nigeria is----------

37. Igneous rock are formed at some depth in the earth are called.——

38. Igneous rock form as a result of cooling and solidification of --------

39. -------is an example of metamorphic rock

40. ---------is an example of sedimentary rock.

APPENDIX C

EXPERIMENTAL GROUP

LESSON PLANS FOR (collaborative constructivism approach)

LESSON 1 BIO-DIVERSITY IN DESERT ECOSYSTEM

Behavioral objectives: At the end of the lesson students are expected to to : (1). Describe desert (2). Mention 5 desert plants and 5 animals that live in the desert.

Previous knowledge: students have lived in the arid zone for more than 2 years.

Introduction: of the lesson: students are taking outdoor.

The teacher introduces students to the lesson by relating his experiences to various places around the arid zone like Yusufari, Machina etc

Presentation of Lesson:

Step I: The teacher groups' student into five groups with each group having six student.

Step II: Teacher takes students to the field and ask them to take note of desertification features and biodiversity e.g. sand dunes and grasshoppers.

Step III: the teacher returns students to classroom for the students to freely discuss their findings in groups and later moderated by the teacher as their lecture note.

Evaluation: the teacher asks students to compare note and provide correct answers to the following questions.

1. Describe the weather of desert.
2. Mention 5 plants and 5 animals that live in the desert.
3. Draw one Plant and Animal desert pieces.

Conclusions: The teacher briefly concludes his lesson by stating the main points of the lesson such as mentioning various desert organisms

Assignments: the students will be ask to state 4 plants and 4 animals' desert species.

LESSON PLAN FOR EXPERIMENTAL GROUP (collaborative teaching strategy)
LESSON 2 DIFFERENCES BETWEEN PLANTS AND ANIMALS

Behavioral objectives: at the end of the lesson students should be able to:

1. List two types of living things
2. Differentiate between plants and animals.

Pervious Knowledge: students have been taught characteristics of living things.

Presentational Lesson:

Step I: The teacher groups student into five groups with each group having six student.

Step II: The Teacher ask the students to different between plant and animals in the environment.

Step III: The teacher instructs the students to observe the characteristics that differentiate living things from non-living things

Step IV: The teacher asks the students to compare notes in groups in the classroom.

Evaluation: The teacher evaluates lessons by asking the following question and providing approach answers.

1. List two type's plants and 2 types of animals.
2. Mention 2 differences between them.

Assignment: Briefly differentiate between plants and animals

LESSON PLAN FOR EXPERIMENTAL GROUP (collaborative constructivism)

LESSON 3: EROSION

Behavioral objective: - at the end of the lesson, students should be able to

1. Define erosion.
2. Mention 3 types of erosion
3. Explain the effect of wind on the soil (wind erosion).

Previous knowledge: the students are familiar with the activities of the wind in the study area.

Presentational Lesson:

Step I: The teacher groups student into five groups with each group having six student

Step II: He ask students to observe the effect of wind as wind out powder of shall or sand out of his palm.

Step III: Teacher asks students to observe the erosion site and mention two types of erosion e.g. sheet erosion and rill erosion.

Step IV: The teacher returns students to classroom and ask them to compare notes freely.

Evaluate: the lesson by comparing answers to the question below:

1. How many erosion types do we have?
2. Mention the various types' o erosion.
3. Describe wind erosion.

Conclusion: he provides answers to the above question in brief.

Assignment: Describe wind erosion

LESSON PLAN FOR EXPERIMENTAL GROUP (collaborative constructivism)

LESSON 4: POLLUTION

Behavioral objectives: at the end of the lesson students should be able to

1. Define pollution
2. Mention types of pollution
3. Mention sources of water pollution.

Previous knowledge: students are familiar with smokes in the air and water turbidity.

Teacher takes students to factory site.

Introduction: teacher introduces his lesson by the following question:

1. What does cars, motor bikes discharge into the air?.
2. Who has seen chummily before?

Presentational Lesson:

Step I: The teacher groups student into five groups with each group having six student.

Step II:. Teacher takes students to pollution site such as mechanic garage or industrial sewage where they take not of the various pollutions e.g. air pollution, land pollution and water pollution

Step III: Teacher return the students to the classroom to discuss their findings while comparing notes among themselves.

Evaluation: The teacher ask the following questions to evaluate his lesson.

1. Define pollution
2. Mention the types of pollution

Assignment: Mention sources of water pollution.

LESSON PLAN FOR EXPERIMENTAL group (collaborative teaching strategy)

LESSON 5 TYPES OF ROCKS

Behavioral objective: At the end of the lesson students should be able to:

1. Define rock
2. Mention the 3 types of rocks
3. Give examples of each rock type.

Previous knowledge: students are familiar with sand stone and igneous stone used for road construction. Teacher taken student to a hill.

Teacher introduces his lesson by asking "who has been to Biu or Jos before. (2). who has seen a mountain or hill before.

Presentational Lesson:

Step I: The teacher groups student into five groups with each group having six student.

Step II: Teachers ask students to take note of the differences between rocks and their colour.

Step III: The Teacher returns students to the classroom and ask them to discuss the concept of rock.

Evaluation: The teacher evaluates his lesson by asking the following

1. What is rock?
2. Mention 3 types of rocks.

Assignment: Mention example of each rock type.

Conclusion: the teacher concludes his lesson by stating main point such as igneous rocks, sedimentary rocks and metamorphic rocks.

LESSON PLAN FOR EXPERIMENTAL GROUP (collaborative teaching strategy)

LESSON 6

Behavioral objective: at the end of the lesson students should be able to:

1. Define bio-diversity
2. Ecology
3. Ecosystem
4. Aridity (5Z). biotic and a biotic factors.

Previous knowledge: students have been taught environment and components and are familiar with desert ecosystem.

Introduction: Teachers take students into the outdoor environment and exposes them to the typical desert characteristics.

Presentational Lesson:

Step I The teacher groups student into five groups with each group having six student.

Step II: The Teacher takes students to Meteorological centre where the students observes various weather instruments such as rain guage, wind vane, hydrometer, etc.

Step III: The Teacher returns students to the classroom and ask them to compare note of their findings in groups.

Evaluation: Teacher evaluates his lesson by asking the following questions.

1. Define the following:
    i. ecology
    ii. Biodiversity
    iii. Aridity
    iv. Biotic and abiotic factors.

Conclusion: Teacher concludes his lesson by giving examples of biotic and biotic factors of environment.

Assignment: explain Biotic and biotic factors of the environment.

APPENDIX D

LESSON PLAN FOR CONTROLGROUP

Lecture method

GENERAL INFORMATION

Subject: Biology

Topic: Desertification

Reference: Idodo Umeh G. (2010) College Biology. Idodo Umeh

Instructional Aid: Teaching Aid Chaste listing plants and animals that dwells in the deserts.

Behavioural Objectives: At the end of the lesson students should be able to

1. Describe desert
2. Mention 5 desert plant
3. Mention 5 desert animals

Previous Knowledge: The students have lived in the arid region for more than a year. They experience the weather of the area.

Introduction: The teacher introduces his subject by relating his experience on journeys across arid zone areas.

Step I: The teacher writes his topic on the chalk board. "Deserts are regions high aridity and extremes of temperature.

Step II: The teacher explains the concepts of aridity and extremes of temperature.

Step III: The teacher brings his chart containing the names of plants and animals that have in the deserts.

Step IV: The teacher allows students to ask questions. The teacher hangs the chart on the chalk board and asks students to copy Teacher reads out the name of plant and animals in the desert.

Chalkboard Summary: Teacher summarized the lesson note on the board i.e. Desert is a hot environment where organisms their must adapt. The organisms include: spider, camels, lizard, rodents, baobab, acacia, cactus date palms.

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

1. Describe the weather of desert
2. Mention 5 animals that lives in the desert
3. Mention 5 plants that live in the desert

Conclusion: The teacher concludes his tans: desert are region of high temperature and pressure.

CONTROL GROUP (lecture method)
GENERAL INFORMATION

Subject: Biology

Topic: Plants and Animals

Reference: Idodo Umeh G. (2010) College Biology. Idodo Umeh Publishers. Ltd. Enugu

Instructional Aid: A Wall Chart Containing Difference Between Plants and Animals

Behavioural Objectives: At The end of The Lesson Students should be able to:

1. List Two Types of Living Things
2. Differentiate One From Another

Previous Knowledge: Already the Students Have Been taught About the Characteristics of Living Things.

Introduction: The teacher introduces his lesson by asking the students question as: who can list four characteristics of living things and explain any two among them.

Step I: The teacher will present his lesson using the students responds to explain the concepts by showing the charts containing plants and animals.

Step II: The teacher will write an essential point on the board for the students to understand the concept fully.

Step III: The teacher will ask the students question on what they have discussed during the lesson.

Step IV: The teacher corrects students responses and continues with his lesson. The Teacher will allow the students to ask question if any

on what they have discussed during lesson with there are teacher.

Chalkboard Summary: The teacher will write some note on the board for the students to copy about what they have discussed with their teacher.

Evaluation: The teacher will evaluate his lesson by asking the following questions List two types of living things and differentiate one from the other.

LESSON PLAN CONTROL GROUP (lecture method)

GENERAL INFORMATION

Subject: Biology

Topic: Erosion

Reference: Idodo Umeh G. (2010) College Biology. Idodo Umeh Publishers. Ltd. Enugu

Instructional Aid: Pictures/Ballons

Behavioural Objectives: At the end of the lesson students are expected to be able to:

1. Define erosion.
2. Mention 3 types of erosion
3. Explain the effect of wind on the soil (wind erosion).

Previous Knowledge: The students are familiar with the activities of wind in the study area.

Introduction: The teacher introduces his lesson by blowing ballon. He ask students what infected the ballon inflated.

Step I: Teacher writes his main points on the chalkboard thus: Erosion is the wearing away of the top soil as a result of erosion of weathering agents. There are three types of erosion, rill erosion, sheet erosion and gully erosion.

Step II: Teacher brings out the picture of sand dunes and valleys created by wind erosion. Teacher describes how wind wears out top soil and deposit it form of sand dunes.

Step III: Teacher allows students to ask question. Teacher answer their question.

Step IV: Teacher asks students to copy main points from the chalkboard.

Chalkboard Summary: Teacher summarizes his lesson by high lighting main points of the lesson. i.e. erosion is the wearing away of the topsoil. Three types of erosion include Rill Erosion, Gully Erosion, Sheet Erosion, wind also cause erosion and this is known as wind erosion.

Evaluation: Teacher evaluates his lesson by asking the following questions

1. Who can define erosion
2. How many types of erosion do we have
3. Mention the types of erosion
4. Describe wind erosion

LESSON PLAN FOR CONTROL GROUP (lecture method)

GENERAL INFORMATION

Subject: Biology

Topic: Pollution

Reference: Idodo Umeh G. (2010) College Biology. Idodo Umeh Publishers. Ltd. Enugu

Instructional Aid: Pictures of Pollution waters, Land and Air

Behavioural Objectives: At The end of the lesson students are expected to be able to:

1. Define pollution
2. Mention types of pollution
3. Mention sources of water pollution.

Previous Knowledge: Students are familiar with smoke in the air and water turbidity

Teaching Procedure:

Introduction: Teacher introduces his lesson by asking the following question.

1. What does cars, motors cycles discharge in to the air?
2. Who has seen chimney in any factory before?

Step I: Teacher defines pollution as addiction of any substance that changes the contact of the air, water, land to makes it harmful to us or the environment.

Step II: Teacher brings out pictures of land, water and air pollutions and display their. He tells students that those are three types of pollution i.e. water pollution, air pollution, land pollution etc.

Step III: Teacher allows students to ask questions and answer them.

Step IV: Teacher writes main points of his lesson on the chalkboard and ask

students to copy.

Chalkboard Summary: Teacher summarizes his main points on the chalkboard and asks students to copy.

Evaluation: Teacher evaluates his lesson by asking the following question:

1. What is pollution
2. Mention three types of pollution
3. Give example of pollutants

Conclusion: Teacher concludes his lesson by give examples of pollution e.g. smoke in air, oil in water bodies, fertilizer in our dunking waters etc.

LESSON PLAN FOR CONTROL GROUP (lecture method)

GENERAL INFORMATION

Subject: Biology

Topic: Rock

Reference: Idodo Umeh G. (2010) College Biology. Idodo Umeh Publishers. Ltd. Enugu

Instructional Aid: Said. Stone, lime stone, and basalt

Behavioural Objectives: At The end of the lesson students are expected to be Able to:

1. Define Rock.
2. Mention 3 types of rock
3. Give example of each rock types.

Previous Knowledge: The students are familiar with the sand, stone and some stone used for construction purposes.

Teaching Procedure:

Introduction: The teacher introduces his lesson by asking the following questions: (1). Who has been to Jos? (2) Who has seen mountain or hill before?. Teachers tells students that rocks are mass of minerals salt that forms parts of the earth.

Step I: Teacher writes the types of rocks on the chalkboard. He tells students that rocks are formed as a result of cooling and solid; of location of molten magma.

Step II: He brings out the three types of rocks and explains their formation. (1). Igneous rocks are formed as a result of cooling and solid of location of molten magma. When formed in the soil it is called

Plutonic igneous rocks. It formed outside the sol they are called volcanic igneous rock (2). Sedimentary rocks are formed as a result of accumulation of debris. (3). Metamorphic rocks are formed as a result of the activities of weathering agents e.g., temperature and pressure which change either igneous or sedimentary rocks to metamorphic rocks.

Step III: Teacher displays the examples of rocks types

Step IV: Teacher allows students to ask questions.

Chalkboard Summary: Teacher summarizes his main points on the chalkboard and asks students to copy.

Evaluation: Teacher evaluates his lesson by asking the following question:

1. Define rocks
2. Mention 3 types of rocks
3. Mention examples of each rocks type.

Conclusion: Teacher concludes his lesson by repeating that rocks are mass of minerals salt task form part of the earth. There 3 types of rocks (1). Igneous rocks (2). Sedimentary rocks (3). Metamorphic rocks.

APPENDIX E

MARKING SCHEME FOR BIOLOGY ACHIEVEMENT TEST (BAT)

S/N	Reg. Number
1	A
2	C
3	C
4	B
5	A
6	C
7	A
8	A
9	C
10	A
11	D
12	C
13	B
14	B
15	D
16	B
17	4
18	C
19	D
20	B
21	C
22	B
23	B
24	C
25	C
26	C
27	B
28	A
29	A
30	A
31	A
32	A
33	A
34	A
35	D
36	C
37	C
38	B
39	C
40	B
41	C

42 C
43 D
44 B
45 A
46 D
47 B
48 A
49 D
50 C
51 C
52 A
53 D
54 B
55 A
56 C
57 C
58 A
59 B
60 B

1 markx60
Total= 60 marks

SECTION B

1. Tasteless
2. Colourless
3. Microbes
4. Aeratethe soil
5. Microbes/Decomposers
6. Simpler
7. Nitrogenous
8. Water and wind
9. Rainfall
10. Afforestation
11. Dirty
12. Cold
13. Agricultural chemical and industrial sewage
14. Alum (Aluminum sulphate)
15. Anhydrous copper sulphate
16. Germs/pathogens
17. Animals
18. Carbon dioxide and smoke
19. Legislation/regulation
20. Grass hopper
21. Biological oxygen demand
22. Cleared/cut
23. Sewage

24. Dysentery/Diarrhea

25. Carbon dioxide and methane

26. Dustbin

27. Pesticide

28. Herbicide

29. Pathogens

30. Plasmodium 31.Rock

32. Fossils

33. Three concentric layers

34. Atmosphere

35. Diameter ranges

36. Petroleum/oil

37. Plutonic igneous rocks

38. Molten magma

39. Slate/marble

40. Sand stone/coal

Section A: Total 1/2markx40=20
Section B: Total 1/2markx60=30

Total maximum scores =50