EFFECTS OF COMPUTER SIMULATION ON ACADEMIC ACHIEVEMENT AND RETENTION IN GEOGRAPHY AMONG SECONDARY SCHOOL STUDENTS IN NIGER STATE, NIGERIA

ABSTRACT

The study investigated the Effects of Computer Simulation on Academic Achievement and Retention in Geography Among Secondary School Students in Niger State. Gender and retention was considered. One hundred and sixty (120) students were selected from the four secondary schools in Minna Metropolis. The research design was pretest- posttest control group design. The experimental group taught with Computer Simulation Package (CSP) and the control group taught using the lecture method. The research materials were developed by the researcher and validated by experts. Geography Achievement Test (GAT) of 20 items was validated by experts for data collection. The data collected were analyzed using the mean, standard deviation and t-test statistics in relation to the associated hypotheses which were tested at 0.05 level of significance. Four (4) research questions and four (4) hypotheses were formulated to guide the study. Based on the findings, it was recommended that the use of CSP or computer software for teaching and learning should be encouraged in schools. It was observed that the use of CSP enhanced the teaching and learning of geography among students.

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

The importance of science and technology cannot be overemphasized when we reflect upon the preponderant scientific and technological advancements around us today. Such advancement include among others the emergence of modern means of transportations and telecommunications which supplement the ancient types, the intervention of satellite, internet, the discovery of test tube babies, and new modes of instruction with computer assisted instructional packages, all over the place now. All these new technologies have automatically changed the mode of our dealings in teaching and learning. Changes and progress never end. New discoveries always emerge on the earth; the basis of all technological advancement is science (STAN, 1999). Science as observed by Umar (2011) is a great enterprise on which all the nations depend in order to advance technologically. Nwagbo (2005) in Usman (2010) explained science as an intellectual activity carried out by humans, designed to discover information about the natural world in which we live and to discover the ways in which this information can be organized to benefit human race. Science is also seen as foundation upon which the bulk of the modern day technological experiences are built upon (Nsofor, 2010). In fact there are multitude numbers of careers in the abode of science and technology which if properly studied will in no small measure alleviate the sufferings of the developing nations including Nigeria.

The adoption of science and technology in national life marks the differences between developed and developing countries, thus classification of nations according to their economic status, basically reflect their scientific and technological development (STAN, 1999 & Ajagun, 2000) and Chado (2010) shared this view and added that the wealth, creativeness and influence of power of any nation depend on her capacity to utilize science and technology for the betterment of her citizens. Experience has shown that, it is only through the growth of scientific and technological manpower base that the development of science

and technology can be achieved. This is in agreement with one of the objectives of secondary school education as identified in the National Policy on Education (NPE, 2004). According to the policy, the provision of relevant manpower training in the area of applied science, technology and commerce at sub-professional grade is a national concern and commitment. This is because, science and technology is now seen as foundation of national power and productivity (STAN, 1999).

Nwachukwu (2008) supposed that the educational system is required to produce advanced scientific and technological knowledge in which Nigeria will satisfy the material and socio-economic needs for her people. Therefore, in preparing the students of today to become the prosperous scientists and technologist of tomorrow, science subject such as chemistry, physics and biology should be taught effectively. Prokop, Tuncer and Chuda (2007) suggest that teachers should have the knowledge of how students learn Science and Mathematics and how best to teach them. They further contended that changing the way of teaching Science and Mathematics is a continuing professional concern, and educators believe that any nation wishing to develop must not neglect the teaching of Science in its schools (Ogunleye, 1999 & Fefunwa, 2004) in Lawal (2011).

Great emphasis is placed on the computer-based science and technology laboratories as well as ordinary science laboratories in the educational curricula of the developed countries. One of the aims of the science and technology course is to train every individual capable of keeping up the fast developing and changing science world and capable of utilizing the recent technological discoveries in every field. Researchers have been interested in revealing the effects of the computer-based instruction, which began to be used with the invention of the computer, which is one of the most important technological devices of the time.

As a result of the rapid development of the information and communication technology, the use of computers in education has become ineludible. The use of technology in education gives the students with a more suitable environment to learn, serves to create interest and a learning centred-atmosphere, and motivates the students. The use of technology in this way plays an important role in the teaching and learning process (Baytekin, Balkan, Horzum, & Kiyici, 2002). In parallel with the technological advances;

technological devices, particularly computers began to be used in educational environments to develop audio-visual materials such as animation and simulation, which resulted in the development of the computer simulation instruction. The best example of the integration of science and technology is the Computer simulation instruction technique.

The use of computers in the teaching and learning activities is defined as Computer-Based Instruction (CBI). CBI is the use of computers in the teaching and learning activities (Broms 2010). CBI enables the students to learn by self-evaluating and reflecting on their learning process. CBI motivates children to learn better by providing them with the immediate feedback and reinforcement and by creating an exciting and interesting game-like atmosphere. For them, the studies in the field reveal that the students' achievements increase when the CBI technique is provided as a supplement to the classroom instruction. CBI is more effective on less successful children. The reason for this is that the computer-based instruction enables the children to progress at their own pace and provides them with appropriate alternative ways of learning by individualizing the learning process (Ogungbade, 2003). The most familiar function of the science education is to teach the children the science concepts in a meaningful way and enable them to lean how they can make use of these concepts in their daily lives (Cepni, Taş, & Kozi, 2010).

The computer based teaching has had an impact on the development of the educational technology to a great extent in the 21 century and this has resulted in the production of the software for the computer-based instruction. The primary purpose of the educational software is to solve the learning problems in the science courses encountered by the primary school students, to increase their motivation and achievements and to protect them against the negative effects of the rote memory based educational system. There are software-supported educational products designed to be used in the computer based and computer-supported teaching practices. These are the products that the teachers use as complementary materials for taking notes about their students and observations; making tables; developing materials; doing calculations, and preparing simple educational software. The educational software is used as a teaching material in the teaching of a part of a subject or the whole subject (Alkan, Deryakulu, & Şimsek, 1995; Isman, 2005).

According to Alessi & Trollip (2005), it is possible to divide educational software into five different types such as tutorial, drill and practice, simulation, educational games and hypermedia type. For effective and productive teaching, these techniques should be used with some classroom activities. These are: presentation, demonstration, practice and evaluation of learning (Ozmen, 2004). The use of computer technology enables learners to be active in the learning process, to construct knowledge, to develop problem solving skills and to discover alternative solutions (Ozmen, 2008).

The presentation of teaching materials by means of the computer technology helps students to process and develop information, to find alternative solutions, to take an active part in the learning process and to develop their problem solving skills. Most of the scientific and technological advances are realized by the people whose problem solving skills have been developed. In addition, these advances give rise to positive changes in the lives of people owing to the ways and techniques developed by means of the power of the problem solving skills. The use of problem solving skills is inevitable at every stage of our daily lives. As a result of the advances in today's technology and computer devices, it's getting indispensable to use this new technology in the solution of educational problems. The education and technology play an important role in the education of humans. Although the education and technology are different concepts, the use of both resulted in the emergence of a new discipline, the educational technology. Owing to the educational technology, the teaching and learning activities become enjoyable. Students learn willingly, by playing and enjoying during these activities (Isman, 2005).

The Place of Geography in the School Curriculum, the Nigerian Educational System has consistently under-gone far reaching changes since the 1960's. These changes manifest in the introduction of the 6-3-3-4, the new 6-3-9 system of Education, the National Council on Education, the Nigerian Educational Research and Development Council (NERDC), and the Universal Basic Education (UBE). The recent restructuring and the development of the Geography curriculum at Secondary school levels are very significant parts of these changes. The adoption of the new 6-3-9 system of education brought with it some provisions for Geography whose secondary school education terminates at the end of the first three years.

Provision was also made for students whose programme will continue for the next three years at the senior secondary school level. The former curriculum was limited to factual, examination-oriented approach, but today, there is greater emphasis on the educational and experiential implications for the students. In the past teachers are much more concerned merely with turning out students who are loaded with facts and terminologies in Geography. Today, the curriculum had changed. It has become a matter of investigation, inquiry and experiential. Emphasis is now placed on the relevance of Geography to life. The new objectives that now guide the formulation of Geography curriculum are: - teaching of Geography should provide a vehicle for the child development, to help him acquire the art of using knowledge or to learn something about his cultural heritage; - provide necessary background to citizenship and to intimate the students into a particular mode of thought; - offer a unique mean of furthering inquiry and high intellectual growth in students; - to help man to live, place himself in the world and to learn his true position and what his duties are; - to equip the students to understand other people and their environment; - develop positive attitudes to race, culture, and to other peoples environments and places; and Technologies and Methods of Teaching Geography There are evidences supporting the introduction and use of new technologies in instruction. The World Bank (2004) opined that ICTs should be considered within education for the purpose of reforming curriculum, reinforcing teaching/learning and to improve leaning. The UN Secretary of State (2005) speaking on the role of technology in education said we must ensure that Information and Communication Technologies (ICTs) are used to help unlock the doors of education. As a result, Millennium Development Goals (MDG's) came up with this policy "to co-operate with the private sector, to make available the benefits of new technologies, especially ICTs to increase educational opportunities and unlock the door of education. As a result of this, new technologies are being disseminated into educational institutions at a rapid rate. For the new technologies to be effectively utilized, teachers at all levels need not only to be proficient in the technologies but must also be well versed in its effective integration into their instruction. The major area Nigeria could meet this expectation is the teacher's preparation in the methods class. It is in the methods class that the students can see their teachers modeling the use or lack of use of the technology. The use or lack of use of the new technologies may widely affect

the students in future as regard whether to use them or not. Other problem associated with the new technologies is the preparation of the pre-service teachers and their level of proficiencies in its usage in education. According to Bull, Bell, Mason and Garaofalo (2002) the use of technology in instruction should either be to improve efficiency or to re-conceptualize the curriculum. Using Technology to Increase Efficiency in the classroom The use of technology in teacher education to improve classroom efficiency have been supported by several scholars among which are Chickening and & Erhmann (1996) Freeman (1997), Leat and McAleavy (1998), Hepp et-al (2004). According to Kozma et –al (2004) those advocating for the use of technology, describe a range of potential impacts that new technologies have when applied to education. According to Leuhrman (1971) and Bull et-al (2002) technology application in classroom may be in the area of computer assisted instruction under this, Geography teachers may use the new technologies for word processing, grading, record keeping, web page production and lectures. The use of Technology to re-conceptualize curriculum In Geography, there have been several efforts at using technology to re-conceptualize the curriculum; prominent among these efforts are the Anneberg Media and the Havard-Smith Center for Astrology. Others are the National Geography Association, NAGEO and NGWw web-sites. They encouraged the application of ICT using Geography Web-Site and Video.

The effort of the Geography Association is also worthy to mention. All these efforts are geared towards encouraging the use of ICT to reform teaching and learning of Geography. The approach used was the constructivist/instructiveist approach. The instructivist approach emphasizes the use of computer assisted teaching of skills or Geography knowledge while constructivist approach involve an active process in which teachers are to help learners construct new idea or concepts. The current move at conceptualizing geography curriculum emphasizes the combination of both instructivist and constructivist approach. This is so because we are interested in using technology to help learners learn in a more meaningful and motivating contexts. As a result there has been call for restructuring the curriculum. Balderstone and Lambert (2000) suggested some creative methods like; inquiry method, project method, drama, discussion, modeling, film making and application of ICT. Thomas and Macmahan (1997) observed that teaching thinking is hard and that it demands some changes in teaching style. These scholars therefore call for a

better teaching strategy that will provide the learner with concrete and real life experience to exemplify and clarify more meaningfully, some of the principles and concepts in Geography. Huckles, (1997) also spoke about the need to reform the curriculum. According this scholar we must acknowledge the fact the subject has distance itself from the current changes in the society and development in modern curriculum theories and pedagogy. Leat (1997, p. 145) therefore suggested the integration of the new technologies which would make the subject more stimulating and challenging. Leat and McAleavy (1998) opined that ICT is an essential requirement in teaching Geography. Barnet and Milton (1995) on the need to increase classroom efficiency and re-conceptualize the curriculum using technology said. Two third of those who says they found school completely dull and uninteresting describe working with ICT interesting. Half of those who claim they always behave badly at school get so interest in working with computers that they don't want to stop. Examples of New Technologies for teaching geography. There are different kinds of product of technology that are useful for teaching Geography. They includes; internet, interactive digital television, video, web-based instruction, Intelligent Tutoring Systems, photography, computers/computer Assisted instruction, video conferencing and discussion group. There are capabilities that CSP can do that other media cannot do. CSP has been found to be very effective in expressing geographical data, cartography, remote sensing, simulation of Geographical System, population forecasting and other Geographical Information Systems. Today, automated and digital maps have replaced the traditional maps. Michael (1969 p. 575) spoke of its advantages: The evidence clearly indicates that CSP teaches at least as well as live teacher on other media that, there is a saving of time to learn, that students respond favorably to CSP, it can be used to accomplish impossible veracity in branching and individualizing instruction, it will perform miracles in processing performance data. Wilce (1998), in an article on what is teaching in a new technological future said; Teachers of tomorrow will have no choice but to become web-workers and not suffers, coaches and facilitators, they are not to pass on knowledge but to encourage the development of high ordered skills as source evaluation and data interpretation not to mention the next century's most vital skill of all time management. The educated adults of tomorrow will be those who know how to cut straight to the core of any task and able to sort necessary information from superfluous, manage their time,

divide up their lives and set limits on how much time they intend to devote to each part. The problem of adoption of ICT in Teaching in Nigeria While there had been a giant attempt at integrating the new technologies into instruction in other advanced countries, Nigeria is not yet fascinated by the potential of technology to enhance teaching and learning. Many of our schools are lagging behind in integrating technology into instruction. Teachers are apprehensive about improving and modifying instruction by incorporating the new technologies. Perhaps it was the lingering apprehension that made some scholars to oppose/criticize its use in Geography and to conclude that the subject has distance itself from current changes in the society and development (Huckle, 1997). It is against this background that this study was designed to determine the extent to which a computer simulation package CSP can improve the student's achievement and retention among senior secondary school students in Geography.

1.2 Statement of the Problem

Despite the relevance of geography to man, and development of the society, its teaching and learning is faced with many problems, such as: poor performance of students at the Senior Secondary School Certificate Examination. (WAEC Chief Examiners' report, May/June 2005, November/December 2007). WAEC Chief Examiners report (2005) attributes students' poor performance in geography to the poor display of the knowledge of geography, poor understanding of questions, lack of qualified teachers, inadequate preparation of students for examination, and student's inability to cover most parts of the syllabus. If the effective geography results must be realized in Nigerian schools, then geography teaching at higher level must accept the challenge of breeding sufficient offering to share in the task of reviving the subject of geography (Nigeria Education Research and Development Council, 1992:6).

Many of these scientific instructional materials are very delicate and costly so that most secondary schools cannot afford them and the federal government also cannot afford to provide all for all the secondary schools due to economic depression. Consequently, teachers depend on chalk and talk method of teaching at the detriment of the use of instructional materials. On this basis, Nfosor, (2010) waned that teachers should not use the absence of inadequacy of instructional materials as an excuse to resort to poor teaching

and learning, instead they should resort to alternative approaches towards keeping science teaching and learning afloat and meaningful during such a difficult time. Based on this, Teachers have recognized that creating their instructional materials is important as noted by Ifegbo (2006). This is a step in that direction; the study will produce a computer simulation and look at its effects on the academic achievement and retention in Geography among secondary school students in Minna metropolis and Niger State at large. Also the issues of gender interference in academic achievement have attracted the attention of many researchers in the recent times but the issues are inconclusive. Some researchers were of the view that male students perform better than female students while others disagreed. Gender and retention are variables that the present research considered worthy of further investigation.

1.3 Purpose of the Study

The purpose of the study is to develop a computer simulation package and investigates its effects on student's achievement and retention in Geography among senior secondary school students in Minna Metropolis. The objectives of this research work include:

1. To develop computer instructional package.
2. Investigate the effects of computer simulation on learning of geography concept Nigeria (regional geography of Nigeria).
3. Determine the influence of gender on the performance of geography students on the concept
4. Find the effects of computer simulation package on students retention.

1.4 Research Questions

The study sought answer to the following questions:

1. Is there any difference between the achievement mean scores of the students taught geography using Computer Simulation Package (CSP) and those taught with conventional teaching method?

2. Is there any difference between the achievement mean scores of the male and female students taught geography using Computer Simulation Package (CSP)?

3. Is there any difference between the retention mean scores of students taught geography using Computer Simulation Package (CSP) and those taught with conventional method.

4. Is there any difference between the mean retention score of students taught geography using Computer Simulation Package (CSP)?

1.5 Research Hypotheses

From the research question, the following hypotheses were formulated:

Ho1: There is no significant difference between the achievement mean scores of students taught geography using Computer Simulation Package (CSP) and those taught with conventional teaching method.

Ho2: There is no significant difference between the achievement mean scores of male and female students taught geography using Computer Simulation Package (CSP).

Ho3: There is no significant difference between the retention mean scores of students taught geography using Computer Simulation Package (CSP) and those taught with conventional teaching method.

Ho4: There is no significant difference between the retention mean scores of male and female students taught geography using Computer Simulation package (CSP).

1.6 Significance of the Study

It is the hope of the researcher that the findings of this research will be beneficial to students, Geography teachers, school administrators, publishers and curriculum planners among others.

- To the students, Computer Simulation Package could help to reduce and avoid misconceptions by students that Geography is a difficult and an abstract subject. Computer simulation will help the students to form their own cognitive models about events and processes.

- To the teacher, it is hoped that computer simulation will help to reduce teacher's workload, burden of searching and monitoring a large class of students, it will assist them to teach practical activities that may be impossible, too expensive and time consuming.

- To the curriculum planners the findings of the study will also serve as guidance to the curriculum planners and textbook writers while giving appropriate examples and illustration on incorporating computer simulation in teaching and as a perfect tool for difficult concepts in Geography.

1.7 Scope of the Study

The study was limited to Minna Metropolis. Four senior secondary schools were randomly selected using SSII students, the concepts that were taught included Nigeria (The Regional Geography of Nigeria) location, position, size and political divisions in west Africa, the relief of Nigeria, the drainage of Nigeria, and the climate of Nigeria which was for the duration of four weeks.

1.8 Operational Definition of Major Terms

Achievement: This is the notable change in the student's performance as a result of their exposure to the specific programme of instruction.

Instructional material: These are objects utilized by the teacher to complement teaching and learning process.

Simulation: This is a special category of real things or a simplified operational model of a real situation that provides with a various participation in the varieties of role and events.

Computer Simulation Package: A self-developed computer simulation package software of the concept Nigeria (The Regional Geography of Nigeria).

CHAPTER TWO

REVIEW OF RELATED LITERATURE

2.0 Introduction

This chapter reviews the work of other people that are considered relevant to this study. Areas reviewed include the following:

2.1 Conceptual Framework

2.1.1 The Concepts of Science and Technology

2.1.2 Concept of Educational Technology

2.1.3 Instructional Technology Definition

2.1.4 Improvisation of Instructional Media in the Teaching and Learning Process

2.1.5 Importance of Education

2.2 Computer Assisted Instruction (CAI)

2.3.1 Computer Simulation

2.3.2 Types of Simulation

2.3.3 Classification of Simulation

3.3.4 Characteristics, Merits and Demerits of Simulation

2.4 The Concept of Nigeria

2.4.1 The Relief of Nigeria

2.4.2 Climate of Nigeria

2.5 Theoretical Framework on Simulation and Learning

2.5.1 Constructivism

2.5.2 Behaviorism

2.6 Empirical Framework on Simulation and Learning

2.7 Studies on Gender

2.8 Gender and Students' Academic Performance

2.9 Achievement and Retention

2.10 Ability Level and Students' Academic Performance

2.11 Summary of the Literature Review

2.1 Conceptual Framework

2.1.1 The Concepts of Science and Technology

No nation has been known to have developed, having an identity and a status without one form of technology or the other (Okah-Avae, 2003). Science and technology differentiates between the rich and the poor nations, and categorized the world into the first, second and third worlds. The place of science and technology as a tool for development of any nation is never in dispute (Chado, 2010; Usman, 2010). Science is the foundation upon which the bulk of present day technological breakthrough is built (Nsofor, 2009; Onasanya& Owosewa, 2011). The authors added that nations all over the world including Nigeria are striving hard to develop technologically and scientifically, since functioning of lives depends on science.

Science and Technology Education is a sure gate way to a scientific and technological greatness of African nations and Nigeria in particular (Akubuilo & Ozonchi, 2007). Competence in and a quality Science and Technology is a foundation of sustainable development of developing countries. This assertion had been supported by many Science Educators (Ema & Ajayi 2008, Nsofor 2010 & Usman, 2010) among others. The secret behind this assertion is that Science and Technology constitutes the bedrock for prosperity and

advancement for nations. In view of this assertion, Okah-Avae (2003) described technology as the cardinal factor that determines the quality of life of a people and the overall status of their nations.

To some individuals, the definitions of the concept of Science and Technology vary and it probably brings to mind many different pictures. According to Academic Press Dictionary of Science and Technology in Feynman (1999). Science is the systematic observation of natural events and conditions in order to discover new facts about them and to formulate laws and principles based on these facts. He also viewed science as an organized body of knowledge that is derived from such observation and that can be verified or tested by further investigation. In continuation any branch of this general body of knowledge such as Biology, Physics, Chemistry, and Astronomy as a science discipline (Feynman, 1999; Onasanya & Omosewo, 2011).

Sheldon (n.d) defined science as an intellectual activity carried on by humans designed to discover information about the natural world in which humans live and to discover the ways I which this information can be organized into meaningful patterns. A primary aim of science according to these definitions is to collect facts (data), and the ultimate purpose of the science is to discern the order that exists between and amongst the various facts. However, the study of science involves more than gaining knowledge. It is the systematic and organized inquiry into the natural world and it phenomena (Feyman, 1999). Science is about gaining a deeper and often useful understanding of the world.

Science according to STAN (1994) is a vital agent of social and political change in the economic and technological development of a nation. From the perspective of Webster's New Collegiate Dictionary (2010) "science is the knowledge attained through study of practice" or "knowledge covering general truth of the operation of general laws, especially as obtained through scientific method". According to these definitions, science refers to a systematic of acquiring knowledge, because the system uses observation and of course experimentation to describe and explain natural phenomena. The term science also refers to the organized body of knowledge people have gained using tat system (Webster's New Collegiate

Dictionary, 2006). Put it less formally, the term often describe any systematic field of study or the knowledge acquired from it. In contrast, Paul (2001) in Usman (2010) lamented that science is the merely a technique of a body of systematic knowledge; it is rather an attitude of processes of observation and reasoning with respect to the world.

In another dimension, Nwagbo (2005) in Usman (2010) defined science as an intellectual activity carried out by human designed to discover information can be organized to benefit human race. The primary aim of science according to him is to collect fact (data) to discern the orde than exist between and among the various facts. However, Ali (2006) in Umar (2011) contends that science is both process and product derived from experimentation. This means that science involves doing experimentations and laboratory related activities.

Owolabi (2004) in Adeosun & Ajulu (2011) defined science as an integrated part of human society. Its impact is felt in every sphere of human life. To him, science as a field of study has done a lot for mankind. Oguleye (200) in Onasanya & Omosewo (2011) described science as a dynamic human activity concerned with the working of our world. Therefore, from science flowed a stream of knowledge skills and inventions for the improvement of human life (Umar, 2011).

Technology on the other hand is defined as the knowledge of industrial arts that is increasingly evolving as the application of science for practical purposes (Okeke, 1993) in (Ema & Ajayi, 2008). More similarities than differences can be found between the concepts of science and technology. This is because; they both imply a process of thinking and a means of acquiring new knowledge (Akubuilo & Ozonchi2007). To them, a scientifically literate person is one who is able to retrieve, use, communicate and relate science and technology to the society. Such a person will be spontaneous in engaging in scientific dialogue/thinking and in imbibing major scientific and technological breakthrough.

Technology is often used as the genetic term to encounter instruments, machines and devices people develop and use in their lives (Ema &Ajayi, 2006). This implies that, technology touches our lives in so

many ways. The United Nations Scientific and Cultural Organization (UNISCO) (2005) in Ema & Ajayi (2006) defined technology as " The knowhow and creative processes that may assit people to utilize tools resources and systems to solve problems to improve the human conditions" (P.6).

Thus, technology according to above assertion involves the purposeful application of knowledge, experience and resources to create processes and products that meet human needs. In another dimension, Sharma (2008) stated that technology neither a mere machine or hardware nor a human-system or software, but is a combinations of all these. Sharma further contend that technology is the applications of science to make the world more efficient using industrial methods. In this case technology is the application and effective utilization of scientific knowledge in order to solve human problems. This statement is supported by Subair &Ashiru (2007) that technology involves a practical engagement, that is, the act of doing which is meant to solve human problems scientifically and systematically.

Going by all these definitions, Wambugu & Changeiywo (2008). Opined that, knowledge of science and technology is a requirement in all countries and all people globally due to the many challenges that are facing them. It is observed that these challenges include the emergence of new drugs resistant diseases, effects of genetic experimentation and engineering, ecological impact of modern technology, dangers of nuclear wars and explosions and global warming among others (Alsop & Hicks,2001; Miishi, Muni, Okumu, Mutai, Mwangasha, Omolo &Munkeleye,2004) in (Wambugu & Changeiywo, 2008).

At the other extreme, The Random House Dictionary defines technology as the "application of knowledge to practical ends, as in a particular field: educational technology" (Venkataiah, 2004) (p.2). Technology to Adaikwu & Agidagbo (2007) is that aspect of education which leads to acquisition of practical and applied skills as well as functional scientific knowledge. The authors further identified the objectives of science and technology as found in the National policy of Science and Technology (1986). They are as follows.

i.Increasing public awareness in science and technology of their vital role in national development and well- being.

ii. Directing science and technology efforts along identifying national goals.

iii. Promotion of the translation of science and technology results into actual goods and services.

iv. Creating, increasing and maintaining an indigenous science and technology base through research development.

V. Motivating creative output in science and technology

2.1.2 Concept Educational of Technology

According to Gbodi (1999), the importance of education media and resources to teaching and learning has now been grimly established as a crucial aspect of the curriculum. It is even now rated highly internationally especially in the aspects of teaching and learning.

Education technology has been defined by various persons, particularly, eminent educationist. For instance, Ogunranti et al (1982), define it as: a 'concept about how problems in human learning are identified and solved'. Similarly, Walter (1979) stated that Educational Technology is the systematic use and involvement of other organizational knowledge to the solution of the problems and tasks of education to produce intended goals. It focuses our attention of the various problems in education. It is the mainstream of visual instrumental resources because its prospect embodies the systematic and continuous application of learning principles to develop the most effective and efficient learning experience.

He further explained that education technology can be viewed as a product as well as a process. As a product, it consists of the use of audiovisual (AV) equipment (hard wares and soft wares) for the solution of problems in education, for instance, the use of instructional graphics.

In addition to sharing the above view, Abimbade (1999) went further to add that science teachers in many schools are often reluctant to conduct science practical. That lecture method is the most popular teaching strategy. This method is teacher centered as already observed. It is probably the easiest method of teaching available to any lazy and undedicated teacher, but to a subject like geography that is activity oriented and needs real instructional materials, it does not pay and the students are always the looser as they find it

difficult to comprehend concepts and features that should have been taught using graphic visuals, but were not used.

Many researchers have commented on the importance of methods employed in teaching, quality, and competency of teachers in teaching of integrated science in schools. One of such researchers, Awoniyi (1979), stated that new schools maybe bait, syllabuses revised, new leaching methods and instructional aids recommended, and new test books provided but in the end, everything depends on the quality and number, of teachers. There can no significant innovations in education, which do not have at their core a consideration of number, ability and approach to work of the teachers, materials in teaching process, while educational technology as a process, is the development of learning experience through the science of learning. Similarly, Balogun (1982) sees educational technology as "a process consisting of educational media like the chalk board, projector media, radio and television as well as method of organizing and effectively utilizing these media in the classroom". The perception of some of the authors above, see educational technology as the systematic approach to the teaching and learning process that involves wise use of the media for effective results that is meeting the needs of the learner. The place of educational technology in effective teaching and learning can therefore not over looked for example, Halbert (1944) asserts that students prefer visual presented information and are more likely to attend to visual stimuli that auditory stimuli presented simultaneously. He however continued by saying that non-verbal illustration content should be integrated with verbal content to enhance realism of concrete situation. Having this in mind it is very clear that education technology is indispensable to the educational process especially to the young learners in secondary schools.

Building upon the opening quote of this from Rufai (2007) whose claims that "The purpose of education is not to impart knowledge, but also to teach how to learn, solve problems and synthesize the old and new" (p.3). Here, Martivonic, Magliaro & Pugh (2009) apply a notion that, "the existing and emerging technologies (i.e., Vidio conferencing ,Smrt Board, Vidio cameras, Laptops New digital Projectors, and Integrated Webcams) to enable students and teachers from all academic streams and groupings to create

authentic forums for the exchange of ideas, thus, providing them with noval educational opportunities through specific learning events" (p.2).

Today, different interpretations emerge with regard to the multitude number of definitions of educational technology ranging from simple definition to complex ones as viewed by numerous scholars, experts and professionals. The concept of educational technology means different things to different people. In support of this, Adeosun & Ajulo (2011) claims that the concept of educational technology has been accorded different meanings, which were later synthesized into its current generally, accepted definitions which see the concept as the application of the system approach to find out educational problems and solving these problems.

According to Ema and Ajayi (2008) educational technology is the media borne out of communication revolution which can be used for instructional purpose alongside the teacher and the chalk board. This definition has a flow being it emphasizes the product of machine and teacher. The author further contends that an instructional material continues to reflect in teachers understanding of the term educational technology is the integration (or weaving together) of variables (or factors) in order to find out problems involved in the process of acquiring knowledge, skills and habits and solve these problems. To these definitions, educational technology deals with the integration of variables of variables to find out the problems of human learning and solve these problems.

"There have been a number of definitions of educational technology produced by different bodies and organizations to (Ema &Ajayi,2008; Venkataih,2004). Four of such include:

i.The Department of Audio-visual Instruction Commission on Definition and Terminology has this definition: *Educational technology* is that field of educational theory and practice primarily concerned with the design and use of massages which control the learning process" (Venkataiah,2004) (p.2)

ii. Educational technology is the development, applications and evaluation of system, techniques and aids to improve the process of human learning (Council of Education Technology for the United Kingdom).

iii. Educational technology is the application of knowledge about learning and the condition of learning situation (National Center for Programmed Learning, UK).

iv. The Presidential Commission on Instructional Technology offer the following definition: "Educational Technology is the systematic way of designing, carrying out (implementing) and evaluating the total process of learning and teaching in terms of specific objectives, based on research in human and non-human resources to bring about more effective instruction" (Venkataiah,2004) (p.2).

Therefore, in support of the above defilations produced by different organizations and bodies of the United Kingdom and United States of America, Mangal and Mangal (2010) further contends that educational technology is not limited to the use of audio- visual aids and does not symbolize merely educational hardware such as the sophisticated gadgets and mechanical devices used in education. To this end, educational technology may be learning experience. This is in line with what Punie (2007) in Martivonic, Magliaro & Pugh (2010) whose states that " it is almost impossible to imaging a future learning environment without some sort of Information and Communication Technology, either at the forefront or in the background" (p.186). However, in Punie's vision, technology-enable learning is "one of the key applications for the development of the information society" (p. 195).

2.1.3 Instructional Technology Definitions

Like every concept, instructional technology means different things to different people. To some people, instructional technology is the utilization of a variety of teaching devices to improve students' learning. People usually think of computer and computer software when referring to instructional, but the reverse is the case, the situation is much more than that. Instructional technology is not limited to computers in the classroom situation. Instructional technology describes all tools that are used in teaching –learning process, those that were discovered and other electronic tools that are not yet to discover for teaching and learning.

The above assertion finds from Froelich (2006) in Seels and Richey (1994) who asserted that over the years, instructional technology has been equated with television, computers, and other related hardware

that the teacher and the students uses in the classroom. To the authors, and instructional technology is how one leverages these tools in conjunction with sound pedagogy to produce an appropriate and effective teaching-learning environment. In the field of education, instructional technology is the theory and practice of design, development, utilization, management, and evaluation of processes and resources for learning (Seels &Richey, 1994). Based on this definition, instructional technology may be described as a systematic way of designing, developing, and evaluating the total process of teaching and learning.

It has been emphasized that instructional technology is a growing field of study which uses technology as a means to solve educational challenges, both in the classroom and in distance learning environment. Gokum, Shetu, Maikano and Ibrahim (2009) argue that there are three types of learner interaction learner-content, learner instructor, and learner-learner interactions). In view of Moore's argument, several philosophical views have supported the relationship between Instructional technology and these types of interaction. Ema and Ajayi (2008), Sharma (2008) and Mangl (2010) advocates the idea that educational technology covers instructional. To them, educational technology includes instructional technology and the field study in human teaching and learning. So, educational technology is broader than instructional technology and the other is learning technology. In the education industry, the term "instructional technology "is frequently used interchangeably with "educational technology".

2.1.4 Improvisation of Instructional Media in the Teaching and Learning Process

The concept of improvisation has been defined variously by several researchers in the field of science education (Akinboyewa, 1992; fajola, 1992; Maduabum, 1996; Olagunji, 1998) in Nsofor (2009). The variation in the definition of improvisation also finds support in (Johnson, 2000; Nsofor, 2009 Nbina, Viko & Omosewa, 2011; and Abdulkadir & Olaitan, 2011) among others. Improvisation is seen as "many splendored thing". The term is applied very broadly to whole field of information, a subject pertaining to inventive people, innovative act and novel products using special techniques, crude, rural or mechanical or creativity. To this definition, improvisation is synonymous with construction or creativity. To this

definition, improvisation encompasses so many materials, locally produced or imported that may result to effective performance in teaching. According to Abibakar & Olaitan (2011) improvisation is the making of substitutes from local materials found at home or school premises when the real or original material is not available. In support of this, Olagunji & Abiona (2008) claim that there are varieties of resources, which the science teacher can readily use to enrich learning, and this resources should be provided in quantity and quality for effective teaching1ear11iflg process. However, Bomide (1986) in Abdulkadir & Olaitan (2011) saw improvisation as a role substitute and a role simulation. He further explained that it serves as substitute when the original material is slightly modified in order to perform novel function in an experimental set up, such as glass cup substituting beaker, or a building model substituting a normal building. To this explanation to improvise is to substitute one thing with the other to attain the same instructional objectives. Ogunbiyi, Okebukola & Fafunwa (1990) in Nbina, Viko & Birahil (2011) tired the above definition by saying that improvisation is the act of s1bstitutiflg for the real thing that is not available.

Improvisation according to Kamoru and Umeano (2006) is the act of using materials obtainable from the local environment or designed by the teacher or with the help of local personnel to enhance instruction. However, Ihiegbulem (2007) in Nbina, Viko & Birabil (2011) opined that improvisation is the act of substituting for the standard equipment or instructional material not available. From these assertions, improvisation7 may involve the construction of locally available and less expensive instructional materials to enhance teaching and learning. Furthermore, Nbina, Viko & Birabil (2011) in their remark declare that improvisation serves the following purposes in education.

- Reduces the money spent on the purchase of equipment in educational institutions;

- Ensures the realization of lesson objectives;

- Helps in solving the problem of lack of equipment in educational institution;

- Gives room for a teacher to demonstrate his/her creative skills

- Gives room for the use of cheap-local materials as alternatives to the expensive foreign ones;

- Encourages students towards the development of creative abilities;

- Enables teachers to think of cheaper, better and faster methods of making teaching- learning process easier for students;

- Affords students the opportunity of becoming familiar with resources in their environment.

In their opinions, researchers such as Ogunleye (2000), Okonkwo (2000) Mkpanang and Obioha (2006) in Onasanya and Ornosewo (2010) reported that there were inadequate resources for the teaching of science subjects in secondary schools in Nigeria. They further stated that where there were little resources at all, they are not usually in good conditions, while the few that were in good conditions were not enough to go round in the class or school. Hence there is need for improvisation. Experience over the years has shown that the inadequacy of teaching materials causes confusion to the classroom teachers. To reduce the inadequacy and such confusion, Asokhia (2009) opined that the confusion faces by the classroom teachers in the cause of instruction can be resolved through the teacher's ingenuity of improvisation. This is in line with the view of Onasanya et al. (2008). Adebimpe (1997) and Aguisiobo (1998) in Onasanya and Omosewo (2010) who noted that improvisation demands adventure, creativity, curiosity and perseverance on the part of the teacher. "An effective learning situation will require the use of teaching aid" (Asokhia, 2009) p.80. And if teachers bear this in mind, they will see the need to create atmosphere conducive to [earning. In fact, there is therefore inadequate science equipment in educational institution at almost all levels in the country. For instance, a considerable number of researchers have observed the ineffective teaching of Biology in educational institutions in Nigeria due to lion-use of science equipment for teaching (Nsofor, 2010 & Usman, 2010).

In their effort to raise the level of teachers' ingenuity, Omosewo (2008) and Akinsola (2000) in Onasanya and Omosewo (2010) considered human factors such as the teacher's professional commitment, creativity, mechanical skills initiative and resourcefulness. They found that many Nigerian teachers were aware of

possibility of improvisation but many exhibited poor attitudes of improvisation. They also noted that very few teachers practice improvisation while majority depends on imported equipment and claim that improvisation is time-consuming and fund depleting. The authors also rioted that students too, possessed little or no interest in improvisation. Therefore, the objectives of any educational process determine the contents, methods and materials needed for achieving such objectives (Onasanya and Oniosewo, 2010). These authors further claimed that the materials used for enhancing instructional effectiveness are aspects of media employed for achieving the instructional objectives. Adekola (2010) remarked on instructional media as important elements of teaching and learning activities. In his effort to formulate a concrete meaning of instructional media. Aclekola (2008) saw instruction as a deliberate arrangement of experiences within the learning space. Classroom, laboratory, workshop etc. aimed at helping learners achieve desirable changes in behaviour or performance. Media according to Vikoo (2008) in Adekola (2010) are gadgets related to television, satellite communication, computer and other sophisticated modern technologies.

From the above Opinion one may conclude that instructional media are teaching instruments that incorporates both the electronics and non-electronics equipment aimed at helping the teacher and students achieve a specific objective. Teaching can only he effective when adequate and relevant instructional materials and resources are used (Sunday & Joshua 2010). Many educators and researchers have reported the importance of' instructional media and material resources in teaching (Erna & Ajayi, 2008; Nsofor, 2010 Usman, 2010: Sunday & Joshua, 2010). Teaching and learning could not be effective without adequate and relevant use of instmctioia1 materials.

Bassey (2002) in Onasanya and Omosewo, (2011) described instructional media as system components that may be used as parts of instructional processes which we used to disseminate information message and ideas or which make possible communication in the teaching-learning process. It is well known among educators that educational experiences involving the learner actively participating in concrete examples are retained longer than abstract experiences (Abduiraheem & Al-Rahane, 2005). They also claimed that

instructional media add elements of reality by providing such concrete examples. Instructional media as described by Adekola (2008) in Adekola (2010) means all human and material resources which appeal to the learner's sense of seeing, hearing, smelling, tasting, touching or feeling and which assist to facilitate teaching-learning, These materials are vital to teaching-learning process (Sunday &. Joshua, 2010). In view of this Scanlan (n.d.) maintained that instructional media encompasses all materials and physical means an instructor might use to implement instruction and facilitate students' achievement of instructional objectives. To Scanlan's assertion, instructional media may include traditional materials such as chalkboads, hand-outs, charts slides, ovetheads, i'eal objects, and video tape or film, as well as newer materials and methods such as compmers, DVDs, CD-ROMs, the Internet, and interactive video conferencing. Abimbade (1997) in Sunda and Joshua (2010) reported that instructional resources in teaching and learning make students to learn more and retain better what they have been taught. To him it promotes and sustains students' interest.

In finding the reason why use instructional media? Scanlan (n.d.) stressed that A good aid is like a window, it should not call attention to itself, and it should just let in the light." In general, you should use media whenever, in your best judgment, it can the imitate learning or increase understanding of your material, Of course, communicating to facilitate learning can be a challenging process, often requiring creative efforts to achieve a variety of implicit instructional goals. Among the implicit goals that media can help achieve are the following:

- Attracting attention.

- Developing interest.

- Adjusting the learning climate

- Promoting acceptance of an idea

In a similar fashion, however, St. Cloud State University (1997) in Scanlan (n.d.) identified eight steps that need to be considered in the implementation of instructional media. The basics steps will help the implernenter achieve his/her explicit and/or implicit goals. It is of greatest importance. For the user to apply the steps in the instructional development process to choose and apply the appropriate media. The steps are outlined below:

1. Review instructional goals, objectives, audience and instructional strategy

2. Determine the best medium for your lesson components

3. Search for and review existing media/materials

4. Adapt existing media/materials if necessary

5. If new media/materials need to be developed:

a. Determine format, script, visuals, etc.

b. Draft materials and media

c. Check for clarity and flow of ideas

6. Conduct formative evaluation

7. Implement/apply

8. Evaluate/revise

In considering the instructional development outline above, Scanlan (n.d) lamented that for you to determine the best medium for your lesson components is among the most confusing aspects of the process. Models for media selection range from simple procedures or algorithms to complex theoretical schemes. Some are based on the communication channel' being used (audio, video, etc.) or the characteristics of the media itself. Other emphasizes the learning outcomes being addressed, while still others focus on learner

attributes or educational theory or the teaching-learning process. In line with this however. Strauss and Frost (1999) in Scanlan (n.d.) identify nine key factors that should influence media selection: institutional resource constraints, course content appropriateness, learner characteristics, professor attitudes and skill levels, course learning objectives, the learning relationships, learning location, time (synchronous versus asynchronous), and media richness level. Source: Adapted from Strauss and Frost (1999) in Scanlan (n.d.). In continuation, Reiser and Dick (1996) in Scanlan (nd.) distill these nine factors down to three major criteria for selecting instructional media: practicality student appropriateness, and instructional appropriateness.

1. **Practicality:** Is the intended media practical in that the media is available, cost efficient, time efficient, and understood by the instructor.

2. Student Appropriateness: Is the intended media appropriate the developmental and experiential levels of the students?

3. Instructional Appropriateness: Is the intended media appropriate for the planned Instructional strategy? Will the media allow for the presentation of' the proposed lesson in an efficient and effective manner? Will the media facilitate the students' acquisition of the specific learning objectives?

On the basis of practicality, Gagne, Briggs, and Wager (1992) in Scanlan (n.d.) suggested that instructors should address the following series of practical questions before implementing any instructional media:

1. What size of group must be accommodated in one room on a single occasion?

2. What is the range of viewing and hearing distance for the use of the media?

3. How easily can the media be "interrupted" for pupil responding or other activity and for providing feedback other learner?

4. Is the presentation "adaptive" to the learners' responses?

5. Does the desired instructional stimulus require motion, color, still pictures, spoken words, or written words?

6. Is sequence fixed or flexible in the medium? Is the instruction repeatable in every detail?

7. Which media provide best for incorporating most of the conditions of learning appropriate for the objective?

8. Which media provide more of the desired instructional events?

9. Do the media under consideration vary in 'affective impact' for the learners?

10. Are the necessary hardware and software items obtainable, accessible, and storable?

11. How much disruption is caused by using the media?

12. Is a backup easily available in case of equipment failure, power failure, Him breakage, and so on?

13. Will instructors need additional training?

14. Is a budget provided for spare parts, repairs, and replacement of items that become damaged?

15. How do cost compare with probable effectiveness?

Similarly, Scanlan (n.d.) recommends that you proceed by considering what you already know about the media available and then begin asking yourself a series of questions that eliminate what isn't feasible or possible. According to the college typical questions that can help you decide on the appropriate media include the following.

- What are the most important tasks or requirements? What are my learning outcomes?

- Based on the learning outcomes, what are the most applicable media attributes?

- Are there any learning materials already available that I might be able to use?

- Should I consider using more than one technology or medium? Will they augment one another or detract from one another?

- Can student location, work schedule or other factors of access be addressed by the use of available technology?

- Where will I be teaching the material? What are the environmental factors'?

- Do I have the skills needed to produce effective media? Do I have the resources to learn?

- Can the medium be produced by the time it is needed?

- Can the production, maintenance and operation costs be afforded?

- Does the medium fit the policies/programs at the college?

- Is the medium a practical choice given its environment?

- Is the technology I want to use readily available? Is it easy to use'?

- What is the main benefit to me of using the technology?

- What are the benefits for students?

For effective usage of instructional media, however, Adekola (2010) advocate that they are often classified into various classes, so that relevant media would be adopted for a particular situation. Therefore based on psychological criterion, Romiszowski (1995) in Adekola(2010) classified media as shown in table below.

Table 2.1: Classification of Media

Class of Media	Sensory Channel	Instructional Media
Auditory	Materials Sense of hearing	Radio
Visual materials	Sense of vision	Still pictures
Audio-visual materials	Sense of hearing and vision	Television
Tactile materials	Sense of touch	Braille

Source: Adapted from Rorniszowski (1995), Vikoo (2003:140) in Adekola (2010) According to Adekola (2010) media can also be classified into Durable and Non-Durable Media. To him, durable materials are those that last for very long time. Such media include Computer, Projector, Television, Radio; Camera etc. the materials mentioned are hardware and high technology. Non-durable materials on the other hand, as the name implies are materials that have little life span or those that cannot be stored for a very long period of time. These include; pictorials and graphic representations such as posters, maps. Charts, bill boards, sketches, cartoons, graphs and drawings, while projected pictures include filmstrips. Transparencies motion pictures etc. (Erna and Ajayi, 2006; Adekola. 2010; Nbina. Viko & Birabil, 2011; & Onasanya & Ornosewo, 2011).

Added to the above, there are also **Audio-visual materials**. To Ema & Ajayi (2006) and Adekola (2010) these are materials that appeal to the sense of seeing and hearing, and they assist the learner to listens to the the sound and see the action. Examples include video, television. Computer motion pictures etc. They went further to classify instructional media according to **Print and Non-print** and they include posters, maps. Charts, graphs etc. According to the same authors, in media classification there is also **projected and Non-projected Material**. Projected materials according to Ema and Ajayi (2006) are the materials that require electricity for operation. To Adekola (2010) are those that require equipment especially projectors to function. Examples of projected media as described by Nzeneri (1996) in Adekola (2010) include slide and filmstrips, video cassettes, transparencies, motion pictures, computer software etc. Non-

projected media on the other hand are those that do not require any other equipment to function (Adekola, 2010), They are pictorials which appeal to the sense of sight and do not require light source for showing them (Erna & Ajayi. 2006). To them, non-projected media enhance understanding in learning; they are available, cheap and easily appealing. Examples of such materials include poster, flash cards chards pictures, models, specimens, maps and globes etc. However, Vikoo, (2003) in Adekola (2010) believed that the classification of instructional media should be based on some criteria. Such criteria he identified include:

- The degree of expertise/technical skills needed for the production.

- The nature of the material (Media).

- The physiological parameter or sensory modality needed.

- Whether or not projection is involved.

- Place produced.

- Miscellaneous characteristics. The author lamented that, based on the criteria; instructional media can be classified as low and high technology, print and non-print media.

2.1.5 The Importance of Education

Geography which is one of the sciences is highly needed for our nation's technological breakthrough. Any nation that wishes to achieve self-reliance must engage in Science and Technology Education. Jegede (1984), stated that the current development in Science and Technology have so greatly affected the lives of every human being that to be ignorant of the basic knowledge of these developments is to live an empty, meaningless and probably unrealistic life. Geography is one of the science subjects and the center of all technological activities. To develop a sound basis for modern technology, the study of geography

necessary. We live in a scientific and technology age that every citizen needs a basic acquaintance with what science is all about if he is to live intelligently and productively in forces. A nation with scientifically uneducated citizenry cannot be expected to make any reasonable technically based political decisions on such issues as nuclear energy and atmospheric pollution because of the rudimentary tools to grasp the various arguments (Greenburg and Mallow 1983).

The rate of advancement of any nation depends to a large extent on the rate of its technology development. Countries like United States, United Kingdom, and USSR are great today because of the advancement they have made in technology. We are living in a world where science and technology have become an integral part of the world's culture and any country that overlooks this significant truism does so at the risk of remaining backward in a technology fast moving world (Fafunwa, 1974); Awokoya, 1979; Bahah, 1983; Yolye, 1982; and Okeke, 1986.

2.2 Computer Assisted Instruction (CAI)

The search for instructional strategies that can improve students' performance has clearly shown that computer based instructional strategies have been found to improve student's performance more than traditional teaching method. (Yaki, 2011 and Gambari 2010). In addition, it is reported that student's abilities and skills in scientific investigation are greatly enhanced by the use of computer (Gambari 2010). Computer has a wide application in education. Computers Based Instruction (CBT) and Computer Based Instruction (CBI) are the broadest terms and can refer to virtually any kind of computer used in educational settings, including drill and practice, tutorials, simulations, instructional management, supplementary exercises, programming, database development, writing; using word processors, and other applications. Nwoji (2002 in Ajayi 2003) noted that computer is among the newer generation education technologies in developing countries such as Nigeria. Nwoji (2002) acknowledge three broad ways by which computers contributes to teaching and learning situation. These ways are namely: mass instruction, individualized instruction and group learning

- Mass Instruction: This is used during normal class lesson. Here it is used to give instructions to large groups in the class. It gives ways for interactive sections among the students.

- Individualized Instruction: This ways can be used for students by giving then structured questions thereby allowing the students to access the computers contributes to conferencing and can even perform mathematical and logical analysis of data.

- Group Learning: When students work in groups, they stands to benefits a lot this is because they will be getting feedback from one another and will contributes to a wide range of group activities. Batey (1986) viewed Computer Assisted Instructed (CAI) as a narrower term and most often refers to drill- and practice, tutorial, or simulation activities offered either by themselves or as supplements to traditional, teacher-directed instruction. Computer Aided Instruction (CAI) is an application of computer software package in instructional process. It is the integration of hardware and software (Alsultan & Abdullahi, 2006). Thus, Computer Aided Instruction (CAI) represent some aspects of reality that one is unable to present directly to the learner; because it present image, sound, and action. Abimbade (1998) defined CAI as an automated instruction in which the computer is used to deliver instruction to the learner through interactive process.

- Many educational computer programs are available online and from computer stores and textbook companies. They enhance teacher instruction in several ways. Computer programs are interactive and can illustrate a concept through attractive animation, sound, and demonstration. They allow students to progress at their own pace and work individually or problem solve in a group. Computer provides immediate feedback, letting students know whether their answer is correct. If the answer is not correct, the program shows students how to correctly answer the question (Patric, 2003). Computer –assisted instruction increases motivation by providing a context for the learner that is challenging and stimulate curiosity. Activities that are intrinsically motivating also carry other significant advantages such as personal satisfaction, challenge, relevance, and promotion of a positive on lifelong learning (Kinzie, 2000). Using Computer Aided Instruction (CAI) to teach has a number of advantages. It is simple in terms of the

complixity of laboratory experiments and inexpensive when considering can serve to disseminate necessary information to a large group of learners. Computer Aided Instruction (CAI) is safe in comparison to using chemicals and other potentially dangerous material and they are practical in terms of administration skills it's also often less time consuming and unlike laboratory experiment Computer Aided Instruction (CAI) can be played back as many times as necessary . In addition to these important contribution studies of science education often reported positive effect from computer –assisted learning in terms of academic achievement (Cekbas et al., 2003; Gance , 2002) in (Efe and Efe, 2011). In using computer aided instruction, (CAI) student learn fast by seeing and hearing sound (Davis, 1974; Kelly, 1976; & obianwu 1994) in (Patrick & Ezenwa, 2000). Any instructional process which evokes the involvement of as many of the human sensory organs tends to facilitates the permanency of learning (Nsofor, 2010),

- Onasanya and Adegbija (2007) identified some of the ways the computer can be effectively used in instructional tools, as a tool for providing payrolls for teaching and Non-teaching staff, as a managing administrative and library records tools, and as a tool for automation of some simple level of instruction.(drill and practice tutorial, animation, simulations, demonstration etc). Actually, the use of computer in education is an extension and a rather sophisticated level of programmed instruction.

2.3.1 Computer Simulation

What is computer? Computer is an electro-mechanical machines which is used as an instructional system in the spheres of education to accept data, process and give output automatically less energy waste. Brightman (1986) defined a computer simulation as a combination of hardware device and programs assembled to accomplish some specific tasks. Computer is a technological information processing machine which can be used to give instructional events that are designed, developed and produced for an individualized learning situation. The computer has been adopted and adapted for this purpose because it can perform numerous mathematical and logical operations without the intervention of a human operator

during the run. Computer has been found to be the most suitable, reliable and versatile medium for individualizing instruction.It is able to deal simultaneously with large number of student on individual basis and this tends lower the cost, in the long run (Becta 2005). The term simulation is used in different ways by different people. Simulation is defined as the process of creating a model (i.e., an abstract representation or facsimile) of an existing or proposed system (e.g., a project, a business, a mine, a watershed, a forest, the organ in your body)in order to identify and understand those factors which control the system which and/or to predict (forecast) the future behavior of the system. Almost any systems which can be quantitatively describe using equation and/or rules can be simulated. Simulation is the imitation of the operation of a real-world process of a system over time. In a broad sense, simulation is defined as an abstraction or simplification of a "real-life" situation or process. Typically a simulation is defined as a model of a real-world environment, usually with the facility, for the user to interact with the environment (Thurman, 1993). Thompson, Simonson and Hargrave (1996) defined simulation as a representation or a model of an event, objects, or some phenomenon. In science education, computer simulation according to Akpan and Andre (1999) is the use of computer to simulate dynamic system of object in a real or imagined world.

Computer simulation gives students the opportunity to observe a real world experience and interact with it. Simulations are useful for simulating labs that are impractical, expensive, impossible, or too dangerous to run (Strauss and Kinzie, 1994). Simulations can contribute to conceptual change (Zietsman, 1986; Stieff, 2003); provide tools for scientific inquiry (Mintz 1993; White and Frederiksen, 2000; Winschitl, 2000; Dwyer & Lopez, 2001) and problem solving experiences Alessi and Trollip (2001) provided the most comprehensive definitions of computer simulation "In an educational context, simulation is a powerful technique that teaches about some aspect of the world by imitating or replacing it. Students are not only motivated by simulation, but learn by interacting with them in a manner similar to the way they would react in real situations. In almost every instance, a simulation simplifies reality by omitting or changing details.

In this simplified world, the student solves problems, learns procedures, comes to understand the characteristics of phenomena and how to control them or learns what actions to take in different situations. On other hand, scholars from constructivist pedagogy (Wilson and Jonassen, (193), (Harper, 2000) describe situations as a simulated real life scenario displayed on the computer in which the students play an authentic role carrying out complex tasks. From this point of view, simulation should reflect the complexity of the real life so that they learn complex skills in authentic problems or inquiries such as Nardoo, and Bio World (Lajoie, Lavigne, Guerrara and Munsie 2001). In each case, the purpose is to help the student build a useful mental model of part of the world and to provide an opportunity to test it safely and efficiently.

A review of the literature reveals that the definitions and characteristics of simulation micro-worlds, games and desktop virtual realities may heavily overlap or even be synonymous as well as remain distinct, depending on their design and most importantly how they are used in a learning interaction. In order to present a rationale for this study. Closely related terms need to be clarified. Therefore, the author finds it necessary to distinguish between simulation and those other media to help readers understands the reasoning on labeling the tool used in this study as "simulation software."

What is computer simulation? Computer simulation can be considered as an experimental approach for studying certain functional properties of a system by experimenting with an appropriate computer model rather than with the real apparatus or the system itself. It can also be said that computer simulation (or "sim") is an attempt to model a real-life or hypothetical situation on a computer so that it can be studied to see how system works. By changing variables in the simulation, predictions may be made about the behavior of the system. It is a tool to virtually investigate the behavior of the system under study. It is basically an experimental methodology using the power of a computer to process and analyze the large amount of data involved in a problem which otherwise would be extremely difficult to handle.

The problem of education in Nigeria and other developing countries among others is inadequate funding. Certain concept especially in geography cannot be taught by the physics laboratory experiment due to lack of facilities and materials in the laboratory, hence computer simulation provides an efficient and an economical way to conduct such practical activities. In a simulation, the motivation level is normally increased because the interactive experience is so new and different. Comprehension is also augmented because the simulation help student develop very personal relationship with the abstractions. The true beauty of simulation however, is the interaction of motivation and comprehension. As students get deeper into the simulation and alternate and the reality becomes their reality, they become more interested in the experience and their motivation level rises and as their motivation level rises, students understands more and more of the subject matter. In fact, comprehension starts growing exponentially, resulting in even higher levels of motivation. Thus, motivation and comprehension becomes fuel for each other, and students become more engaged in the learning experience. When we engaged in new learning that includes a high level of relevant context (such as simulation), there is a greater likelihood that this information will be deeply encoded in memory when information is deeply encoded, it is more easily activated in the brain – leading to better memory for the information and a greater likelihood that it will be recalled. Also, high context learning creates connecting within their brains that can rarely, if ever, be accomplished through conventional teaching techniques. Consequently, the learning has a greater impact, plus the new knowledge and skills are retained much longer.

The time devoted to simulation does not reduce content learning. Instead, students learn just as much of the traditional contents in a course, while making additional learning through the simulation experience. Other researchers have focused on critical benefits of the simulation approach to teaching political science. Simulation accommodate various learning styles (Fox and Ronkowski 1997), generate enthusiasm for the subject matter (Karbo and Lantis 1997), as well as improve understanding and retention of knowledge (Smith and Boyer 1996). It is similar to the laboratory experiment conducted by physical scientist to gain insight into the existing theory and to teach hard concept or concept whose apparatus is not available with

the added advantage of lower cost, shorter cost, shorter time, smaller risk and greater flexibility (Lois 1984) Computer simulation aids learning, design, prediction, and evaluation of alternative quickly, cheaply and harmlessly. (Mayr 1991) Slot (2002) defined four key elements of inquiry curriculum that may benefit from computer simulations: make science accessible, make thinking visible, help students learn from each other, and help students develop autonomous learning.

Software Simulation: Simulation package are designed for the purpose of bringing laboratory facilities to the door of the students. (Aotani, 1997). Simulation can be used in distance education (Lara & Alfonseca, 200; Mclsaac and Gunawardena, 1996). Software companies offer online simulations. Constant improvements are being in simulation packages to make the whole experience nearer to reality (Aotani, 1997).

2.3.2 Types of Simulation

Simulation: Simulation resembles games in that both contain a model of some kind of system, and learners can provide input and observe the consequences of their actions. According to Gredler (1996) the deep structure of simulation and local resources differs in three important ways:

(1) Instead of attempting to win, participants in a simulation are executing serious responsibilities with associated consequences and privileges;
(2) The event sequence of a local resources is typically linear, whereas, a simulation sequences is nonlinear; and
(3) Rules in local resources can be imaginative and need to relate to real-world events, whereas overtime and reflect authentic casual processes (i.e., the relationship most be verifiable).

Computer simulation is a computer operated version of real-world objects or processes. They may be presented in 2-dimentional, text-driven formats or increasingly 3-dimentional, multimedia format Computer simulation can take many different forms, ranging from computer renderings of 3-dimentional geometric to highly interactive computerized laboratory experiment. Virtual Reality (VR), on the other

hand, is a technology that allows students to explore and manipulate computer-generated, 3-dimentional multimedia environment in real time. One form of VR is desktop VR (DVR), which uses an interactive computer-based, multimedia environment in which the user becomes a participant with computer in a "virtually real" world (Pantelidis, 1993). DVR has the potential to enhance and improve learning by enabling the user to interact with the environment. DVR environments are presented on an ordinary computer screen and are usually explored by keyboard, mouse, wand, joystick or touch- screen. Web-based "virtual tour" are an example of a commonly available DVR format. One of the major methodologies used in DVR is that of simulation and modeling (Van Weert, 1995).

Educational computer simulation is based on dynamic interactive between a learner and a computer program and a computer program and may be defined as that part of the modeling process involving the learner's execution of a model. The learner experiments with the simulated phenomenon by observing and analyzing the interactions between him/herself and the modeled phenomenon. In simulation systems, the learner enters a powerful learning environment and engaged in a cycle of expression, evaluation and reflection. With design changes, simulation- based programs can become VR-based programs. Thomas and Hooper (1991) developed a useful taxonomy of uses for simulation and evaluated the effectiveness of simulations with respect to these uses. The first category, experiencing, describes cases in which simulations precede formal instruction and are used to set the stage for future learning. Experience is useful for providing motivation, providing concrete example, providing an organizing structure and exposing misconception. The second taxonomic category is informing. The use of computer simulations is simply for the delivery of information and few learning benefit were found for student using computer simulation in this manner as compared with the use of computer tutorials, or direct instruction. The third category reinforcing, is described as the strengthening of leaning objective. The criteria for simulation classified as being used for reinforcing is that they direct the student to apply existing knowledge in the same context it was learned. As with informing, few learning benefits were found for students using simulations in this manner. Using simulations to give initial exposure to students about a concept (experimental) and using

computer simulation to integrate knowledge and simulate problem solving behaviors (integrating) seem to be the two most promising classroom applications.

2.3.3 Classification of Simulation

Alassi (2000) categorized simulation into the following four different types (a) physical simulation, in which a physical object such as electric cell is display on the computer screen, giving the student an opportunity to manipulate it and learn about it; (b) procedural simulations, in which simulated machine operates so that the student learn the skills and sections needed to operate it; (c) situation simulation, which normally give students the chance to explore the effects of different methods to a situation; and (d) process simulation, which is different from other simulation in that the student neither acts as a participant (as in situation simulation) nor constantly manipulates the simulation (as in physical or procedural simulation) but instead selects values of various parameters and then watches the process occur without intervention. Similarly, De Jong & Van Joolingen (198) divided simulation into two types: (a) conceptual simulation which hold principles, concepts and facts related to the class of systems being simulated and (b) operational simulation including sequences of cognitive and non-cognitive operations that can be applied to the class of simulated systems. Conceptual simulation can be altered into a more operational simulation (game-like) adding specific goals (De Jong et al., 1998).

Greler (1996) proposed two categories of simulation (a) experimental simulation, which establish a particular psychological reality and put participant in defined roles within that reality and (b) symbolic simulation in which the behavior that is simulated is usually the interaction of two or more variables over time, and the learner can manipulate these variables in order to discover scientific relationships, explain or predict events or confront misconceptions (Harper, Squire & McDougall, 2000). Students using a symbolic simulation manipulate the virtual environment from outside of the simulation (Gredler, 1996). The presentation of reality is usually mediated through a symbol system, such a graphs of output or diagrams of processes. Students using symbols simulation maintain an advantage point that is more

detached than the experiential simulation. Additionally, the representation of reality is more abstract (Gredler, 1996). The simulation used in this study falls in to both the conceptual and symbolic category. On one hand; the simulation holds principles, concepts and facts related to the waves that are being simulated and the mathematical operations behind each processed output according to the input variables. On the other hand, students can manipulate these variables in other to discover the relationships between amplitude, reaction and forces, which assist them to explain or predict even.

2.3.4 Characteristics, Merits and Demerits of Simulation

Simulation according to (Harper, Taranto, Edwards & Daily, 2000), has been used in education and training environments for many years but it is only in the recent literature that the characteristics of simulation have been clearly defined. There seems to be a general agreement that the goal of simulation must be to provide interactive experiences mimicking the real world as closely as possible. It has been noted by Harper et al. (2000) that "the key distinguishing feature of simulation designed for educational purposes is that they make use of a model represent some event or process which the user can interact with and manipulate during their exploration within a learning landscape that presents information in a multi-representational format." The need for interactivity, active engagement and navigational support in simulation has been noted as a significant characteristic that contributes to the educational outcome of such tools. Additionally, an important characteristic of a simulation is its validity. Different types of validity can be distinguished. Content validity expresses the degree in which the constructs, knowledge and skills the learner has to use have to use/develop in a simulation environment resemble the ones that has to use in the real world while both traditional and laboratory activities and simulation are of inquiry which engage the learner in the process of observing, hypothesizing, experimenting and forming conclusions, computer-simulated experiment, as inquiry tools, are considered by some authors to be superior to conventional laboratories (Mintz, 1993). Computer simulations give students the opportunity to observe a real world experience and interact with it. Simulations are useful for simulating laboratories that are impractical, expensive, impossible, or too dangerous to run (Strauss and Kinzie, 1994). Simulation

can contribute to conceptual change (Zietsman; Stieff, 2003); provide tools for scientific inquiry (Mintz, 1993; White and Frederiksen, 2000; 2000; Dwyer & Lopez, 2001) and problem solving experiences (Akpan & Andre, 2000) was of the view that with computer simulations will make learning more effective.

In addition to many practical advantages, computer –simulated experiments have a number of instructional advantages. Mintz (1993) listed the following:

1. Various types of research problems, which cannot be addressed by conventional experimentation, such as prediction and forecasting, can be presented to the learner through simulations.

2. Simulation can improve immediate input and output, allowing students to see immediate connections between hypotheses and experimental results. Immediate responses to "what if" questions encourage students to examine various system states and investigate as many hypotheses as they desire without fear of error and without having to repeat their experiments.

3. Isolation and control of variable enable students to assess the effect of each individual variable as well as their combined effects, promoting clearer understanding of this key aspect of inquiry work.

4. Simulation can display information in a variety of formats, improving student ability to interpret and organize data.

Mintz (1995) presented some other advantages, asserting that simulation allows the student to insert those parameter values that he or she thinks will produce a result that is of interest to him, as well as allow a students to choose how he or she wants to approach a simulation or experiment. Computer simulation also allows the student to repeat the experiment as often as desired. Computer simulations also have potentials for distance education (Lara & Alfonseca, 2000). Simulation is a very powerful and important tool because it provides a way in which alternative designs, plans and /or policies can be evaluated without having to experiment on a real system, which may be prohibitively costly, time-consuming, or simply impractical to do. That is, it allows you to ask "what if" question about a system without having to experiment on the

actual system itself (and hence incur the costs of field tests, prototypes and other). It is important to mention that there are disadvantages associated with the use of computer-simulated programs in education. It is of note that these limitations are in some cases that result of the wrong or inappropriate use of such programs. Mint (1995), listed several possible limitations as follows:

1. Simulation concerns the manipulation of a number of variables of a model representing a real system. However, manipulation of a single variable often means that the reality of the system as whole can be lost.

2. A computer simulation program cannot develop students' emotional and intuitive awareness that the use of simulation is specifically directed at establishing relations between variables in a model.

3. Computer simulation cannot react to unexpected sub-goal which the student may develop during a learning process;

4. Computer programs may function well from a technical point of view, but they are difficult to fit into a curriculum.

5. Often a computer simulation program cannot be adapted to take into account different student levels within a group or class.

6. During the experience of interaction with a computer simulation program, the student is frequently asked problems in which creativity is often the decisive factor to success.

2.4 Nigeria (Regional Geography of Nigeria)

The Federal Republic of Nigeria is in West Africa between Latitudes 4 ^{o} to 14^{o} North and between Longitudes 2^{o}2' and 14 ^{o} 30' East. To the north the country is bounded by the Niger Republic and Chad; in the west by the Benin Republic, in the East by the Cameroon Republic and to the south by the Atlantic Ocean. The country takes its name from its most prominent river, the Niger. Nigeria has a land area of about 923 769 km^{2} (FOS, 1989); a north-south length of about 1 450 km and a west-east breadth of about 800 km. Its total land boundary is 4 047 km while the coastline is 853 km. The Federal Ministry of

Environment of Nigeria (FMEN, 2001) 1993 estimate of irrigated land is 9 570 km^2 and arable land about 35 %; 15 % pasture; 10 % forest reserve; 10 % for settlements and the remaining 30 % considered uncultivable for one reason or the other. Boomie (1998) corroborated the irrigated land at 9 570 km^2 with arable land at 33 %; permanent crops 3 %; permanent pastures 44 %; forests and woodland 12 % and others 8 %. Cleaver and Shreiber (1994) put the surface area of Nigeria as 91.07 million hectares, 57 % of which is believed to be either under crops or pastures while the remaining 43 % is divided amongst forest, water bodies and other uses.

Nigeria is a country of marked ecological diversity and climatic contrasts. The lowest point is the Atlantic Ocean at sea level while the highest point is the Chappal Waddi at 2 419 m. Nigeria has diverse biophysical characteristics, ethnic nationalities, agro-ecological zones and socio-economic conditions. It has evolved over time and space in terms of administrative structures and nature of governance. It started as an amalgamated British colony in 1914, became a federation in 1963; then became independent in 1960 as a two-unit region comprising the Northern and Southern provinces. An additional Mid-Western region was created in 1963. Also in 1963, Nigeria was proclaimed a republic.

The three former regions (Western, Eastern and Northern) excluding the Midwest were later divided into 12 states in 1967 along with a number of sub-administrative divisions for each state. In 1976 the states were increased to 19, in 1987 to 21 and 30 in 1987. Further changes in the administrative composition of the country include the redefining of the political regions as local government areas (LGAs) and the creation of the new Abuja Federal Capital Territory (FCT) on December 12 1991. With this, Lagos ceased to be the country's capital, a position that it held right from before independence. Thus today Abuja is the capital while Lagos is the largest city in terms of population and the main commercial centre. There are now 744 LGAs. The present 36 States structure emerged in 1996 during the time of erstwhile Babaginda, with the creation of 6 additional states namely Bayelsa, Ebonyi, Ekiti, Gombe, Nasarawa and Zamfara. Today Nigeria consists of 36 states and the Federal Capital Territory located at Abuja**.**Nigeria is the most populous country in Africa with an estimated population of 131,859,731 inhabitants (July 2006 estimate,

World Factbook). The average annual growth rate according to the 2006 estimate was 2.38 %. Nigeria's population is divided among 478 different ethnic groups, some numbering fewer than 10 000 people. Of the different ethnic groups, ten (Hausa, Fulani, Yoruba, Ibo, Kanuri, Tiv, Edo, Nupe, Ibibio and Ijaw) account for nearly 80% of the population. Twenty-five percent of the population is in the former Western Region (12% of area), 21% in the former Eastern Region (9% of area), and 53% in the former Northern Region (79% of area). The lowest population densities are in the northern regions, especially in Borno, Adamawa, Kebbi, Kwara, Taraba, Yobe and Zamfara States.

Figure. 2 1. Map of Nigeria showing the different states

Nigeria's economy has been dominated since the late nineteen-sixties by the export of oil, a sector dominated by the Government. By the mid-nineteen-seventies, about 75% of Federal revenue came from petroleum. The share of exports accounted for by fuel, mineral and metals continued to rise and stood at 96% in 1991 (World Bank, 1993). In 2004, the share of export commodities from petroleum and petroleum products was 95 %, while cocoa, rubber and others contributed most of the remainder of exports. Nigeria's

industrial production growth rate was 2.3 % (2004 estimate) (CIA World Factbook, 2004). GDP growth rose marginally in 2004, led by oil and natural gas exports. The capital-intensive oil sector provides 20% of GDP, 95% of foreign exchange earnings, and about 65% of budgetary revenues (2004 estimate) (CIA World Factbook, 2004). The development of the petroleum industry in the late nineteen-sixties and nineteen-seventies radically transformed Nigeria from an agricultural based economy to a major oil exporter. Increased earnings from petroleum exports generated high levels of real economic growth, and by the mid-nineteen-seventies Nigeria ranked as the dominant economy in sub-Saharan Africa and as the continent's major exporter of crude petroleum. Notwithstanding the decline in world petroleum prices after 1981, the government became increasingly over-extended financially, with insufficient revenue from petroleum to pay the rising cost of imports or to finance major development projects. The decline in Nigeria's earnings of foreign exchange led to an accumulation of arrears in trade debts and of import shortages, which, in turn, resulted in a sharp fall in economic activity, with most of Nigerian industry struggling to operate without essential imported raw materials and spare parts. A series of poor harvests, an overvalued currency and a widening budget deficit compounded the problem.

The dramatic fall in international prices for petroleum in 1986, and reduced output in all sectors (except agriculture), kept the economy in the depths of recession, thus in July 1986 the government announced a two-year structural adjustment program (SAP). This programme was aimed at expanding non-oil exports, reducing the import of goods that could be manufactured locally, achieving self-sufficiency in food and increasing the role of the private sector. The SAP included the abolition of import licenses and a reduction in import duties. Consequently in 1994, the SAP was abandoned, following a severe deterioration in political and economic conditions in the early nineteen-nineties. Economic instability was also reflected in a persistently high rate of inflation, which increased from an annual average of 24.0% in 1986-91, to a peak 72.8% in 1995. Between 1996 and 1998, the Nigerian economy recorded impressive macroeconomic stability while it continued to show positive signs of growth (as reported by the Federal Ministry of Finance). These included the exchange rate and the rate of inflation. The improved performance of the

economy in 1997 was as a result of the sustained implementation of a sound fiscal policy dovetailed into an anti-inflationary monetary stance. Indeed, inflation rate decelerated dramatically to reach a 7-year low of 8.5% by the end of December 1997.

2.4.1The Relief of Nigeria

The geology of Nigeria is dominated by igneous structures that form most of the highlands and hills. The rocks of the basement complex, mainly of igneous origin, are encountered in over 60 % of the surface area. The landforms can simply be classified into highlands, plateaux, hills, plains and river valley systems. The landforms are more deeply dissected in the south than in the northern parts (Udo, 1970). The topography of the country shows that Nigeria is highest along the eastern border and rises to a maximum of 2,040 m above sea level at Vogel Peak, south of the Benue River. The Jos plateau, that is located close to the Centre of the country rises to 1780 m at Sphere hill and 1,698 at Wadi Hill. The Plateau is also the watershed, from which streams flow to Lake Chad and the rivers Niger and Benue. The land declines steadily northward from the plateau and this area, known as the High Plains of Hausaland, is characterized by a broad expanse of level sandy plains, interspersed by rocky dome outcrops. To the south-west, across the Niger River similar relief is represented in the Yoruba highlands, where the rocky outcrops are surrounded by forest or tall grass and form the major watershed for rivers flowing northwards to the Niger and southwards to the sea. Elsewhere in the country, lowlands of less than 300m stretch inland from the coast for over 250 km and continue in the trough-like basins of the Niger and Benue rivers. Lowland areas also exist in the Rima and Chad basins at the extreme north-west and north-east of the country respectively. These lowlands are dissected by innumerable streams and rivers flowing in broad sandy valleys.
The low-lying areas are generally below 300 m and these are found in the centre and the south (Iloeje, 2001). The Udi Plateau for instance attains a height of over 300 m, and this seems to break the monotony of the surface in the low lands.

Figure.2.2: Map showing simple relief of Nigeria
Source: Agriculture: Towards 2010 – FAO, Rome 1993.

Thus, Nigeria can be divided into:- (1) the high plateau; and (2) the lowlands (Iloeje, 2001)

(1) **The high plateaux**. The three tracks of the Niger-Benue river system cut across the highland to form three blocks, i.e. the central Plateau in the north; the Eastern and North-Eastern highlands in the east; and the western Uplands in the west. It is important to highlight the fact that these highlands correspond roughly with the areas of volcanic rocks and uplifted areas of basement complex rocks. This goes to show that these areas were initially high and were able to resist erosion (Iloeje, 2001).

Based on the above description, the high plateau consists of:

(a) ***The Northern Central plateau*** – This plateau as the name suggests lies in the centre of northern Nigeria and covers nearly one-fifth of the area of the country. The surface is generally flat, but it is dotted here and there with some granite hills and ridges. The plateau is made up of two distinct platforms that lie at different levels: (i) the high plains of Hausaland forms the lower step. The average elevation stands at 750 m; (ii) the Jos plateau. Has a higher platform with an elevation of 1 500 to 1 800 m. It has a south-west steep

scarp that overlooks the high plains from a height of about 1 600 metres in the north-east, but falls to these plains rather gradually. The highest part is the Shere Hills north-east of Jos where the elevation exceeds 1 650 m above sea level (Iloeje, 2001).

(b) ***The Eastern and North-eastern highlands*** **–** These highlands consist of the Mandara Mountains (1 200 –1 500 m) and the Biu Plateau (600 – 900 m). The Mandara Mountains are a mass of basement complex exposure while the Biu Plateau is of basalt. In eastern Nigeria, the highlands are made up of two big granite spurs that are western prolongations of the Cameroon Mountains into the Cross River Plains (Iloeje, 2001). These spurs are the Obudu Plateau that stands at a height of over 1 200 metres above the general level of the land and the Oban Hills with an average elevation of 1 200 m above sea level.

(c) ***The Western uplands*** – They cover an area of about half the size of the North Central Plateau. Most of the area lies between 300 to 600 m however the Idanre Hills, where the Plateau is highest are about 1 000 m above sea level (Iloeje, 2001).

(2) **The lowlands** lie mainly in the basins of the major rivers and fall roughly within the areas of sedimentary rocks lying in the basins of sedimentation.

(a) ***The Sokoto plains*** **in the north-west –** These extend over one twentieth of the area of Nigeria and have an average height of 150 m. They are monotonously flat. The main rivers that drain into this area are the Sokoto, Rima and Zamfara. They have flat-floored valleys that are flooded in the wet season only. The water recedes during the dry season and leaves a coating of alluvial soil behind. These seasonally flooded areas are called “fadamas” in Hausa (Iloeje, 2001).

(b) ***The Niger/Benue*** trough wrapping round the north-central plateau – This starts from the Sokoto plains in the North-west through Lokoja, and ends near Yola. The Niger/Benue trough is an elongated bow-shaped lowland. It represents a previous arm of the sea, probably an extension of the Atlantic, into which

sediments were deposited. Its surface generally lies below 300 m. It has been deeply disserted by erosion into tabular hills that are separated by gorge-like river valleys (Ileoje, 2001).

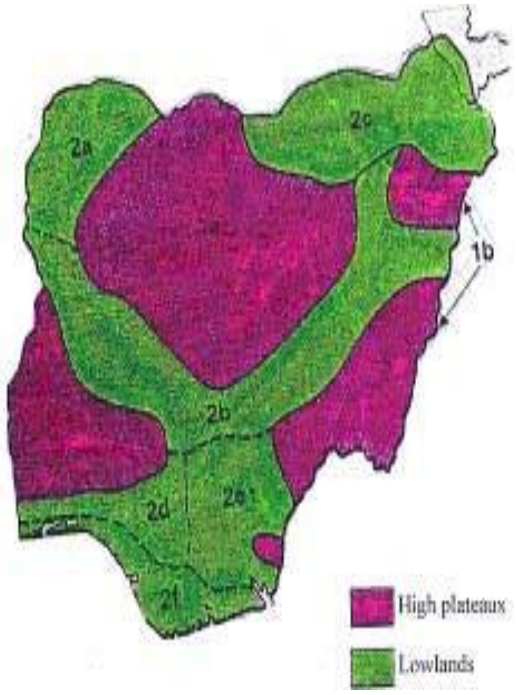
(c) *The Chad Basin* in the North-east extremity of the country – It consists of about one-tenth of Nigeria. It is a depressed basin composed of Territory rocks. It has a average elevation of about 45 – 60 m and is separated from the Benue valley by the Biu Plateau. Except for the sand dunes of the Hadejia, the surface is almost flat. These dunes are long narrow sand ridges of about 12 – 30 m high and 275 – 365 m wide and they vary in length between 800 m and 12 km. As a result of increased rainfall, they have been overgrown by vegetation and are thus fixed in their present position (Ileoje, 2001).

(d) ***The interior coastal lowlands of Western Nigeria* –** This area lies west of the Niger. Its boundary is marked in the north by the ridge of the basement complex of the western Highlands; in the South by Quaternary deposits of the coastal margin. Rocks found in this area are Secondary and Tertiary sedimentaries, which dip gently southwards. The South dipping surface has however, sunk to below 300 m and is cut into blocks by narrow parallel valleys cut by the north-south flowing rivers (Ileoje, 2001).

(e) ***The lowlands and scarplands of South-eastern Nigeria* –** The rocks in this area are made of sandstones, shales, clays and coal. With the exception of the coastal areas and the Eastern Highlands it covers the whole of the eastern section of Nigeria. This area is divided into three sub-units (i) The Cross Rive plains, east of Enugu; (ii) The Scarplands that lies west of the longitude of Enugu and (iii) The South-east Coastal Plains that are tertiary rocks and lie south of the Scarplands (Ileoje, 2001).

(f) ***The Coastal Margins and swamps* that lie adjacent to the seas** – These run along the coast from east to west in a strip of land below 30 m and are made up of recent deposits of sand, clays and mud. This area can be divided into two (i) the lagoon coast lies in the west where the strip is narrow. Sands predominate and sand-bars cut off east-west lagoons. The Lagos lagoon is partly made up of fresh water from the rivers and partly of sea-water stranded behind a sand-bar. (ii) The Niger Delta which consists mainly of muddy

deposits pushed out by the Niger into a relatively tideless salt sea. The creeks and water channels of the coastland form important fishing grounds and provide highways in this marshy area (Ileoje, 2001).



1. *High Plateau*

a. The north Central Plateau
b. The Eastern and North-eastern highlands
c. The Western Uplands

2. *Lowlands*

a. The Sokoto Plains
b. The Niger/Benue trough
c. The Chad Basin.
d. The interior coastal lowlands of western Nigeria
e. The lowlands and scarplands of south-eastern Nigeria.
f. The coastlands

Figure 2.3 Map showing Relief zones of Nigeria

2.4.2 Climate of Nigeria

Nigeria, by virtue of its location, enjoys a warm tropical climate with relatively high temperatures throughout the year and two seasons – the rainy or wet season that lasts from mid- March – November in the South and from May to October in the north; and the dry season that occupies the rest of the year (Oyenuga, 1967). However, in a country like Nigeria, where the temperatures do not fluctuates regularly,

constant elements such as relative humidity and rainfall are heavily relied on to differentiate between the season and climatic zones. The climate of the country is influenced by the interaction of two air masses:

(I) the relatively warm and moist tropical marine mass which originates over the Atlantic Ocean and is associated with Southwest winds in Nigeria, and

(II) the relatively cool, dry and relatively stable tropical continental air mass that originates from the Sahara Desert and is associated with the dry, cool and dusty North-East Trades (*harmattan*).

The seasonal pattern of the south differs from that of the north and the south has four seasons: (i) The long wet season that starts in mid-March and lasts till July is a season of heavy rains and high humidity. Plants and pasture are fresh and green, grasses and weeds grow rapidly and look attractive. This is the planting season. (ii) The short dry season. This is the August break and it starts from July – August and lasts for about one month. (iii) The short wet season. It follows the August break and lasts from September to October. During this period rainfall is not usually heavy compared to the first wet season and the total amount of rainfall is less; and (iv) The long dry or *harmattan* season which continues from November to mid-March. *Harmattan* mornings are usually cool and misty, however the mist disappears after sunrise. The afternoons are full of haze due to dust in the air brought by winds from the north. At this period of the year grasses die off and leaves of some trees turn brown and later fall (Oyenuga, 1967; Ileoje, 2001).

In the north, the long dry season starts earlier and ends later. Here there is nothing like the August break, therefore the two wet seasons become one. Therefore two seasons are prominent – a long dry season that spans from October to April, and a wet season for the remaining five months. (i) The long dry season: there is lack of rainfall and the dry conditions that prevail cause cracks to develop on clay soils. However, this season is welcomed because the nights are cool and the afternoon haze helps to wade off the sun's heat; and (ii) the wet season that is ushered in by frequent storms. This is the planting season in the north.Rainfall varies from place to place and from season to season. In the wet season, the full effect of

the tropical maritime air mass is the main reason that brings rainfall, while in the dry season the rainfall is less. The total annual rainfall decreases from the south to the north. The southern two-thirds of the country have double peak rainfall while the northern third has a single peak. For example Brass has 379 cm, Jos 143 cm, Sokoto 71 cm, and Maiduguri 63 cm (Iloeje, 2001).

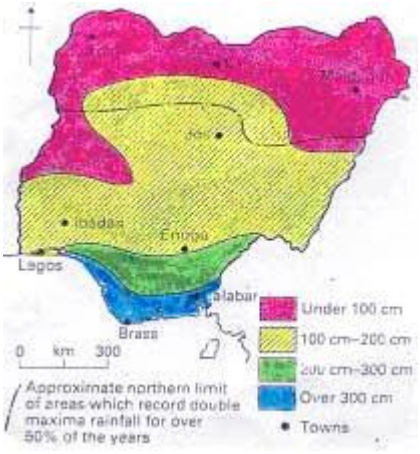


Figure 2.4 Total Annual Rainfall

July is the middle of the wet season and the relative humidity is usually high because of the warm wet air that prevails. The humidity is over 80 % in the South and never goes below 60 % in the north. Over 80 % of the rains fall within the wet months of April – September. In the South the figure is above 70 % and in the north nearly 100 % of the rains are during these months. Temperature also varies from place to place and from season to season. It has been observed that there are considerable contrasts between the coastal areas and the interior, as well as between the high plateau and the lowlands. On the plateau, the mean annual temperature varies between 21 ^{0}C and 27 ^{0}C. In the Jos area, temperatures are between 20 ^{0}C and 25^0 C. On the lowlands such as the Sokoto Plains, the Chad Basin and the Niger-Benue lowlands, the mean annual temperature is 27 ^{0}C. The coastal fringes have lower means than the interior. It appears

therefore that altitude and proximity to the seas determine to a large extent the distribution of temperatu

re in Nigeria. Generally, temperatures are high throughout the year because Nigeria lies within the tropics and the mean monthly figure could go above 27 ^{0}C, while daily maximum temperatures can go between beyond 35 ^{0}C – 38 ^{0}C depending on the location (Iloeje, 2001).

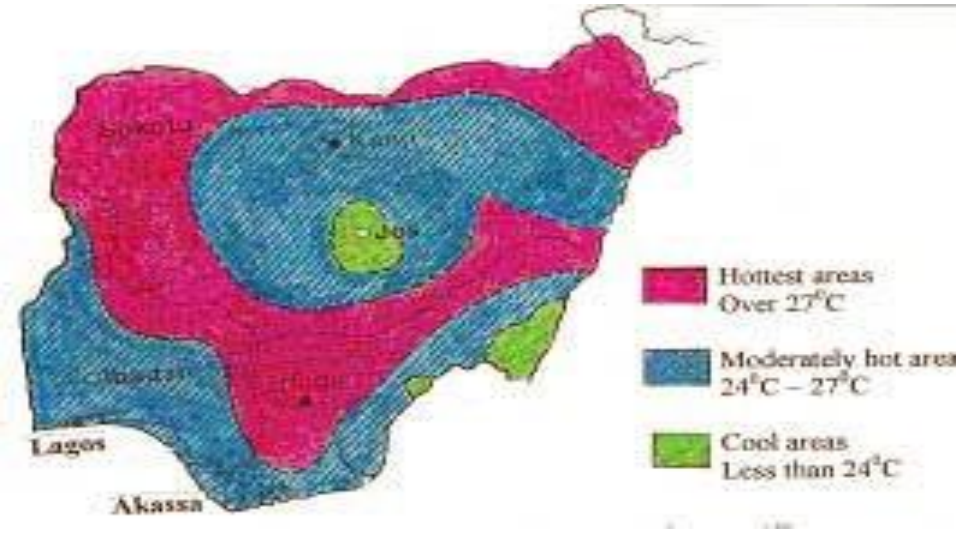


Figure 2.5 Mean annual temperature distribution

In general while there is hardly any dry season in the extreme southern tip of the country, the wet season hardly lasts for more than three months in the north-eastern part. Similarly annual rainfall totals range from 2,500 mm in the south to less than 400 mm in parts of the extreme north (FMEN, 2001).

2.5 Theoretical Framework on Simulation and Learning

2.5.1 Constructivism

This has been gradual paradigm shift in educational psychology from teacher to learner centeredness. This change reflects a move away from information transmission view of education to that of knowledge construction. This is informed by current world realities such globalization and rapid technological change. The prevalent view of education is called constructivism (lgboko and lbemese, (2006setat) constructivism seed learning as an active process in which the learner constructs mental representation of the world around them these representation which are subjective are shaped by additional knowledge as it is acquired check (1992) in Ogunkunle and Gbmanja (2006) view constructivism as a process where learner actively take

knowledge, connect it to previously assimilated knowledge and make it their by constructing their own interpretation. While Cobb (1994) sees constructivism as knowledge irrespective of how one is taught and emphasizes learning with understanding.

Constructivist learning is inductive. Constructivist learning dictates that concept follows the action rather than precede it. The activities lead to the concepts; the concept does not lead to the activity. Essentially, in constructive learning, the standard classroom procedure is tuner upside-no lecture, no demonstration, and no presentation. From the beginning, student engages in actives through which they develop skill and acquire concepts. In this article, we describe ways we turn library instruction upside down by incorporating constructivist principle throughout lesson to transform the typical 50-minute lesson into truly "active'' learning (Susan and Elizabeth, 2004).

Although there are variations in definition and degree, there are four generally agreed upon aspects of constructivist lessons. Extensively explained in Good and Brophy (1994), they include:

- Learners construct their massages their own meaning. Students are not passive receptacles. They do not easily processor transfer what they passively receive. In order to make knowledge and new information, students must make a deliberate effort to make sense of the information that comes to them. They must own it. They must manipulate, discover, and create knowledge to fit their belief system.

- New learning builds on prior knowledge. In making an effort to make sense of information, students must make connections between old knowledge and new information. They must compare and question, challenge and investigate, accept or discard old information and beliefs in order to progress.

- Learning is enhanced by interaction. The constructivist process works best in social setting as students have the opportunity to compare and share their ideas with others. Learning occurs as students attempt to resolve conflicting ideas. Although social interaction is frequently accomplished in small group activities, discussions within the entire class provide students the opportunity to vacate their knowledge and to learn from others.

- Meaningful learning develops through “authentic “task. This aspect of the construcvism is frequently misinterpreted. Using authentic tasks does not mean that we wait until a frog hops by to seize the opportunity to teach metamorphosis. It simply means that activities are chosen to simulate those that will counter in real life or in an assignment.

Constructivism learning usually begins with a question, a case or a problem. In typical constructivist sessions, as students work on a problem the instructor intervene s only as required to guide students in the appropriate direction. Essentially, the instructor presents the problem and lets the students go. This principle behind this activity is for the students to discover their own truths (Susan and Elizabeth, 2004).

Mayer, (1999) in Gambari (2011) view learning in three ways as Learning as response strengthening;ing occurs as weakening or weakening or strengthening of an association between stimulus and response. Secondly he sees learning as knowledge acquisition; occurs when the new information is placed in long term memory. Lastly learning as knowledge construction; learning occurs when a learner actively constructs a knowledge representation in working memory. This is facilitated through the creation of meaningful interaction between learner and the academic material, and to facilitate the learners’ processes of selecting, organizing and integrating information. This is focused on constructive leaning, active learning, in which the learner possesses and uses a variety of cognitive processes during the leaning. This idea of Mayer is in line works of several educationist of constructivist persuasion that categorized constructivism into three dimensions, cognitive constructivism being one of them emphasized the accurate internalization and reconstruction of external reality (Igboko and Ibeneme, 2006). The underly assumption of the structures should accurately correspond to processes and structures that exist in the real world. This makes cognitive constructivism very suitable for application in the study of science and chemistry in particular.

Constructivism is described as a learning based on authentic and real-world situations. It is student centered and encourages higher level processing skills to apply their working knowledge. The student

plays an active role in terms of process of learning, acquiring and knowledge. The students play and bring past experience and prior knowledge to the classroom and use these to actively connect with new levels or problems that are presented. “Knowing” is being able to internalize the material, connecting it with things you already know. Various approaches in instruction strategies derive from constructivist theory. They usually suggest that learning is accomplished best using a hands-on approach. Learners learn by experimentation not by being told what will happen, and are left make their own inferences, discoveries and conclusions (Igboko and Ibeneme, 2006). Students use higher level processed skills` such as valuating, analyzing and synthesis to apply newly constructed knowledge to problems or situations as required in the condition of science practical and chemistry practical in particular.

Constructivist epistemology sees production of the new knowledge as a human construction with a1l the power and weakness associated with the ideational framework and instrumentation used by the learner on the ground of constructs (experience) already available to the learner. This implies that knowledge is gained from active interpretative process that involves learners’ construct’ of their ideas and understanding on the basis of personal experience. Hence “meaningful learning results when a person consciously and explicitly ties new knowledge to relevant concepts they already possess (Novak el al., in Thoron and Myers 2010) Ausubeln his epigraphy’ o his 1968 book, asserted that if I had to reduce all the educational psychology to just one Principle, i would say this: the most important learning is that which the learner already knows. Ascertain this and teach him accordingly (Novak 1990).

The constructivist literature emphasizes that the teacher always has to teach from where the students are (in terms of knowledge development) rather than where the teacher would like them to be or where the curriculum suggested (Taber, 2001). This approach to teaching allows student to actively he involved in decision-making and problern_S0Mh1g prior knowledge and past experience help shape student connections to new material and apply that knowledge to the world in which they live. Various approaches in instructional strategies derive from constructivist theory. They usually suggest that learning is

accomplished best using a hands-on approach. Learners learn by experimentation and not by being told what will happen, and are Left to make their own inferences, discoveries and conclusions (Faber, 2001).

2.5.2 Behaviorism

The central idea in behaviorism can he stated simply: A science of behavior is possible. Behaviorists have diverse views about what this proposition means, and particularly about what science is and what behavior is but every behaviorist agrees that there can be a science o behavior (Boakes 1984). Many behaviorists add that the science of behavior should he psychology; a psychology of behaviour analysis. Since behaviorism is a set of ideas about this science called behavior analysis, not the science itself, but philosophy of science. However, philosophy about behaviour touches topics near and dear to us: why we do what we do, and what we should and should not do. Behaviorism otters an alternative VICW that often runs counter to traditional thinking about action, because traditional views have been un-scientific. Behaviorism views are based on experimentation (Boakes. 1984).

Behaviourists regard all behaviour as a response to a stimulus. They assume that what we do is determined by the environment we IIVC in, which provides stimuli to which we respond, and the environments have been in the past, which caused us to learn to respond to stimuli in particular ways. Behaviorists are unique amongst psychologists in believing that it is unnecessary to speculate about internal mental processes when explaining behaviour: it is enough to know which stimuli elicit which responses (Aidan, 2008). Behaviourists also believe that people are with only harmful of innate reflexes (stimulus-response units that do not need to be Learned) and that all of a person's complex behaviours are the result of learning through interaction with the environment. They also assume that the processes of 'earning are common to all species and so humans learn in the same way as other animals (Aidan, 2008).The behaviourist theory also called Stimulus-Response (S-P) theory of learning. The S-R in psychology means something that causes a change in behavior and the change it causes. The S-R theory of learning follows the behaviorist approach to learning which focuses on the study of observable behavior i.e. upon the responses made by

the individual and upon the conditions under which they occurred. Behaviorism is described as a developmental theory that measures observable behaviors' produced by a learner's response to Stimulus. The theoretical basis guiding the Study of practical oriented subjects is the "instrument conditioning" of Thorndike which based on "trial- and-error". Which skinner later expanded with both conceptual reformulations. Throdilike's nation of a Stimulus- Response association' or' connection' was abandoned. The use of the free operant, so called because the animal was now permitted to respond at its own rate, rather than in a series of trials determined by the experimenter procedures (Behaviorist Learning theory BLT). This learning theory does recognize true free act, since an individual will not be conditioned to act in a certain way. According to behaviorism, Knowing is giving the correct response when exposed to a particular stimulus. The basic promise of radical behaviorism is that the study of behavior should be a natural science such as chemistry or physics without any reference to hypothetical inner states of organisms (BLT).

The behaviorist is not concern with how or why knowledge s obtained, but rather if the correct Responses is given. Behaviorism states that learning is defined as nothing more than acquisition of new behaviors' (Stand ridge). Behaviorist assert that the only behavior' worthy of study are those that can he observed thus it is actions, rather than thoughts or emotions, which are legitimate object of study (Stafld1idg Thorndike's law of effect which states that behavior that are followed by a positive outcome (reward or success) are likely to be repeated while those follow by a negative outcome or none at all are extinguish implying the more satisfying the result of a particular action, the better that action is learned. Implication for practical chemistry volumetric analysis in particular is that the more the students arrive at the correct cnd-POI1 the more the students repeat the act of titration and the better the process skills acquired. According to Skinner knowledge is action (Burton Moore, Magliaro) Skinner (1968) stated that a learner does not passively absorb knowledge from the world around him but must play an active role". He further explained how learners learn by doing, experiencing and engaging in error. All these three components work together and must be studied together to formulate any given instance of learning. It is only when

these three components are describable that we can identify what has been learned, under what conditions the learning has taken place, and the consequences that support and maintain the learner behavior. The emphasis is on the active respond of the learner, the learner must be engaged in the behavior in order to learn and to validate that learning has occurred (Burton, Moore and Magliaro). An individual selects one response instead of another because of prior conditioning and psychological drives existing at that moment of the action (Parkay and Hass, 2000). Woolfolk assert that behaviorist approach to teaching has practical application in education, in particular understanding basic skills and core subject knowledge**.**

2.6 Empirical Framework on Simulation and Learning

Many philosophers of science and technology find it difficult to define and explain some scientific terms and concepts properly without the use of improvised materials to practicalise them. STAN (2011), NTI (2008), stated that, the use of simulation helps to recognize the learning process; it offers students and their teachers a good opportunity to relate theoretical knowledge to practical experiences in the outcome. One research conducted by Kennephol (2011) who examined computer simulations employing video images incorporated into the laboratory component of an existing first-year university chemistry course as part of a pilot study. He surveyed students' experience and their performance in the distance course and also tracked and compared them with students who did not do the simulations. He found no difference in overall course performance between students completed in-laboratory work in a shorter period and showed a slightly higher performance in the practical laboratory component. Choi & Gennaro (1987) compared the effectiveness of computer-simulated experiences for teaching the concept of volume displacement of junior school students. They found that computer simulated experiences were as effective as hand-on laboratory experiences. This suggest that it may be possible to use a computer simulated experiment in place of a laboratory experience in the teaching of some concepts such as the volume displacement and obtain comparable result. This may suggest that computer simulations may be used to replace laboratory activities that require cognitive interactions with the content rather than psychomotor interactions with the content rather than psychomotor interactions so that they not require much physical (e.g., taste, smell,

touch) interactions. Kara Yesilyurt (2007) compared the impacts of tutorial and edutainment software programs on students' achievement misconceptions and attitudes towards biology. The result indicated that instructional software programs (computer simulation) have significantly higher effect than control group, the effects of computer simulation on secondary biology instruction: an application of Bloom's taxonomy. A total of ninety one (91), fifty five (55) male and thirty six (36) female students were selected at random for experimental and control groups. The results often-test and ANOVA revealed that students who had access to computer simulations scored higher in the posttest. Thus significant difference existed.

Nandom (2011) worked on the effects of computer mediated simulation in the teaching of geometry among Senior Secondary Schools in Minna Metropolis as seen from the result, students taught with the computer mediated simulation (CMS) package performed significantly better compared to those taught the conventional method of teaching. Addullahi and Sheriff (2008) in an empirical study investigated the effects of inquiry-based computer simulation on scientific thinking and conceptual understanding of gas laws. The researcher used three hundred and one (301) from four (SSI) students from twelve (12) pure science classes which were randomly selected. A quasi-experimental with three by two (3x2) factorial design was applied. The ANOVA/MANOVA results showed that students in heterogeneous-ability cooperative learning group who, in turn, significantly outperformed their counterparts in the scientific thinking and conceptual understanding thus inquiry based computer simulations enhances scientific reasoning and conceptual understanding.

The following science educators, Adeniyi, (2001), Nsofor, (2004), Balogun, (2005),and Iliya (2004)have shown that students showed more interest and involvement in a lesson when instructional material materials are utilized in teaching. Okwo and Iliya (2004) noted that the experiment group did better than the control group, when one of the groups, experiment was exposed to the teaching of a concept in biology.

2.7 Studies on Gender

Many research works had been conducted to measure the performance of male and female in behavioral science. The finding has shown that is an alternating performance between the two sexes. Gbodi, Hide and Adiboye (2002) in Leleye (2004) have shown that the male and females have equal tendencies to excel in science based subjects. Nworgu (2005) conducted a research work on graphic advanced orginers and noted that there was no significant different in the performance of male and female student. Ayeodele (2001) noted that individual learn though different sense organ. Some learn best though learning, seeing and touching. Mkpa (2009) noted that the number of sense involve in institutional process, the more efficient is the outcome.

Opera (2008) making reference to other finding on gender noted that society where gender stereotyping is very strong, the achievement, aspiration and interest in girl are conditioned by what the society regards as male and female activities, careers, behaviors, right and soon some school of thoughts are of view that some behaviors culturally acquired in the environment are the main factor that account for the difference. Based on the above he suggested that fields of human endeavor as advocated by the woman Right protection agency.

Joseph (2000) stated that some parents have believed that a girl who succeeds in science, mathematics and technology (SMT) is somehow abnormal and poor prospect for marriage. The need to increase female participation in biology will bring necessary change in the school, home and the society at large and will also call for necessary attitudinal change among teacher, student and parents.

Furthermore, Jegede (2007) in his study review that female student show more fear or anxiety toward the learning of biology than their male counterparts .The female are scared too much of calculations which leads to more failure than passes. Okwo and Otubah (2007) noted that boys did better than girl in the physics essay test. Adesoji and Fisiyi (2001) also design a study to analyze the problem solving difficulties of male and female student when they solve problem based on volumetric analysis. The study revealed that more girls than boys had difficulties in three of the stages of problem solving. Also,63% the girls

could not reason out the solution to the problem. They, therefore, concluded that the claim that boys are better problem –solvers could be said to be true.

Oyedeji (1996) also found significant gender-group difference (in favour of boys) in science and mathematics. This have been confirmed by the findings of Okpala and Onocha (1995) who also explained that science subject, such as physic and chemistry are given muscular image of the African educational setting. Gimba (2006) noted that there was a there was a significant difference in the performance of girl and boys taught with mathematical models. The girl did better than the boys in mathematics achievement test (mat) however, Gambari (2004); sabamowa (2006) noted that there was a significant difference in the performance of boys and girl taught physics and mathematics and computer.

These finding clearly support the established fact that gender differences exist in specific ability of student. Jegede and inyang (1990), Adesoji and Fisugi (2001), and that these differences are based on some inborn characteristics.

2.8 Gender and Students' Academic Performance

A multiple number of educational researches have been conducted by various researchers on the effects of gender on students' academic performance. Some of these studies include, Cindy (1993), Bello and Abimbola (2010), Hay, Ashman and Van Kraayenoord (1998), Tercanlioglu (2004), Machin and McNally, (2006), Nsofo (2010) and Jabor, Kungu, Machtmes, Buntu and Nordi (2011) to mention but a few. It has evidently shown that, the study on the influence of gender on students' academic performance is not conclusive and the disparity still exists. In support of this assertion, Chavez (2011) reported that male and female students tend to perform differently in various subject areas. He added that the gender gap in specific subjects has prompted academics to examine the possible influences that gender has on students' achievement. In contract to the above findings, Erhman and Oxford (1989), Nyikos (1990), Oxford (1994), Sheorey (1999) in tercanlioglu (2004) argued that sometimes male surpassed females in the use of a particular strategy; female employ more learning strategies more effectively. Tercanlioglu (2004) carried

out a research title "Exploring gender effect on adult foreign language learning strategies. The authors used a sample of one hundred and eighty four (184) pre-service teachers; forty four (44) male and one hundred and fourty (140) female. Data were analyzed using analysis of variance (ANOVA) to investigate the gender-related differences. The results showed gender differences, favoring males in students, strategies use. However, there was a statistically significant gender differences. In another dimension, Hay, Ashman and Van Kraayenoord (1998) investigated the effects of gender, academic achievement and non-school factors upon-pre-adolescent self-concept. A total number of three hundred and ninety (390) students were used for the study. In the study, pre-adolescent boys' and girls' general self-concepts were significantly influenced by peer, parent relationship and physical appearance and the findings contradicting the notion that boys value school and reading less than girls.

Jabor, kungu, machtmes, Buntal and Nordin (2011) studied the influence of age, gender on students achievement in mathematics. Disc containing data sets from the National Assessment of Educational Progress (NAEP) High School Transcript Study (HSTS) was used as the instrument for the study. The data was also analyzed using descriptive statistic of independent t-test. The result of the findings indicated that female student had higher mathematical GPA scores than the scores of their male counterparts. Female student had a statistically significant t-test for higher mean score than male student. In contrast Afolabi and Yusuf (2010) conducted a quasi-experimental three by two (3x2) factorial design on the effect of computer assisted instruction (CAI) on secondary school student performance in biology. The author investigated the influence of gender on the performances of student exposed to CAI in individualized and cooperative learning package among one hundred and twenty (120) senior secondary two (S.S.II) students. Data obtain were analyzed using analysis of covariance (ANCOVA) and the findings showed that there is no significant differences between the performance of male and female student in biology when they are taught using cooperative computer assisted instructions (CCAI). Bello and Abimbola (2010) look on the gender influence on biology student concept-mapping ability and achievement in evolution by adopting one group pretest-posttest experimental design among eighty seven (87) second year senior secondary

(S.S.II) student. The findings of the study after adopting chi-square and t-test for the analysis of data and result revealed that there is no statistically significant difference between the achievement of high scoring of male and female student. Also there is no gender difference in the achievement of high scoring student. Furthermore, there is no statistically significant difference in the achievement of male and female average scoring student. The researcher also concluded that the achievement of low scoring student did not differ significantly. In a wide study conducted by Nsofor (2010) where she investigated the effect of gender on student academic performance in biology concept. The researcher adopted a pretest-posttest factorial design followed up with Scheffe's post hoc multiple comparison to two hundred and seventy (270) student, one hundred and thirty five (135) female and one hundred and thirty five (135) male student were used for the study. The finding revealed that there is statistically significant difference among the group irrespective of gender. A follow-up Schffe's post hoc multiple comparison was made to find out where the significant differences occur, and the result indicated that there is statistically significant differences between the mean achievement of experimental group one male and control female in favor of experimental group one male also there is significant differences between the mean achievement of experimental group one female. Finally, the result indicated a no significant difference between the mean achievement of male and female in the control group as well as male and female in the experimental group.

More so, review of the study conducted by Patrick and Ezenwa (2000) on gender considerations of the effects of visual aids and tactile stimuli in the teaching of English indicated a significant difference in the performance of boys and girls. Eighty (80) senior secondary school two (S.S.II) students made up of forty (40) girls and forty (40) boys were randomly selected from 2 (mixed) gender (co-educational) schools. The design adopted to reach at the above result was a pretest-posttest experimental- control group design, and the data were obtained and analyzed using t-test. In this way, Afolabi and Yusuf (2010) stated that the issue of gender has been linked with performance of students in academic tasks in several studies without any definite conclusion. The authors reiterated that there is general conclusion that gender imbalance exist in computer use, access, career and attitude.

2.9 Achievement and Retention

Achievement-Achievement refers to the acquisition and initial retention of learning items such as that the learner easily make use of the knowledge or skill acquired when the opportunity is presented. (Alabi 2011). Achievement according to Annie (2005) is said to be the ability to achieve something especially by superior ability, special effort and great courage or bring to a successful ending of program or event.

What facilities student understanding and retention of knowledge have been found to be dependent on such as learner characteristics, the learning environment, the teacher's knowledge level and instructional approaches. The teacher's aspect is considered most important hence it influences students learning and retention. In a practical sense, in teaching approaches whereby the teacher uses real life experiences and simulation to present a lesson, understanding and retention of the subject matter will be enhanced (Okeke 1995) in Alabi (2010).

Retention: This is the ability to respond to new stimulus using the previously learnt responses. It involves three methods, namely, recall, recognition and relating. Recall involves the producing some or all the materials learnt, recognition refers to identification of materials by the learners without actual recalling the detail about the learnt materials while releasing is regarded as there can never be an achiever or achievement without making reference to recalling and putting to positive use has being previously learnt and retained.

2.10 Ability Level and Students' Academic Performance

Students are not the same especially when it relates to the rate at which facts, principles and science are being assimilated (Adesoji, 2008). In view of this assertion one can realize that there is disparity in the ability to perform specific tasks. Ability grouping of students is one of the oldest and most controversial issues in elementary and secondary schools (Hollified, 1987). Several studies within the Nigerian

environment have, however, shown that learners are qualitatively different in their ability levels and in learning problems (Usua, 1974; Ehindero, 1980) in (Adesoji, 2008). However, numerous researchers in their studies observed that achievements of low ability students have been found to be lowest while that of high ability students was the highest (Kampa and Dupe, 1974; Robert, 1995) in (Adesoji, 2008).

Researches in science education defined ability level in different ways. According to Witkin et al, 1977) in Adeyemo (2010) is the characteristics mode of functioning that individual shows in intellectual activities in a highly consistent and persuasive way. According to him, three ability levels have been identified in relation to teaching-learning situation viz: High, Medium and low. High ability level learners are those that prefer isolation and social distance, theoretical and abstract ideas (akin to field independent learner). High ability individuals are better than medium or low. Ability grouping might be better in other tasks that have to do with the use of hands. In this case Adeyemo (2010) reported that the high ability group has greater ability to structure information and solve problems. However, medium ability level learners perform relatively better on learning activities involving social materials, and are more likely to require external defined goals reinforcements (Witkin, et al., 1997) in (Adeyemi, 2010).

In relation to the above opinions, Wagama (2008) observed that the school system group students by age without considering that not all of the children in one class are at the than academic level. Even, so teachers are expected to teach them all. In a typical classroom there will be a range of learning abilities. There will be those students who struggle to keep up, those who are right on grade level and those who are so advanced, and they bored. There are several teaching methods according to Wagaman, which will help teachers to meet the need of every student in their classroom regardless of ability.

In his attempt to find out the reasons why ability grouping is used, Hollified (1987) summarize the conclusion of Slavin (1986) who made a comprehensive review of different types of ability grouping in elementary schools. The purpose of his review was to identify grouping practices that promote students' achievement. He also assumed that the grouping allows teachers:

1.To increase the pace of and raise the level of instruction for higher achievers, and

2.To provide more individuals attention, repetition, and review for low achievers. The high achievers according to the review benefits from having to compete with their more able peers. Slavin (1986) in Hollified (1987) examines evidence on the achievement effect of five (5) comprehensive ability grouping plans in elementary schools and drew conclusions on their effectiveness. The grouping plans he made include:

i. Ability Group Class Assignment. This grouping plans in elementary schools and self-contained class on the basis of ability or achievement. Evidence suggests. That ability grouped class assignment does not enhance student achievement in the elementary school.

ii. Regrouping for Reading and Mathematics: under this plan, students are assigned to heterogeneous homeroom classes for most for most of the day, but are regrouped according to achievement level for one or more subjects. Results indicated that regrouping for reading or mathematics can improve student achievement. To this outcome, Slavin in Hollified (1987) opined that the level and pace of instruction must be adapted to achievement level, and students must not be regrouped for more than one or two subjects.

iii. The Joplin Plan: this grouping plan assigns students to heterogeneous classes for most of the day, but regroups them across grade levels for instruction. There is strong evidence that the Joplin Plan increases reading achievement.

iv. Non-grade Plan: This plan includes a variety of related grouping plans that place students in flexible groups according to performance rather than age. Thus, grade-level designations are eliminated. The curriculum for each subject is divided into levels through which students generally support the use of comprehensive non-graded plans.

v. Within-class Ability Grouping: This plan is generally used for reading or mathematics. Teachers assign students within their classroom to one of a small number of groups based on ability level. These

groups work on different materials at rates unique to their needs and ability level. These groups work on different materials at rates unique to their needs and ability. Many studies have been conducted on the use of within-class ability grouping in reading to support or challenge its effectiveness. Research on within-class ability grouping in mathematics is clearly support the practice while that of reading instruction does not. The positive effects are slightly greater for low-achieving students than for average or high achievers.

Elder (1981) conducted a research on ability grouping as self-fulfilling ability prophecy; a macro-analysis teacher-student interaction. The author employed observation, interviewing and Analysis of video-taped interaction during lesson to identify major behavioral differences across group and crucial processes within groups. Thirty (30) video-taped lessons were then coded to determine the relative frequency of certain behaviors across group levels. In this, study, lower ability groups were found to have more attentiveness, teacher management and reading turn disruptions and violations, contributing to lower levels of reading achievement. In short, those students who were likely to have more difficulty in learning were assigned to groups whose social contexts were much less conducive for learning. The results of this study posed the ability grouping for instructing low ability students and indicate the impact of differential learning environment within schools.

Another study was carried out by Kerckhoff (1986) on the effects of ability grouping in British Secondary Schools. The study examines the effects of both school types (some of which serve students selected according to ability) and ability grouping within school types. The analysis involves comparing students who have separated into ability groups with those who have not been so separated. The results of the study supported the general hypothesis, that students in high ability groups gain more, and students in low ability group gain less over a five period than they would be expected to gain if they had not been separated into ability groups.

In another dimension, Cindy (1993) examined the effects of different types of cooperative learning environment on low, average and high ability students' perception of the whole school science classroom

environment. The author employed fifteen (15) teachers and one thousand, one hundred and eighty five, (1,185) students from the sixth and eighth grades of two (2) middle schools. Data were gathered from a variety of source which includes: a student pretest and posttest using my class inventory measure; classroom teacher reports; informal interviews with teachers and classroom observation. The results of the study found that, students in average cooperative learning classes perceived themselves as less competitive than those in the no and high cooperative learning classes. However, no significant effects were found between the types of cooperative learning environment and ability level.

A pretest-posttest study was conducted by Adesoji (2008) on students' levels and effectiveness of problem-solving strategy. One hundred and twenty (120) senior secondary school class two chemistry students were randomly selected from four (4) schools which were randomly picked in Ife central, Ife south and Atakumosa Local Government Area of Osun State, Nigeria. Thirty (30) students were randomly selected from each of the four (4) schools. The participants were stratified into three (3) ability groups of high, medium and low. In Adesoji's study, one treatment and an instrument were used. The treatment was Problem- Solving Techniques Procedures (PSTP) while the instrument was a multiple test used for both pretest and posttest. The data from the study were analyzed using Analysis of Variance (ANOVA). The results of the finding revealed that there was no significant different in the performance of students in the three (3) ability groups in posttest after exposing them to teacher-directed problem-solving strategy. This implies that, all the students in the different ability levels were able to solve problems based on electrolysis and its prerequisite concepts after treatment.

2.11 Summary of Reviewed Literature

From the findings of many scholars, it is shown that there will continue to be poor performance by students in geography without the use of instructional aides or improvised materials by the teachers. Hence improvisation of instructional package enables the teacher to minimize the problems hindering the effectiveness of teaching and learning of geography in secondary school. Computer simulations are potentially useful for simulating labs that are impractical, expensive, impossible, or too dangerous to run. Simulations can contribute to conceptual change, provide open-ended experiences, and provide tool for

scientific inquiry and problem solving. Computer simulations also have potentials for distance education. From the summary it shows that computer simulations are good supplementary tools for classroom instruction and science laboratories. Multimedia supported, highly interactive, collaborative computer simulations appealing growing interest because of their potentials to supplement constructivist learning. They offer inquiry environments and cognitive tools to scaffold learning and supply problem solving skills.

CHAPTER THREE

RESEARCH METHODOLOGY

3.0 Introduction

This chapter explains the procedures in the collections and analysis of data among others.

3.1 Research Design

The study adopted pretest-posttest control group design type.

Table 3.1 Research Design Layout

Groups	Pretest	Treatment	Posttest	Retention Test
Experimental Group	O_1	X_1	O_2	O_{rt}
Control Group	O_3	X_2	O_4	O_{rt}

Schematic representation of research design layout

Key

O_1 O_3 …….Pretest

X_1 X_2 …….Treatment

O_2 O_4 ……. Posttest

O_{rt} ……Retention Test

_ ……. Control

3.2 Population of the Study

The population of the study consists of all the SS II students from all the secondary schools in Minna Metropolis of Niger State. The target population is four thousand five hundred (4,500) students who registered for Geography in 2012/2013 session.

3.3 Sample and Sampling Techniques

The simple random sampling technique was adopted for this study selection from the secondary schools in Minna metropolis, so as to take care of gender variable. Four (4) co-educational secondary schools were randomly selected using a hat drown method from nine (10) co- educational schools in Bosso local government areas of Niger State.

A total of thirty (30) students were selected, fifteen (15) male and fifteen (15) female students were selected from each school for the purpose of treatment. This will make the total sample to be one hundred and twenty (120). The techniques adopted for selection of the thirty students from each school for the study was stratified random sampling technique. The choice of stratified random sampling is based on the belief that gender is an important variable that may affect the outcome of the study. The advantage of the stratified random sampling is that it will increase the likelihood of representativeness, especially when the sample is not very large. According to Asika (2009) adopting random sampling gives every subject in a

population an equal chance of appearing in a population. It virtually ensures that any key characteristics of individuals in the population are included in the same proportions in the sample. Within the school the students will be stratified into two groups along genders (male and female) from each stratum, fifteen students were selected using the hat drow method in which papers will be written YES or NO separately for boys and girls. Those who pick yes were selected and while those who picked no stepped down. This gives a sample of thirty students (15 male and 15 female) from each school and a total sample size of one hundred and twenty (60 male and 60 female).

3.4 Research Instrument

Two research instruments were developed for the study. These were treatment instrument: Computer Simulation Package (CSP) and test instrument Geography Achievement Test (GAT).

Treatment instrument: These were developed by the researcher and a computer programmer; the computer simulation package which consist of one topic were subdivided in to four (4) lessons. An algorithm for the framework of the computer simulation package (CSP) was developed using macromedia firework 8.0, the interface for the simulation package were design.

Macromedia action were used to add interactivity to the interface i.e the designer user interface were created using macromedia firework for text, button and graph while macromedia flash were used for the same simulation. The main menu of the package consists of introduction of the list of lesson, topics, sub-topics, and the home, previous, next, mute and exit. The voice over of the simulation was done using audacity and finally compiled after inserting the audio in the package. The computer simulation package (CSP) was installed and displayed to the students via a projector, this was used to display information and simulation to the students. At the end of the whole units, students were scored. If after attempting and could not get all questions correctly, they have to click next to repeat the lesson.

Test Instrument: the test instrument Geography Achievement Test (GAT) is a carefully structured 20-item of objective questions instrument which was developed by the researcher from Essential Geography for Senior Secondary Schools by O.A Iwena. The Geography Achievement Test (GAT) was based on SSII Geography curriculum on the concept of regional geography of Nigeria, which were covered in the GAT

which were distributed to 120 students from the four secondary schools offering geography in SS1 in Minna metropolis. This instrument was administered to the experimental and control groups as pretest which was later administered for the posttest and retention test respectively. To reduce the prettest effect, the question were reshuffled and administered in the posttest and retention test each with five options of which the correct respondent attract ten marks each after which the overall scores was converted in to percentage by the researcher

3.5 Validity of the Instrument

i. Computer Simulation Package (CSP)

The computer simulation package was given to four computer programmers to determine the appropriateness of the package in terms of clarity and simplicity of the package, colour was used, spelling, text and voicing as well as the font size were used. Useful and constructive suggestion was used to amend on the instrument. The package was burn in a CD plate and audio was introduced to the whole content.

ii. Geography Achievement Test (GAT)

Face and content validity for the research instrument was established by two Geography teachers, the project supervisor and some lecturers in Geography and science education departments of Federal University of Technology Minna. Useful and constructive suggestions were made which led to the restructuring of some items in the objective questions.

3.6 Reliability of the Test Instrument (GAT)

To test the reliability of the Geography Achievement Test (GAT), 20 randomly selected SSII students were selected (10 boys and 10 girls) from Limawa Secondary School Minna. Test-retest method was used to determine the reliability coefficient of the test items. The response of the subjects was scored after the first and second administration of the test. The scores obtained were computed using Pearson's Product Moment Correlation Coefficient (PPMC). A reliability coefficient of 0.79 was obtained.

3.7 Method of Data Collection

The researcher visited the selected secondary schools to seek official permission from the authorities to use the schools and facilities. Researcher sought the cooperation of both the staff and the students in all the selected schools. The Geography teachers in all the schools were trained as research assistants. The first week of experiment was used for the administration of the pretest to the selected groups to check for the student's entry behavior. The experiment was conducted during school hours. Two experimental groups were taught using the computer simulation package (CSP) while two control groups were taught using the conventional method. Each class had two periods of 80 minutes each per week as provided in the school timetable. The experiment continued for six weeks followed by revision. The Geography Achievement Test (GAT) was then administered to test the achievement and retention of the students for both experimental and control groups. The test was conducted in all the selected schools for the study at various times and scripts were collected immediately for scoring as proper timing was strictly adhered to.

3.8 Method of Data Analysis

Mean, standard deviation and t-test statistics were used to analyze the data at p=0.05 level of significance, by means of Statistical Package for Social Science (SPSS) 15.00 version.

CHAPTER FOUR

RESULT

4.1 Introduction

This chapter presents the data collected, results and their analyses. This was done in accordance with the formulated null hypotheses in chapter one and it presents as well as the discussion of the findings of the study. The mean scores of both the experimental and control groups were analysed using mean, standard deviation and t-test statistics as shown in tables below.

4.2 Presentation of Data

The data for the study were presented under the following;

i. Demographic Data.

ii. Testing of Hypothesis.

4.2.1 Demographic Data

The following tables; 4.1 and 4.2 indicates the subjects' demographical data in terms of gender and the instructional strategy groups.

Table 4.1 Distribution of Subjects by Groups

Groups	No. of Subjects	Percentage (%)
Experimental	60	50
Control	60	50
Total	120	100

The table (4.1) shows that 60 subjects representing50% were categorized into experimental group the other 60 subjects also representing 50% of the samples in the control group.

Table 4.2 Distribution of Subject by Gender

Groups	males	Females	Total
Experimental	30	30	60
Control	30	30	60

Table 4.2 shows the distribution of subjects according to gender and group. The table indicates that there is equal number of subjects with respect to gender in equal proportion for the two groups. The experimental group has male and female subject (30/30) and also (30/30) for the control group. The distribution shows that there are equal numbers of male and female subjects in both groups.

4.2 Pretest Result

4.3 Table 4.3 Pre-test Achievement of Experimental and Control Groups

Group	No	Df	Mean	SD	t-cal	P-value

Experimental	60	59	22.00	10.218	1.800^{ns}	.182
Control	60		22.17	8.506		

ns=not significant at p>0.05

Table 4.3 presents t-test result for Pretest of Experimental and Control groups. The mean of the male and female students is 22.00 and 22.17 respectively the mean scores of male did not differ significantly from the female (t=1.337,df=29,p=0.05). Hence, the two groups were equivalent in terms of performance before treatment began.

4.3 Testing the Hypotheses

Hypothesis One (HO_1)

HO_1: There is no significant difference between the achievement mean scores of students taught geography using Computer Simulation Package (CSP) and those taught with conventional teaching method.

Table 4.4Summary of Post-test mean scores of Experimental and Control Groups

Group	No	Df	Mean	SD	t-cal	P-value
Experimental	60	118	74.67	11.60	7.503*	0.000
Control	60		61.67	6.743		

significant at p<0.05

Table 4.4 presents the t-test comparison between the mean achievement score of students treated with computer simulation package and the mean achievement score of those taught using the conventional teaching method. The mean score and standard deviation of the experimental group are 74.67 and 11.60 respectively while those of the control group are 61.67 and 6.743. This result shows that there is a significant difference in the mean achievement score of students taught geography using Computer Simulation Package (CSP) and those taught using conventional teaching method (t=7.503, df=118, P<0.05). Hence the null hypothesis stated above that there is no significant difference between the mean achievement score of students taught geography using Computer Simulation Package (CSP) and those taught using conventional teaching method is hereby rejected.

Hypothesis Two (HO_2)

HO_2: There is no significant difference between the achievement mean scores of male and female students taught geography using Computer Simulation Package (CSP).

Table 4.5Summary of Post-test Achievement scores of Male and Female of Experimental Group

Group	No	Df	Mean	SD	t-cal	P-value
Male	30	58	80.50	8.545	4.479	0.023
Female	30		68.83	11.42		

significant at p<0.05

Table 4.5 presents the t-test comparison between the mean achievement score of male students and the mean achievement score of female students treated with computer simulation package (CSP). The mean score and standard deviation of the male students are 80.50 and 8.545 respectively while those of the female students are 68.83 and 11.42. This result shows that there is a significant difference in the mean achievement score of male and female students taught geography using Computer Simulation Package (CSP)($t=4.479$, $df=58$, $P<0.05$). Hence the null hypothesis stated above that there is no significant difference between the mean achievement score of male and female students taught geography using Computer Simulation Package (CSP) is hereby rejected.

Hypothesis Three (HO_3)

HO_3: There is no significant difference between the retention mean scores of students taught geography using Computer Simulation Package (CSP) and those taught using conventional teaching method.

Table 4.6Summary of Retention Scores of Experimental and Control Groups

Group	No	Df	Mean	SD	t-cal	P-value
Experimental	60	118	73.67	9.291	26.83	0.039
Control	60		21.08	12.01		

significant at $p<0.05$

Table 4.6 presents the t-test comparison between the mean retention score of students treated with computer simulation package and the mean retention score of those taught using the conventional teaching method. The mean score and standard deviation of the experimental group are 73.67 and 9.291 respectively while those of the control group are 21.08 and 12.01. This result shows that there is a significant difference in the retention mean score of students taught the geography using Computer Simulation Package (CSP) and those taught using conventional teaching method ($t=26.83$, $df=118$, $P<0.05$). Hence the null hypothesis stated above that there is no significant difference between the mean retention score of students taught geography using Computer Simulation Package (CSP) and those taught using conventional teaching method is hereby rejected.

Hypothesis Four (HO_4)

HO_4: There is no significant difference between the achievement mean scores of male and female students taught geography using Computer Simulation Package (CSP).

Table 4.7Retention of Male and Female of Experimental Groups

Group	No	Df	Mean	SD	t-cal	P-value
Male	30	58	78.33	6.065	26.53	0.000
Female	30		19.33	10.56		

significant at $p<0.05$

Table 4.7 presents the t-test comparison between the mean retention score of male students and the mean retention score of female students treated with computer simulation package (CSP). The mean score and standard deviation of the male students are 78.33 and 6.065 respectively while those of the female students are 19.33 and 10.56. This result shows that there is a significant difference in the mean retention score of male and female students taught geography using Computer Simulation Package (CSP)($t=26.53$, $df=58$, $P<0.05$). Hence the null hypothesis stated above that there is no significant difference between the mean retention score of male and female students taught geography using Computer Simulation Package (CSP) is hereby rejected.

CHAPTER FIVE
DISCUSSION, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter dwells on the discussion of results, major findings, and contributions to knowledge, conclusion, recommendations and suggestions for further studies

5.2 Discussion of Results

Table 4.3 presents t-test result for Pretest of Experimental and Control groups. The mean of the male and female students is 22.00 and 22.17 respectively the mean scores of male did not differ significantly from the female (t=1.337,df=29,p=0.05). Hence, the two groups were equivalent in terms of performance before treatment began Computer Simulation Package (CSP).

Table 4.4 presents the t-test comparison between the mean achievement score of students treated with computer simulation package and the mean achievement score of those taught using the conventional teaching method. The mean score and standard deviation of the experimental group are 74.67 and 11.60 respectively while those of the control group are 61.67 and 6.743. This result shows that there is a significant difference in the mean achievement score of students taught geography using Computer Simulation Package (CSP) and those taught using conventional teaching method (t=7.503, df=118, P<0.05). Hence the null hypothesis stated above that there is no significant difference between the mean achievement score of students taught geography using Computer Simulation Package (CSP) and those taught using conventional teaching method is hereby rejected. That is there significant difference between the two groups on achievement. The result is therefore in agreement with that of Nsofor, 2010; Nordi,2011; and Bello et al (2011) who noted that CSP instruction enhances students achievement.

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Table 4.7 presents the t-test comparison between the mean retention score of male students and the mean retention score of female students treated with computer simulation package (CSP). The mean score and standard deviation of the male students are 78.33 and 6.065 respectively while those of the female students are 19.33 and 10.56. This result shows that there is a significant difference in the mean retention score of male and female students taught geography using Computer Simulation Package (CSP)($t=26.53$, $df=58$, $P<0.05$). Hence the null hypothesis stated above that there is no significant difference between the mean retention score of male and female students taught geography using Computer Simulation Package (CSP) is hereby rejected. This finding agrees with the work of; McNally (2006) and Chavez (2011); and in disagreement with the findings of Oxford (1994); Afolabi and Yusuf (2010); Patric and Ezenwa (2000). Who note that there was significant difference in retention of concepts learnt by the two sexes when CAI and concept maps were used.

5.3 Major Findings of the Study

The followings were the findings derived from this research study.

1. That the use of Computer Simulation Packages (CSP) in teaching the concept of regional geography of Nigeria enhances students' academic achievements in the subject.
2. The use of CSP has no gender influence on achievement that is there was no significant difference in the mean achievement scores of the males and females taught with CSP.
3. The experimental group taught regional geography of Nigeria with CSP retained the concepts taught for a longer period of over time than their counterparts in the control group taught with lecture method
4. The CSP exerted profound effects on the retention of concepts in geography when gender scores were analyzed indicating that the males did better than their female counterparts in the same group.

5.4 Conclusion from the Findings

Based on the major findings of the study, the following conclusions are made;

(i) Computer Simulation Package is a versatile tool in enhancing the academic achievement of students in geography
(ii) Computer Simulation Package do not have much effects or influence on gender achievement when exposed to the treatment.
(iii) Computer Simulation Package has profound effects on the retention of concepts taught via the packages for a long period of time.
(iv) Computer Simulation Package has more profound effects on retention of concept by male students than female students.

5.5 Summary of the Study

The study investigated the effects of CSP on the academic achievement of senior school students in geography, in Minna metropolis Niger state. This study was based on the current trend of poor performances of students in the two examinations conducted by WAEC and NECO in the country. It is

against this backdrop that the research study intended to conduct a study on the use of CSP for the betterment of the whole scenario. The study has five purposes, four research questions and four corresponding research hypothesis, and tested at 0.05 alpha level of significance. Findings from the study revealed that the CSP has a lot of advantages especially in enhancing the teaching and learning of the subject geography. It was recommended that the government should as a matter of urgency provides a lot of fund and the retraining of teachers so that the educational objectives of secondary education could be achieved.

5.6 Contribution of the Study to Knowledge

It is believed that the findings from this study would be beneficial to the entire body of knowledge, especially in the achievement of the nation's educational policy goals.

I. Learning through the use of CSP will develop the student's ability in manipulating equipment such as the computers, labtops, ipads and others.

II. The use of simulation and sound in instruction by CSP bridges the gap between the outside world and the classroom environment by bringing to reality what would have not been possible to be demonstrated in the classroom.\

III. Reduction in boredom of the learners when exposed to the traditional mode of instruction is replaced by the active participation of the students in learning process could help in accelerating the rate of achieving the objectives of education in the country.

5.7 Recommendations

The findings from the study yielded the following recommendations;

1. The use of Computer Simulation Package should be put in to consideration. As it provides diversity of knowledge in geography and technology.

2. Computer should be made available in schools to enable students carry out simulation activities themselves.

3. Since the findings of this study showed that students who worked on the CSP performed better, students should be encourage to develop in a social interaction in the use of computer.

4. Provision of facilities and equipment to schools by the government will help in addressing the poor performance of students in final year examinations.

5. Retraining of teachers through workshops, seminars and conferences will increase the teachers' competence towards the use of new media in teaching and planning of instruction.

6. Non-governmental organizations should assist the schools in the provision of infrastructures and equipment in order to raise the standard of instruction in our schools, which might result in higher positive output of learning outcomes.

5.8 Suggestions Further Studies

The research study which was conducted within the shortest possible time has the belief that if the study can be conducted on a large scale basis, more fruitful results could be obtained. Some of the suggestions are as follows;

1. Research should be conducted on the use of CSP in teaching other concepts in geography that are difficult to be taught traditionally or conventionally.
2. Other computer software packages should be used in conducting research on the effects of student prepared CSP and teacher prepared CSP.

3. Gender is one of the variables that play an important role in any research study. Therefore, more research studies should be conducted on the influence of other independent variables affecting gender achievements as a whole.

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APPENDIX A

FISRT LESSON PLAN: EXPERIMENTAL GROUP

SCHOOL: Government Day Secondary school, Minna

CLASS: SS II

SUBJECT: Geography

TOPIC: Nigeria (The Regional Geography of Nigeria)

SUB-Topic: Location, position, size and political divisions in West Africa date

DATE:

DURATION: 80 minutes

PERIOD:

AVERAGE AGE: 16 – 17Years

INSTRUCTIONAL Media: Computer Simulation Package (CSP)

BEHAVOURAL OBJECTIVES: At the end of the lesson the students should be able to:

(i) Identify Specific characteristics of location, size position and political divisions

(ii) Define location, size, position and political divisions

(iii) Drown the map of Nigeria showing the 36 states and capitals including FCT.

PREVIOUS KNOWLEDGE: Students have learnt the size, position, size and political devotions in West Africa.

INTRODUCTION: The package introduces the lesson by defining location size position and political divisions, Nigeria lies within latitude 46N – 140N of the equator and longitude 30E – 15 0E of Green which Meridian. Position Nigeria as a country is found in West Africa , with four major international borders size in terms of size Nigeria is about 92 3, 768 square kilometers.

PRESENTATION: The package presents the lesson in the following steps:

STEP I: The package will begin by location of Nigeria which lies within latitude 40N 140N of the Equator and longitude 30E – 15 0E of green which meridian. It therefore follows that Nigeria has a latitudinal sketch of 100 and longitudinal Extent of 1200

STEP II: The package will explains the position of Nigeria as a country found in West Africa. Bounded to the West by the Republic of Bering to the East by Cameroun Republic, to the North by Niger Republic and to the south by the Atlantic Ocean. Also to explain further and the Nigeria is surrounded by the French – speaking countries with exception of the south where a pool of water body exist.

STEP III: The package will explain the size of Nigeria that Nigeria is about 923,768 square kilometers. It is the fourth largest country in West Africa after Niger, Mali and Mauritania in terms of land area, but in terms of population, her population stood at 150,000,000 according to 2006 census but projected by UN in 2012 that the population stood at 160, 000,000, having the highest population in Africa.

STEP IV: The package will explain the political divisions of Nigeria and history; Nigeria came in to being in 1914 as a result of the amalgamation of the Northern and southern protectorates. She became independent in 1960. As at dependence, the country has three regions namely, North, West and East.

Northern region had its headquarters at Kaduna, west Ibadan and East at Enugu. In 1963, she became a Republic and the Fourth division known as MTd – West was created from the Western region with its headquarters at Benin City. The political division leaned four until 1967 when the country was further split in to twelve (12) states as follows

States		**Capital**	**States**		**Capital**
1.	North – west	Sokoto	9. North Easter		Maidudun
2.	Kwara -	Ilorin	10. North Central	Kaduna	
3.	Benue – Plateau	Jos	11. East Central		Enugu
4.	Lagos	Lagos	12. Western	Ibadan	
5.	Mid – Western	Begin City			
6.	Riverrs	Post – Harcourt			
7.	Kano	Kano			
8.	South – Eastern	Calabar			

In 1976, the country was further divided into 19 states. On September 23, 1987 two more states were created making the total number 21, Today, Nigeria has thirty – six states and a Federal Capital territory

at Abuja which is the Federal capital of Nigeria. Below is the map of Nigeria showing the states and their capitals.

MAP OF NIGERIA

EVALUATION:

(1) Nigeria lies within latitude

a. 10N – 20N (b) 40N – 100N (c) 30N – 130N (d) 40N – 140N (e) 50N – 80N

(2) Nigeria has the latitudinal stretch longituchnal extent of

(a) 6 0 – 7 (b) 10 0 – 120 (c) 200 – 250 (d) 110 – 120 (e) 150 - 160

(3) The country Nigeria is found in which part of the Africa

(a) East Africa (b) North Africa (c) West Africa (d) Sourth Africa (e) Central Africa

(4) Nigeria has how may international boundaries?

(a) 10 (b) 6 (c) 4 (d) 3 (e) 12

(5) Based on Nigerians position, it can be said that Nigeria is surrounded by the following speaking countries.

(a) English speaking countries (b) Spanish speaking countries(c) Yomba speaking countries (d) Hench specking countries (e) Nupe sealing countries

(6) In 1967 country Nigeria was split in to how may states?

(a) 12 (b) 13 (c) 20 (d) 35 (e) 10

(7) The headquarters of Northern Region was located in which of the following cities?

(a) Kaduna (b) Maiduguri (c) Jigawa (d) Bauchi (e) Gombe

SUMMARY: The package will Summarizes the major points of the lesson such as location is that Nigeria lies within latitude 40N – 140N, position is that the country is located in the west Africa with four major international boundaries. Size is the area of Nigeria which is about 923,768 square kilometer. Political divisions, the country, Nigeria came into being in 1916 as a result of the amalgamation of the northern and southern protectorate.

SECOND LESSON PLAN: EXPERIMENTAL GROUP

SCHOOL: Government Day Secondary school, Minna

CLASS: SS II

SUBJECT: Geography

TOPIC: Nigeria (The Regional Geography of Nigeria)

SUB-TOPIC: Relief of Nigeria

DATE:

DURATION: 80 minutes

PERIOD:

AVERAGE AGE: 16 – 17Years

INSTRUCTIONAL MEDIA: Computer Simulation Package

BEHAVOURAL OBJECTIVES: At the end of the lesson the students should be able:

(1) Explain the following terms the highlands or plateaux the lowlands

(2) Describe the relief of Nigeria

(3) Importance of highlands

(4) Importance of low lands

PREVOUS KNOWLEDGE: Students know the meaning of relief of Nigeria.

NTRODUCTIOIN: The package will introduce the lesson by asking question such as;

1. What is relief?

2. Nigeria relief can be divided in to how many?

3. How many high lands do we have in Nigeria?

PRESENTATION: The package will present the lesson in the following steps

STEP I: The package explains the meaning of relief in Nigeria, the types of reliefs such as: The north – Central highlands that that lies within the centre of Northern Nigeria and covers nearly one – fifth of the area. The highlands is made up of two different platforms which lie at different levels

(a) The high plains of Housa land whose average elevation stands at 750 meters from the lower step (b) The Jos plateau is the highest platform with an elevation 1500m to 1800 meters. Many rivers in northern Nigeria rise from the North – Central plateau.

(b) The Western Highlands; The Western highlands to Yoruba upland is found in the western part of Nigeria around Ogu, Osun, Oyo, Kwara, Ondo and Edo States. The important outstanding hills found within this area are Idame asom, Efon Laiye ridge,, Apata hill (400 – 700m), Epeme hill, (350 – 600m) Kukuruku hill, Iseyin hill, Abeokuta hill etc. many rivers takes up their sources forum this into River Niger.

(c) The eastern scarp land: This area is found in the eastern region of Nigeria especially around Enugu and Nsukka. The major highlands in this area are the Udi – Nsukka plateau whose height lies between 300m to 600m. The major rivers that take up their sources form this scarpland include River Anambra, Imo, and cross River.

(d) The Eastern Highlands: The Eastern highlands are areas which represent the highest zone in Nigeria and they can be located between the Nigeria and Cameroun border fringe. Among highlands are (1) Adamawa mountain whose heights is between 1800 – 2400 metres (2) The Alantika and sherbshi hills 1600 – 2,000 metres (3) The mandarin mountain 1200 – 1599 metre (4) Obudu and Oban hilss 1200 metres (5) Bin plateau 800 – 1200 metres. The rives that take their sources from this zone include Yesseram, Ngoda, Gana, Ka tsina Ala e.t.c.

STEP II: The plackage explains the importance of highlands, sources of minerals; like coal (Eugun, tin and columbite (Jos) gold, diamond and limestone. For deference highlands are usefully in rimes of many river and lands in Nigeria serve as watershed or sources of many river and streams; As Tourist centers: Some highlands in Nigeria serve as centre for tourist attraction e.g Jos plateau; some highlands like Jos plateau have cool climate which aids settlement of people.

STEP III: The package will explains the importance of lowlands in Nigeria; lowland areas are good for human habitation; The coastal lowlands are rich sources of mineral deposits such as Iron Ore and crude oil; lowland areas in Nigeria favour the construction of communication networks such as roads, railways,

airports e.t.c; low and areas in Nigeria especially depositional plains in Nigeria provide good Jobs such as fishing.

STEP IV: The package will also explain the problems associated with high lands, problem such as; They prevent human habitation; most highlands occupy large area; Highlands encourage soil erosion; The often serve as barriers to communication; Most highland soils may be poor nutrient and as such may not be good for agriculture.

The package will also explain the lowland areas in Nigeria: The lowlands with height generally below 300 meters, lie along the coast and along the valleys of the rives (1) The Sokoto plainss, in the North – west (200 – 300m) (2) The Niger – Benue Trough, Wrapping round the North – central plateau (100 – 300m) (3) The Chad basin or Borno plain the North East extremity (100 - 300) (4) The interson coastal Lowland of Western Nigeria (100 – 300m) (5) The coastal plains (0 – 100m) (6) The cross River basin (0 – 100m) (7) The Coastal plains (0 – 100m) the lowland areas are usually associated with various rocks such as alluvial deposits, limestone, sand stones, shale, clay e.t.c

EVALUATION: The package evaluates the lesson by asking the following questions.

(1) How many Categories of relief do we have in Nigeria?

(a) 1 (b) 2 (c) 4 (d) 6 (e)3

(2) The highlands in Nigeria are refers to the areas ---------- above the see level

(a) 100m (b) 300m (c) 200m (d) 400m (e) 500m

(3) The following problems associated with Highlands Except.

(a) The prevent human habitation

(b) Most highlands occupy large area

(c) Highland encourage soil erosion

(d) Highland discourage soil erosion

(4) The highlands in Nigeria can be grouped in to how many?

(a) Four (b) Two (c) Five (d) Seven (e) Three

(5) The relevance of highlands in Nigeria include the following except

(a) Source of minerals (b) For defiance (c) For slavery (d) As a source of rivers (e) as tourist centers

SUMMARY: The package summarizes the major points of the lesson North – Central Highlands: This area lies within the Centre of Northern and covers nearly one – fifth of the area: The Western Highlands: the Western Highlands in found in western Nigeria; The Eastern Scarp land: This area is found in the eastern region of Nigeria especially around Enugu and Nsukka; The Eastern Highlands: The Eastern highlands are areas which represent the highest zone in Nigeria and they can be located between the Nigeria and Cameroun border fringe.

THIRD LESSON PLAN: EXPERIMENTAL GROUP

SCHOOL: Government Day Secondary school, Minna

CLASS: SS II

SUBJECT: Geography

TOPIC: Nigeria (The Regional Geography of Nigeria)

SUB-TOPIC: Relief of Nigeria

DATE:

DURATION: 80 minutes

PERIOD:

AVERAGE AGE: 16 – 17Years

INSTRUCTIONAL MEDIA: Computer Simulation Package

BEHAVOURAL OBJECTIVES: At the end of the lesson students should be able to:

(1) Name the four major groups of rivers in Nig.

(2) The characteristics of Nigeria rivers

(3) Economic importance of rivers in Nigeria

(4) River basin and lakes

PREVIOUS KNOWLEDGE: The package will begin by presenting the map of Nigeria showing the Drainage Basins in Nigeria.

PRESENTATION: The package will present the lesson Trough the following steps.

STEP I: The package presents the North central plateau from the maps showing the area on the map, Niger – Benue river system the River Niger, the largest and longest river in Nigeria has a length of 2600 miles from its source in Futa – Jalon highland (Guinea) passing through Mali and Niger before flowing eastwards and later southwards of Nigeria. The River West of the Lower Niger; these rivers are found on the western

highland or Yoruba highland which include the following: Rivers Ogun, Oshun, Osse and Ossiomo which flows directly in the Atlantic Ocean.

The Rivers that flow into lake Chad, these rivers take source form the North – Central Highlands basically Jos Plateau. Most of these rivers flow into lake chard, hence, the area is termed in land drainage.

The Rivers East of the lower Niger; these are rivers that take their sources form eastern scarpland and eastern highland, thereby emptying their water in to River Niger, River Donga, Katsina – Ala, Anambra, Imo, Cross and Taraba.

STEP II: The package will explains, the characteristics of Nigeria rives; Rapid and cataracts: Majority of Nigerian rivers are often characterized by the presence of rapids and cataracts which impede drainage or navigation; Seasonality the rivers increase in volume during rainy season and during the dry seasing the water reduce drastically; Presence of Debris the most rivers are characterized with a lot of sediments as they flow through the high forests; Shallowness majority of the Nigerian rivers are very shallow and full of silt; Short distance most of the rivers often flow over a short distance, hence not suitable for navigation.

STEP III: The package will state the economic importance of rivers in Nigeria;

(1) Mitigation purposes

(2) For generation of hydro – electric power

(3) For navigation

(4) For Industrial uses

(5) For domestic purposes

(6) For recreation and tourism purposes

(7) For fisting

(8) For the construction of ports

(9) For festival purposes.

STEP IV: The package will explain the River Basins, the River Basin simply refers to the area generally drained or leveled by a river and its main tributaries. The Nigeria has five main river Basins namely:

The Niger Basin, The Benue Basin, The Chad Basin, The Cross River Basin and South Atlantic Basin The economic importance of Rives Basin; (1) River basing provide good sites for settlements; (2) River basing provide medium of communication, which people and goods can be transported from one place to another (3) River basing often provide both domestic and industrial water supply. (4) River basing usually produce good fishing ground to its inhabitants who may take fishing as an occupation (5) River basin are usually suitable for Agricultural purpose

STEP IV: The package will explain the lakes; (a) Artificial or man – made lake; this type referred as "atypical lake" are constructed by man as a result of improvement in science and technology for two main reasons:

1. Immigration

2. Hydro – electric power generation

(b) The natural lakes these are lakes that exist naturally without man having anything to do with them e.g lake Chad – often referred to as an inland drainage because of several rivers flow in to it without getting out.

EVALUATION: The package will evaluates the lesson by asking students the following questions

(1) The rivers of Nigeria can be subdivided in to how many groups?

(a) 4 (b) 6 (c)10 (d)20 (e) 11

(2) The economic importance of Nigeria rivers include the following accepts?

(a) For immigration (b) For fighting (c) For navigation (d) For domestic use (e) For fishing

(3) The river basin simply refers to the area generally drained or leveled by a river and its main:- ……

(a) Niger Basin (b) Festival (c) Tributaries (d) Crop cultivations (e) navigations

(4) The characteristics of Nigeria rivers include the following except?

(a) Rapid and cataracts (b) seasonality (c) short distance (d) shallowness (e) construction of part

(5) On the Drainage basin of Nigeria simulated before the area mark A is what?

(a) North Central Plateau (b) Western Highlands (c) Eastern Highlands (d) Udi highlands (e) Dry lands

SUMMARY: The package summarizes the major point of the lesson to the students. River Benue the longest and largest river in Nigeria; lake Chad the river take their sources from the north – central highland basically Jos plateau.

ASSIGNMENT: Draw the map of Nigeria on it show drainage basins of Nigeria.

FOURTH LESSON PLAN: EXPERIMENTAL GROUP

SCHOOL: Government Day Secondary school, Minna

CLASS: SS II

SUBJECT: Geography

TOPIC: Nigeria (The Regional Geography of Nigeria)

SUB-TOPIC: The climate of Nigeria

DATE:

DURATION: 80 minutes

PERIOD:

AVERAGE AGE: 16 – 17Years

INSTRUCTIONAL MEDIA: Computer Simulation Package

BEHAVOURAL OBJECTIVES: At the end of the lesson students should be able to

1. Define climate
2. State the factors that affect climate
3. Draw the map of Nigeria showing tropical continental air mass January and tropical maritime Air mass July
4. Draw the map of Nigeria showing annual rainfall and Nigeria mean annual temperature.

PREVIOUS KNOWLEDGE: Students have idea of the drainage system of Nigeria

INTRODUCTION: The package introduces the lesson by giving the meaning of affect climate e.g wind, the Nigeria climate is affected by two main air masses.

(a) The Tropical Minutemen (TM) Air masses or South west Trod wind

(b) Tropical Continental Air masses (CT) or North East Trade Wind.

PRESENTATION: The package will present the lesson through the following steps:

STEP I: the package explains the meaning of climate; climate is the average weather condition of the atmosphere over a long period of time. There are various factors that affect climate in Nigeria such as winds, rainfall, and temperature.

Factor one: WIND

The Nigeria's Climate is affected by two main air masses.

(a) The tropical maritime (MT) air masses or South West trade Wind

(b) Tropical continental air masses (CT) or North East Trade Wind.

(a)The tropical maritime air masses or the south west trade wind is responsible for rainy season. This wind blows across the Atlantic Ocean towards the coast of Nigeria. During this period, (summer wet season),high temperatures in the hot interior north of Nigeria lead to low air pressure in the southern Sahara. Warm, moist south west wind is attracted inland during this period. In other words, the tropical maritime air mass lies well inland over Nigeria during July, giving wet conditions. Wet conditions start around March and ends around October with a short dry period in August referred to as August break.

(b)The tropical continental air mass or North East Trade Wind is responsible for dry season in Nigeria. This wind blows across the Sahara Desert towards Nigeria. In winter, the tropical continental air mass moves much further south. The contact zone of low pressure between the two air masses- Intertropical Convergence Zone (ITCZ) is near the coast and air movement in Nigeria is dominated by the hot dry winds blowing from the north – east. At this time of the year rainfall is slight and hot, dry wind often carries dust which makes life difficult in many ways. This wind is known as harmattan.

Step II: The packages will present the rainfall:

Rainfall is clearly the most important fact in Nigeria's climate. Seasons are determined by rainfall than by temperature. Rainfall totals generally decrease inland from over 2800mm in the extreme South to below 600mm in the extreme North, though this simple pattern is upset by relief, notably on the Jos Plateu.

As for seasons, there are two main ones namely the "wet" and the "dry" these two seasons vary in length as one move northwards. The rainy season is the longest in the extreme south and shortest in the extreme north, where it last for only four and a half month-,March to November of every year.

Two additional points need to be mentioned about the rainfall distribution in Nigeria

(1) Along the coast, the simple division of the year into along wet season and a short dry season is complication, because of the fact that there are really four seasoning here. The rainy season is split into two with a short little "little dry "season in the middle- usually in August. This short dry spell is probably caused by the prominence of easterly winds, relatively empty of moisture, which blow during the period.

(2) the second point to note is that the coast of Nigeria bends southwards as one approaches the Niger Delta from the west. Lagos is a long ways North of the –eastern coast. Being nearer to the equator, the Delta and the South-East have greater rainfall and shorter dry season than Lagos. Climate condition is the extreme South-east, indeed, are really equatorial.

Finally, a point about the way it rains in Nigeria. Nearer the south west coast, rain may fall for long continues period as kind of drizzle. But further east, the rain are frequently heavier. Over much of Nigeria interior, rainfall often experiences conventional origin, the air being forced to rise by intense heating of the land or by relief features like the Jos Plateau. During the wet season, light local storms are common. These intense thunderstorms are strong common. These intense thunderstorms are known as "line squalls and move generally from east to west. They are characterized by thunder, lightning land short, heavy downpours, they are particularly common at the beginning and of end of the rains.

STEP III: the package will explain the temperature regime, Nigeria is of course a hot country, and only in few areas like the Jos Plateau does relief reduce temperature significantly. But the seasonal and diurnal ranges of temperature increase generally inland from the coast. In the south the variation from month to month is not great -the annual temperature range is only about 30C. Temperature variation from day to night, however are more marked, about 100C. In the north, the annual temperature range is greater about 60C. The diunal range is quite considerable; about 150C. This supports the well-known fact or statement that "night is the winter of the tropics.

EVALUATION: The package evaluate the lesson spiraling the following question

(1) The Nigerian climate is affected by how many air masses?

(a) 2 (b) 10 (c) 3 (d) 4 (e) non the above

(2) The tropical continental air mass or North East Trade wind is responsible for dry season in which of the country?

(a) Nigeria (b) Gnana (c) Malli (d) Ivory coast (e) Benin

(3) The inter tropical convergence zone (ITCZ) is near the coast and air movement in Nigeria is dominated by the not dry winds blowing from ----------

(a) South – North (b) North – east (c) North – north east (d) south – south east (e) west - North

(4) As for season we have how many in Nigeria?

(a) 2 (b) 4 (c) 10 (d) 3 (e) 5

(5) In the south, the variation from month to month is not greater the annual temperature range is only about ----------

(a) 200 (b) 100 (c) 50 (d) 30 (e)150

SUMMARY: The package will summarizes the main points to the lesson to the students; Such as climate is the average weather condition of the atmosphere over a long period of time. Tropical Maritime (MT) Air masses or South West Trade Wind.

Tropical Continental Air Masses (CT) or north East trade wind.

APPENDIX B

QUESTIONS FOR EXPERIMENTAL AND CONTROL GROUP

SHORT ANSWERS

100 MARKS

GEOGRAPHY ACHIEVEMENT TEST (GAT)

Instruction: Read the following questions carefully and choose the correct answer from option A-E. answer all questions

(1) Nigeria lies within latitude

a. 10N – 20N

(b) 40N – 100N

(c) 30N – 130N

(d) 40N – 140N

(e) 50N – 80N

(2) Nigeria has the latitudinal stretch longituchnal extent of

(a) 6 0 – 7

(b) 10 0 – 120

(c) 200 – 250

(d) 110 – 120

(e) 150 - 160

(3) The country Nigeria is found in which part of the Africa

(a) East Africa

(b) North Africa

(c) West Africa

(d) Sourth Africa

(e) Central Africa

(4) Nigeria has how may international boundaries?

(a)10

(b) 6

(c) 4

(d) 3

(e) 12

(5) Based on Nigerians position, it can be said that Nigeria is surrounded by the following speaking countries.

(a) English speaking countries

(b) Spanish speaking countries

(c) Yomba speaking countries

(d) Hench specking countries

(e) Nupe sealing countries

(6) In 1967 country Nigeria was split in to how may states?

(a)12

(b) 13

(c) 20

(d) 35

(e) 10

(7) The headquarters of Northern Region was located in which of the following cities?

(a)Kaduna

(b) Maiduguri

(c) Jigawa

(d) Bauchi

(e) Gombe

(8) How many Categories of relief do we have in Nigeria?

(a)1

(b) 2

(c) 4

(d) 6

(e)3

(9) The highlands in Nigeria are refers to the areas ---------- above the see level

(a)100m

(b) 300m

(c) 200m

(d) 400m

(e) 500m

(10) The following problems associated with Highlands Except.

(a) The prevent human habitation

(b) Most highlands occupy large area

(c) Highland encourage soil erosion

(d) Highland discourage soil erosion

(11) The highlands in Nigeria can be grouped in to how many?

(a)Four

(b) Two

(c) Five

(d) Seven

(e) Three

(12) The relevance of highlands in Nigeria include the following except

(a)Source of minerals

(b) For defiance

(c) For slavery

(d) As a source of rivers

(e) as tourist centres

(13) The rivers of Nigeria can be subdivided in to how many groups?

(a)4

(b) 6

(c)10

(d)20

(e) 11

(14) The economic importance of Nigeria rivers include the following accepts?

(a)For immigration

(b) For fighting

(c) For navigation

(d) For domestic use

(e) For fishing

(15) The river basin simply refers to the area generally drained or leveled by a river and its main:- ……

(a)Niger Basin

(b) Festival

(c) Tributaries (d) Crop cultivations (e) navigations

(16) The characteristics of Nigeria rivers include the following except?

(a)Rapid and cataracts

(b) seasonality

(c) short distance

(d) shallowness

(e) construction of part

(17) On the Drainage basin of Nigeria simulated before the area mark A is what?

(a) North Central Plateau

(b) Western Highlands

(c) Eastern Highlands

(d) Udi highlands

(e) Dry lands

(18) The Nigerian climate is affected by how many air masses?

(a) 2

(b) 10

(c) 3

(d) 4

(e) non the above

(19) The tropical continental air mass or North East Trade wind is responsible for dry season in which of the country?

(a)Nigeria

(b) Gnana

(c) Malli

(d) Ivory Coast

(e) Benin

(20) The inter tropical convergence zone (ITCZ) is near the coast and air movement in Nigeria is dominated by the not dry winds blowing from ----------

(a)South – North

(b) North – east

(c) North – north east

(d) south – south east

(e) west - North