

**EFFECT OF CONCEPT MAPPING ON ACADEMIC PERFORMANCE OF  
SECONDARY SCHOOL GEOGRAPHY STUDENTS IN BOSSO LOCAL  
GOVERNMENT MINNA, NIGER STATE**

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MINNA NIGER STATE, NIGERIA**

**AUGUST, 2021**

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**A PROJECT SUBMITTED TO THE DEPARTMENT OF EDUCATIONAL  
TECHNOLOGY, SCHOOL OF SCIENCE AND TECHNOLOGY EDUCATION  
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## ABSTRACT

The study is investigated on Effect of Concept Mapping on Academic Performance of Secondary School Geography Students in Bosso Local Government Minna, Niger State. Based on the findings of the study, on lecture instructional strategy learning instruction on the academic achievement of concept of Concept mapping by Geography students. it could be concluded that on lecture instructional strategy helps to improve the achievement of student. The study further highlighted the positive influence of on lecture instructional strategy on academic achievement of student in Geography. The population for this study will consists of all senior secondary two (SS2) students registered in government co-educational senior secondary schools located in Bosso Local Government. They are government owned schools; operate same academic calendar and same curriculum. The total student's population consists of 1333 consisting of 547 males and 786 females. All schools offer courses in Geography with particular reference to measurement, which is relevant to this study. Mean and standard deviation are used to analyse the research questions and inferential statistics t-test was used to analyze the null hypotheses at  $\rho \leq 0.05$  level of significance. From the findings of the study it could be concluded that there is significance difference between the mean achievement score of those students taught lecture instructional strategy is 29.91, SD = 5.33, while those wealthier measurement using concept mapping is 35.36 and the SD=3.62, df = 78, with p-value of  $0.022 < 0.05$ . the findings of the showed that there is no significant difference in mean achievement score of male and female students taught using concept map with p-value of 0.89, Based on the findings of the study the following recommendation was made: The Ministry of Education should encourage the using concept mapping instructional strategy in teaching Geography in Senior Secondary School, School Authority and teachers should be enlightened on the importance of lecture instructional strategy in teaching and the students should also be enlightened on the importance of concept map of learning to their careers.

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## **CHAPTER ONE**

### **1.0**

### **INTRODUCTION**

#### **1.1 Background to the Study**

Geography is a science subject which focuses attention mainly on the interactions between man and his environment. It is a science of synthesis which seeks to understand a given area in terms of the total integration of various phenomena which characterize it (Ezeani, 2017). Geography is undisputedly an environmental science that studies all systems of the environment. It is also seen as a subject whose practical and intellectual values have become widely applicable to many spheres of life and thereby contributes to national and international development. Therefore, geography alone has no unique claim to environmental competence since it draws attention on the spatial relationship between phenomena in relation to space and time. It is therefore appropriate to teach Environmental Related (ER) contents which are also referred to as Environmental Education (EE) contents through the secondary school geography. In addition, ACARA (2011) confirms that Geography is closely related to Environmental Education since many of the concerns of EE coincide closely with those of Geography. Specifically, ACARA asserts that most environmental problems have a spatial dimension and it is this that makes the geographical perspective so important in Environment related issues.

Hence, the objectives of geography according to Igbogoro (2016) include: to enable students develop interest in both physical and cultural environment as a place and home of humans and thus broaden their outlook; to enable students gain an understanding of how the environment and climatic factors influence our lives; to develop in students an understanding of the basic concepts, principles and theories relating to geographical and environmental phenomena and finally, to help students develop a sense of responsibility

towards the environment. The study of geography can be better understood if improved instructional strategies is employed.

However, Ezegebe (2016) refers to teaching techniques as the specific activities or actions performed by the teachers in the classroom to achieve the goal of instruction. Some of the commonly identified instructional strategies include: discovery, value clarification, discussion, simulation and game, and dramatization (National Teachers' Institute, NTI, 2017). The NTI has therefore recommended a new approach for the teaching and learning of Social Sciences in schools called the learner-centered instructional strategy. According to the Federal Ministry of Education (FME, 2014), the instructional strategies for teaching Geography as a living subject should include collaborative, interactive and learner-oriented instructional strategies. The FME further breaks the instructional strategies to include future's wheel, entre education, concept mapping, field trips, co- operative learning instructional strategies among others.

However, most Geography teachers in secondary schools go about using the lecture instructional strategy. This proposition is in line with Ezegebe e (2015) who state that the dominant instructional strategy adopted by teachers in developing countries like Nigeria is the lecture instructional strategy. Lecture instructional strategy refers to an instructional strategy where the teacher claims an all knowing position and authoritatively gives instructions to the learners who are passive listeners (Akpochofo, 2016). It involves the teacher telling students facts about a particular topic (e.g. concept of revenue) and expecting those students to recount what they have been told (Aguokagbue, 2006). Lecture stresses on the traditional view that the learner is almost blank and it is the teacher's role to impart knowledge to fill the blank by merely telling his students who function as passive listeners (Rao, 2017). Lecture as an instructional strategy has many advantages. It can be used in teaching large class, enhances economy of time, easy

coverage of content, creates interest and appreciation on learners and supplements and enriches materials found in students' textbooks (Ezeani, 2017). However, lecture instructional strategy encourages rote memorization of concepts instead of making learning participatory and/or interactive (Ezegbe, 2015). It focuses entirely on intellectual development and ignores experiential learning. It teaches students how to succeed on standardized tests and relies mostly on the use of the intellect. Obviously, this instructional strategy has failed to bring about the desired outcome of producing thinking students. Thus, some scholars have blamed students' poor achievement to the dominant use of lecture instructional strategy (Torty & Offorma, 2017).

Therefore, there is the need for teachers to have a change of style in order to be able to meet the demands of the 21st century students. In the light of this, an alternative teaching strategy like concept mapping could be used. The sciences of map-making which is referred to as cartography dates back to about 10,000BC (Hellemans and Bunch, 2016). A cartographic map is a constructed bounded representation that corresponds to perceived reality. Therefore, once, one's experience has been mapped, that region has become a known region and not an unknown region. Thus, to map has always meant to know (Hellemans and Bunch, 2016). The process gives insight into how concepts are mapped. Two critical changes must take place if a map is to fulfill its role as an instrument of human communication (Igboanugo, 2018). In the first place, the mapmaker must encode the meaning, using appropriate graph conventions. Therefore, only potentially meaningful and contextually appropriate information should be included in a map. Secondly, the map-reader must perform detection, recognition, discrimination and estimation tasks in order to extract the meaning, which was encoded (Gulk, 1976). The interpretation process of mapping involves complex cognitive changes that go along with both intellectual and visual components. These components may serve to challenge one's

assumption to (1) recognize new patterns (ii) Make new connections and (iii) Visualize the unknown.

Concept mapping was developed from a work by Novak (1972) and his graduate students at Cornell University (Rowell, 1978). The technique was originally intended as a vehicle for exploring meaningful learning acquired through audio-tutorial instruction in elementary school science. Also, as a research and evaluation tool in science education in order to represent learner's prior, relevant knowledge (Karakuyu, 2015). As a Meta learning technique, it was based on the Ausubel 1968 theory of meaningful learning. It has direct relationship with some theoretical principles, such as prior knowledge, subsumption, progressive differentiation, cognitive bridging and integrative reconciliation (Hay, 2017).

Concept mapping is a teaching and learning strategy that establishes a bridge between how people learn knowledge and sensible learning, students need to have sufficient foundation and a critical thinking about concept mapping and the relations between different concepts. Concept mapping promises to be useful in enhancing meaningful learning and students' conceptual understanding in science and geographys. Students can develop their knowledge of geographys; one way of achieving this may be through the adoption of student-centered, activity-based and concepts-on approaches that cater for individual needs and differences, learning styles, interests and abilities. One such student-centered, inquiry-based approach to organize learning is concept mapping (Torty & Offorma, 2017).

Concept mapping is a metacognitive learning strategy used in measuring individual's knowledge structure and organization in a specific domain of knowledge. Concepts are a procedure that is used to measure the structure and organization of an individual's knowledge. Concept Mapping can also be explained as the spatial representations of

concepts and the interrelationships that are intended to represent the knowledge structures that humans store in their concepts. Concept mapping as a method to visualize the structure of knowledge as a means of representing frameworks for the interrelationships between concepts and as an instructional and assessment tool to facilitate meaningful learning (Jibrin & Abba, 2016).

Concept maps as originally developed in assimilation theory of cognitive learning which focuses on individual and how they integrate new learning into existing conceptual frameworks by making explicit, conscious connections between concepts as a way to integrate information into memory. Concept maps are built by placing terms which represent the concepts to be mapped in structures called nodes. The nodes, which are linked together into propositions, show how students connect or link concepts. The propositions are represented by arrows to connect individual concepts together. The directionality of the link is indicated by arrow. The conceptualization of the materials by the students is indicated by the directionality and the connecting proposition. The proposition, thus illustrates the contextual relationship of the concepts to each other.

Academic achievements in geography is the exhibition of knowledge attained or skills developed by students in the subject usually designed by test scores assigned by teachers. It is an indication of the types of learning and its environment in a teaching and learning process. Gender issues and academic achievement has become a very important issue among researchers, some studies are in view that boys perform better than girls and vice versa. Females and males could do well in geography if exposed to similar conditions (Ipem and Odeigah, 2015). According to this view, gender difference has little or influence on students performance in geography. Essentially, achievement by learners depend more on personal effort. This implies that high achievement could be traced to the individual's efforts. It is against this background that the research finds it necessary

to investigate whether or not concept mapping in the instructional delivery could improve the academic performance and consequently better students coming of the subject.

## **1.2 Statement of the Research Problem**

Secondary education has been acknowledged as preparation of the student for useful activities within the society and preparation for higher education (F.R.N, 2015). Any inadequacies and deficiencies at that level are likely, to adversely affect the children's learning at subsequent levels and living within the society.

The inability of Geography students to see the real world application of concepts and principles coupled with the traditional method of teaching have been attributed as the major cause of poor performance in both internal and external examination (Jibrin and Abba, 2016). Among the several factors enumerated to account for this poor performance, poor teaching methods seems to be a major contributory factor (Danjuma, 2015).

There is the need to identify teaching methods that students can relate with share ideas and interact academically within themselves. Concept mapping however, is an effective teaching strategy that has been extensively used in Geography and other subjects out of Nigeria. Since the use of concept mapping had been found effective in enhancing students' achievement in Geography and other related sciences subject in Nigeria, there is therefore the need to investigate the effect of concept mapping in Geography in Nigeria.

## **1.3 Aim and Objectives of the Study**

The aim study is to be investigating the effect of concept mapping on academic performance of secondary school Geography students in Bosso Local Government Minna, Niger State.

The objectives set to achieve the aim are to:

- i.** investigate the effect of concept mapping teaching strategy on the performance of students in Geography.

- ii. compare the effect of concept mapping teaching strategy on male and female students' performance in Geography.

#### **1.4 Research Questions**

- i. What are the mean achievement scores of students taught Geography in secondary schools using concept mapping instructional strategy and those taught with the lecture instructional strategy?
- ii. What are the mean achievement scores of male and females' students taught Geography in secondary schools using concept mapping instructional strategy?

#### **1.5 Research Hypotheses**

The following null hypotheses guided the study and were tested at 0.05 level of significance.

H<sub>01</sub>: There is no significant difference between the mean achievement scores of students taught Geography in secondary schools with concept mapping instructional strategy and those taught with lecture instructional strategy.

H<sub>02</sub>: There is no significant difference between mean achievement scores of male and females' students taught Geography in secondary schools using concept mapping instructional strategy.

#### **1.6 Significance of the Study**

The study was expected to be of immense benefits to the following stakeholders; students, teachers, curriculum planners, author and researchers.

The finding will help to strengthen the application of these theories in teaching and learning in science subject, specifically in Geography.

The findings of this study could enhance student's participation in science activities that will increase their acquisition of multiple intelligences, retention and achievement in biology. It could also help students to spend their leisure wisely by engaging in activities that pertains to science, thereby improving the functionality of science.

For the teachers, the study will enable them to understand that even though the traditional science instructions saves time in terms of content coverage, it has also contributed to the myriad of misconception. It is hoped that the findings of this study would help the teachers to know the efficacy of concept mapping in teaching and learning, so as to be able to apply it to their daily teaching in other to improve students' achievement, retention. It will also help teachers to present their teaching in a manner that would accommodate student's diverse learning style and stimulate the functions of the left and right brain hemisphere. The findings may likewise help to modify the nature of teacher's interaction with the students, which will in turn help to create the spirit of inquiry among the students. In addition, teachers in all subjects may be willing to try out some multiple intelligence techniques in their classroom if they see positive results from the study.

Furthermore, the study would help curriculum planners to appreciate the need to accommodate learning styles and activities that stimulate the brain hemispheric functions in designing the school curriculum. The findings of this study will enable them to have some basis for encouraging their teachers to try multiple intelligences in their classrooms, and it can enable them to implement a multiple intelligence-based curriculum.

To other researchers, the findings of this study will help them to build their literature and it will serve as a guide to their study.

## **1.6 Scope of the Study**

The scope of this study encompass the assessment of effect of concept mapping on academic performance of secondary school Geography students. The study will be limited to Senior Secondary School Two (SSII) students in Bosso Local Government Area of Niger. The S.S.II students will be used because geographical mapping is contained in their curriculum. The variable scope of this study are:- conventional teaching style and metacognitive style. While the dependent variable is achievement, and the moderating variable is gender. The experimental fieldwork is proposed to last for four (4) weeks.

## **1.7 Operational Definition of Terms**

**Achievement:** is the extent to which a student, teacher or institution has achieved their short or long-term educational goals. Cumulative GPA and completion of educational benchmarks such as secondary school diplomas and bachelor's degrees represent academic achievement.

**Concept Mapping:** refers to a schematic representation of concepts and their inter-relationships often in a framework that appear like a flowchart, in order to enhance teaching and learning.

**Geography:** is a field of science devoted to the study of the lands, features, inhabitants, and phenomena of the Earth and planets

**Conventional method:** In the concept of this study, conventional method is regard to used or known method of teaching by the teacher or lecturer in the institution or schools.

## **CHAPTER TWO**

### **2.0 REVIEW OF RELATED LITERATURE**

#### **2.1 Introduction**

The chapter presents a review of work related to this study under the following subheadings:

##### **Conceptual Framework**

Meaning and uses of concept mapping.

Other geographical maps, distinctions and similarities.

Teacher factor and students' achievement in geographys

##### **Theoretical Framework**

Theories underlying the use of concept mapping in teaching Geography.

##### **Empirical Studies**

Studies on gender as a factor in Geography achievement

Studies on concept mapping

Studies on academic achievement

##### **Summary of Related Literature**

## **2.1 Conceptual Framework**

### **2.1.1 Concept of Education**

Translated from its Latin root, 'educio' or 'educare', the word 'education' means 'to lead' or 'I lead'. In other words, education implies showing the way. In principle, education is the process by which a person or group of persons lead in the act of acquiring new knowledge or experience. Education is the result of gained knowledge. Knowledge is the outcome of learning. When an individual has acquired knowledge in a specific area, we consider him to be educated in that area. Education implies experiencing. It involves all the experiences that an individual comes in contact with or undergoes whether with or without the school. Everything that happens to an individual whether deliberately or accidentally is an experience and every experience is education. Education comes to the learner from parents, teachers, friends, the church, the market places, and from every experience or things in the society. However, in this context, education will be considered as experiences which teaching and learning provides (in a school system) and, it involves the teacher who has the idea, knowledge, skills and values (instruction) that is being imparted to the learners, Irene and Baguma (2015).

### **2.1.3 The Concept of Geography**

A search through the textbooks confounds the reader with numerous definitions of geography. ACARA (2011) says —the entire man surrounding constitutes the laboratory of geography. It is quite difficult to encompass the whole physical, social, cultural, economic and political environment into a single definition. This account for definitional dichotomy of geography discipline, Igbogoro (2016) simplified the definition of geography as: an integrated field of study which probes man's symbolic relationship with his environments, endows man with the reflective or contemplative capacities,

intellectual, affective, social and work skills to enable him understand his words and its problems, and to rationally solve or cope with them for effective living in the society.

N.E.R.C (2011) states that geography is the study of man as he interacts with the various environments, physical, economic, psychological, social and intellectual. Thus its true nature is seen as the study of man, how he influences and is influenced by other forces or how he solve his problems. Abdulmalik (2013) defines it as a programme of study which a society uses to instill in learners the knowledge, skills, attitudes and actions it considers important concerning the relationships human beings have with each other, their world and themselves. Abdulmalik (2013) rightly explained geography is a study of man in his totally Ololobou (2013) defined it as an organized integrated study emphasizing on cognition, functional skills and desirable attitudes and actions for the purpose of producing an effective citizenry.

According to Shaibu (2014) geography is an aspect of learning which deals with how to get on (get along) with ones environment, physical as well as human and how to develop those skills knowledge, attitudes and values that characterize a respective and responsible citizen in a free society. Also view geography as a course which is concerned with man as a social being and with the way he organizes cultural, economic, political, historical and geographical aspects of his society.

Mezieobi (2013) defined geography as a formalized, correlated or integrated study of man and his environment which imbibe the learner with the cognition skills, values, attitudes, abilities and competences that will make him become an informed, rational, analytical, participative and functional citizen. Mezieobi (2013) geography concerns itself with learning about people, how and where they live, how they form and structure societies, how they govern themselves and provide for their material and psychological needs, how and why they love and hate each other, how they use and misuse the resources of the

planet that is their home. This definition implies that geography is particularly interested in man's problems and how to help him solve them.

From the above literature it is obvious that geography is concerned primarily with man's relationship with all his environments, whose variety call for different forms of knowledge and experiences to understand man himself. Ikwumelu (2012) remarked the problem of definition has continued to be the greatest impediment to the success of geography education. He added that it has affected both the teaching of the subject and its popularity. Similarly Mezieobi (2013) asserted that —the definitional disagreement among Nigeria scholars and writers on geography and their continuing quest for an acceptable Nigerian's definition of geography is an impediment to the effective teaching of geography in the Nigerian school system.

### **2.1.3 The Nature and Scope of Geography**

Geography can be conceptualized as an organized, integrated study of man and his environment, both physical and social, emphasizing on cognition, functional skills, desirable attitudes and actions for the purpose of producing an effective citizenry. It is defined as, A programme of study which a society use to transmit to students the knowledge, skills, attitudes and action it consider important concerning the relationship human beings have with each other and with their world (Rikichi, 2011).

Geography is the integrated study of the social sciences and humanities to promote civic competence. Within the school programme, geography provides coordinated systematic study drawing upon such disciplines as anthropology, Economics, Geography, History, Law, Political Science, Religion etc, as well as appropriate content from the humanities, geographys and natural sciences. The purpose of geography is to help young people develop the ability to make informed and reasoned decisions for the public good as citizens of a culturally diverse, democratic society in an interdependent world.

Mezieobi (2013) outlined the following distinguishing characteristics of geography. Unlike the other field of study which sees knowledge in their separateness or in a compartmentalized frame hence the discrete subject areas of the social sciences and the humanities, geography sees knowledge and man's social world as an integral whole. In this way, one gets to exactly know how people live in the real world. It develops an integrated view of reality, (and) free (himself) from the narrow confines of traditional social sciences discipline. It is this integrative flavour of geography that makes it an inter-disciplinary discipline.

Geography draw its content from mainly the social sciences, the humanities and from many other relevant sources including the experiences of the children. The Nigeria centric characteristics of geography is to emphasize the social relevance of geography in which case it addresses the social needs, social realities and social aspirations of Nigeria.

Geography is socially or society sensitive. This implies that geography must keep pace with global changes particularly those affecting Nigeria, and must of necessity reflect the changes, as they occur, in the school geography syllabus or curriculum. One very important characteristic of geography is its emphasis on classroom without walls in the community.

Good geography programme is activity loaded and predominantly contains activities to be done not knowledge to be acquired and fact to be stored. It makes the learner an active participant in teaching learning process, which discourages learner's passivity. The goal objects of geography, simply put are to produce responsible and participative citizens with analytic and reflective skills and attitudes to make their environments yield all that make for good and successful living. The essence is to make the society a worthy human habitation with a minimum of problems.

Another unique characteristic of geography is that it evaluates criteria focus principally on the affective domain-values and attitudes. The evaluation of the learner performance in the other educational domain-cognitive and psychomotor has meaning and significance only within the context of the affective; Further more instead of the cognitive memory questions that are common in the other disciplines, questions in geography are largely though provoking, convergent, divergent and evaluative.

Ololobou (2013) sees scope as what does (or should) a typical geography program encompass? He goes further to highlight four broad areas that readily come to mind as follows:

The environment, physical and social; emphasizing on unrestricted cognition. Various skills (e.g. manipulative, intellectual, group, communication, study, economic etc) for functionally relating with the environment. Values, attitudes, aspirations,, appreciations and actions which are conducive to peaceful co-existence and overall societal development. Emergent issues (e.g. HIV/AIDs, AVIAN FLU, human trafficking, terrorism etc) and other current affairs. He further says that geography source facts from discrete academic disciplines (the arts, social science, natural sciences, technology, vocations and contemporary events). Also Mezieobi (2013) say that the real nature of geography with its ill-defined and almost very broad content constantly outwits even the greatest lion-hearted teacher. So much at times, is the confusion about the nature of geography that the geography as a subject is mistaken for a new method of approach.

In response to the unlimited scope of geography and the contents which are drawn from multifarious independent discipline. Ikwumelu (2011) commented that everyday comes with its strange set of social realities requiring the attention of geography education to cope with these realities, all its facets must be constantly reviewed and restructured.

According to Mezieobi (2013) people expect geography to purify our society, turn, and our criminals into saints, produce incorruptible leaders and eradicate demonstration and indiscipline in our schools. Consequently, all aspects of geography, the definition, objectives, content, instructional materials need to change at the same pace and in the same direction with social realities.

The Nigerian Educational Research and Development Council,(NERDC) in 2017 designed and developed the current realigned 9-year Basic Education Geography Curriculum to take cognizance of certain challenges facing this area of study as a core subject. The new curriculum incorporated many of the contemporary issues of global and local concern such as, youth unemployment and youth restiveness, environmental issues, drug abuse, child/women trafficking, family life education, HIV/AIDS preventive measures, gender issues, peace and conflict issues, Nigerian peoples and their cultures, mass media, globalization, millennium development goals (MDGs), and sn. The new curriculum, according to NERDC (2017) has its pivot. functional education, self reliance, and responsible citizenship.

Thus Geography is a dynamic course of study that is ever changing with regard to the variables of space, time, and human development. One of the characteristics of a functional geography program is its ability to cope with and accommodate new developments and challenges. According to Rikichi, (2011), geography is not so much concerned with theory building, rather it interrelates the already formulated theories in order to gain an understanding and wider perspective in the study of man and how he solves his/her societal/environmental problems.

#### **2.1.4 Objectives of Geography in Secondary Schools**

The National Policy on Education (2013) listed Geography and Citizenship Education among the core subjects that every pupil at Junior Secondary School is expected to study

to prepare him/her to acquire further knowledge and skills (p. 14). To this end, NERDC.(2017) States that the overall objectives of geography at both Basic Education and Junior Secondary level should enable the pupils and students to achieve the following: Develop the 'ability to adapt to his/her changing environment. Become responsible and disciplined individuals capable and willing to contribute the development of their societies; inculcate the right types of values; Develop a sense of comprehension towards other people, their diverse cultures, history, and those fundamental things that makes them human; Develop the capacity to recognize the many dimensions of being human in different cultural and social contexts; Develop a sense of solidarity and sharing based on a sense of security in one's own identity.

The geography curriculum is basically geared towards inculcating in Nigerian youth ideas, norms, and values that are essential for national development. Rikichi, (2011) maintain that this would produce effective citizens who are Sensitive to their environment: active participants in the polity; democratic-orientated minded; willingness to assume and perform civic responsibilities; obedient to the law of the land; dogged in defense of his rights; positive relation with political class; harmoniously co-exist with other members of the society; and possess nationalistic and patriotic spirit towards societal improvement.

In order to present geography in a holistic manner to students, the thematic approach to content organization was adopted. Major relevant themes were selected and topics were arranged under them across" the 9-year basic education in a spiral manner to sustain the interest of the students. For effective delivery of subject matter and improved learning achievement of basic education, NERDC strongly recommends teacher orientation and training on the implementation of the curriculum, as well as development of relevant resource materials.

### **2.2.5 Concept mapping**

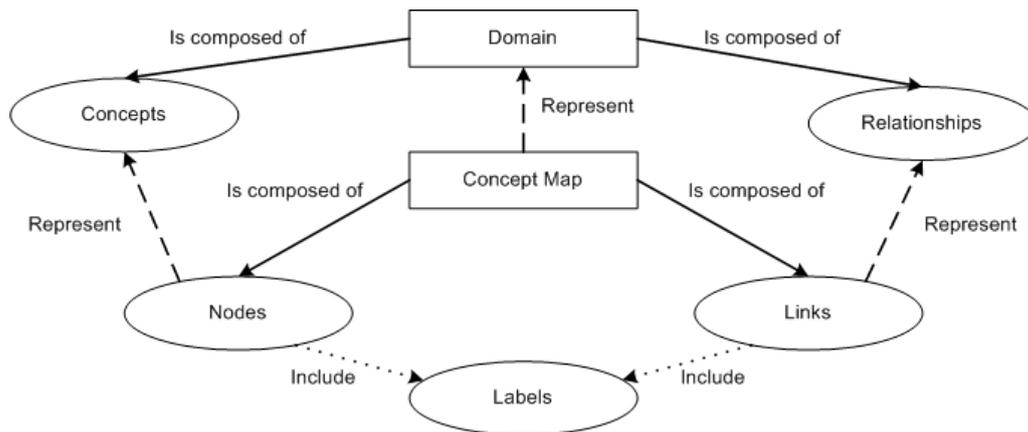
Concept mapping is a technique for visualizing the relationships between different concepts. A concept map is a diagram showing relationships between concepts. Concepts are connected with labelled arrows, in a downward branching hierarchical structure. The relationship between concepts is articulated in linking phrases for example “gives rise to”, “results in”, “is required by”, or “contribute to”. The technique of concept mapping was developed as a way to increase meaningful learning in the sciences. Concept maps can be used to stimulate the generation of ideas, and are believed to aid creativity. For example, concept mapping is sometimes used for brain-storming. Although they are often personalized and idiosyncratic. Concept maps can be used to communicate complex ideas (Novak, 1990).

Concept maps of concept mapping learning techniques are graphical tools for organizing and representing knowledge. They include concepts (usually framed) and links among concepts that are represented with lines. Words on line are linking words or linking phrases, and they represent relationships between two concepts.

Concept is defined as noticeable regularity in events and objects or as a record of events or objects, named with label. Label for most of the concepts is a word, although we sometimes use symbols, or more than one word. Propositions are contained of two or more concepts, linked with linking word or phrase, and forming meaningful claim. Cross-links are important characteristic of concept maps. These are links between concepts in different segments or domains of knowledge on the map. Cross-links help us to understand how these domains are related to one other. In creation of new knowledge, cross-links often represent creative leaps on the part of the knowledge producer.

Important characteristic of concept maps is that concepts are represented hierarchically with most involved and most general concepts at the top of the map, and with specific,

less general concepts hierarchically lower. Hierarchical structure for specific domain of knowledge also depends on content in which that knowledge is used or considered. Therefore, it should be the best to construct concept map with focus on some specified question needed to be answered. These questions are called focused questions.



**Figure 2.1: Simple concept map**

The Figure 2.1, above illustrate the concept map of concept mapping in diagrammatical relationship cross linking ideas

### **Using of concept mapping Strategy**

In learning, concept maps are used for introducing new concepts, linking prior and new knowledge and evaluation and organizing knowledge.

In table 1 there are some answers on questions about concept maps.

### **Other Geography Maps, Distinctions and Similarities**

There are many types of maps, other than concept mapping, which can be utilized in geography instructions some of them as enumerated by Williams, (2002) include mind map, topic map and cognitive map. These he said can be used effectively to organize large amounts of information, combining spatial organization and dynamic hierarchical structuring.

The method of mind mapping basically takes into account that the two halves of the human brain are performing different tasks. While the left is mainly for logic, word arithmetic, linearity sequences, analysis, lists, the right side of the brain mainly performs tasks like multidimensionality, imagination, emotion, colour, rhythm, shapes, geometry synthesis. Mind mapping uses both sides of the brain, hence work together and thus increases productivity and memory retention. Buzan (1991) claimed that the mind map is a vastly superior note taking method because it's "semi-hypnotic trace" state, is induced by the other note forms. He also pointed out that mind map, utilizes the full range of left and right human cortical skills, balance the brain, taps into the 99% of the unused mental potential as well as intuition. Mind map represents logical structures using an artistic spatial image that the individual creates. Thus mind mapping connects imagination with structure and pictures with logic (Svantesson, 1992).

Topic maps are standard for the representation and interchange of knowledge, with an emphasis on finding information. The standard is formally known as ISO/IEC/13250:2003. A topic map can represent information using topic (representing any concept, from people, countries and organizations to software modules, individual files and events), associations and occurrences. They are similar to semantic networks. In loose usage all those concepts are often used synonymously, though only topic maps are standardized. Topics associations and occurrences can be typed, but the types must be defined by the creator of the topic maps, and is known as the ontology of the topic map. There are also additional features, such as merging and scope. The concept of merging and identity allows automated integration of topic maps from diverse sources into a coherent new topic map. A format called linear topic map notation (LTM) serves as a kind of shorthand for writing topic map in plan text editors (LUTZ 2003).

Tolman (1984), defined cognitive map, mental maps, cognitive models, or mental models as a type of mental processing, cognition, composed of a series of psychological transformations, by which an individual can acquire, code, store, recall and decode information about the relative locations and attributes of phenomena in their everyday or metaphorical spatial environment. Cognitive maps are used to structure and store spatial knowledge, allowing the “mind’s eye” to visualize images in order to reduce cognitive load, and enhance recall and learning of information. He concluded that cognitive maps may also be represented and assessed on paper or screen through various practical methods such as a concept map, sketch map, spider diagram, or any variety of spatial representation.

However, concept mapping teaching strategy leads to meaningful learning as students are actively involved in the process of construction and showing relationships between concepts.

### **2.3 Theoretical Framework**

In view of the subject matter involved, the research work is predicted on the perspectives of Dual coding theory of memory (Paivio & Clark, 2010). It is an empirically well founded characterization of the mental process that under lie human behaviour and experience. The theory explains the psychological phenomena by collective action of non verbal and verbal systems that specialized for processing of imagery and linguistic information (Paivio, 2010).

Dual coding theory is a general theory of cognition and mind (Paivio, 2010). It was originated in the 1960s by Allan Paivio to explain the powerful effects that mental imagery has on memory. It is sometimes referred to as a theory of mental imagery, particularly visual imagery. Dual coding theory is a complete set of assumptions/hypotheses about how-information is stored in memory (Sadoski & Paivio, 2014). The

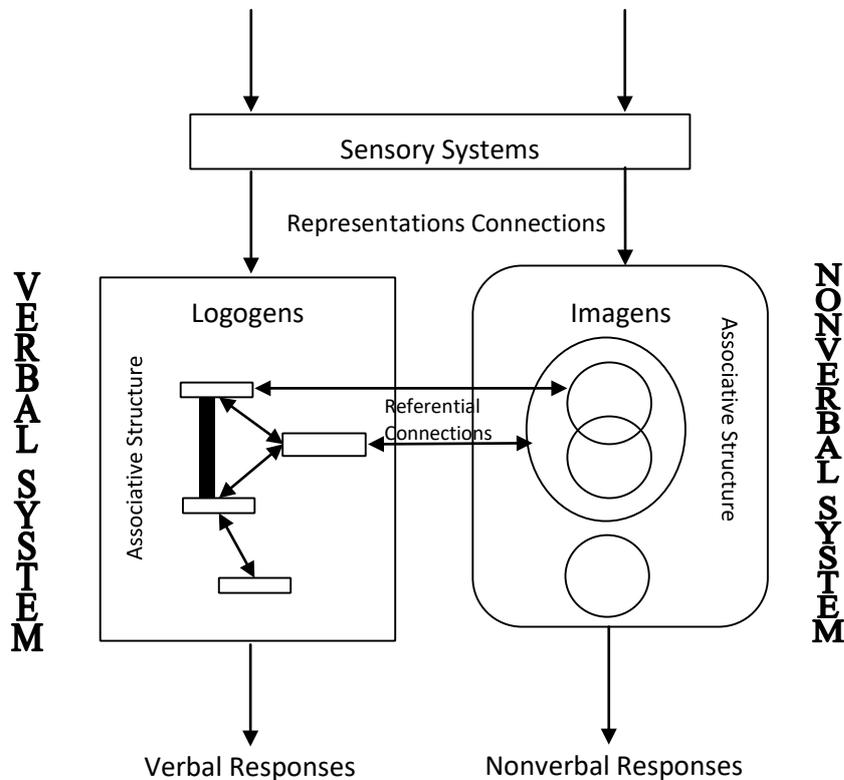
theory suggests that memory consists of two separate and distinct mental representations, or codes one verbal and one nonverbal. The verbal system is "language-like" in that it specializes in linguistic activities associated with words, sentences, and so on. The nonverbal system includes memory for all nonverbal phenomenon, including such things as emotional reactions, images, and other '-picture - like' representations.

Dual coding supports the idea that knowledge is represented on a concreteness abstractness continuum and that human cognition is predisposed to storing mental representations in one of two forms corresponding to the ends of the continuum. At one end are the visually based representations in which knowledge is stored in concrete and non arbitrary ways. At the other end are the verbal, or semantic, representations in which knowledge is stored in discrete and arbitrary ways. In this theory, the most fundamental memory units are called logogens in the verbal system and images in the visual system (Reiber, 2010)

Both the verbal and-visual subsystems have unique properties. Logogens are stored in the verbal system as discrete elements, resembling words and sentences, whereas images are stored as continuous units in the visual system having an "all-inoneness" quality. Dual coding predicts that three distinct levels of processing can occur within and between the verbal and visual systems: representational, referential, and associative (Paivio, 2010).

Representational processing describes the connections between incoming stimuli and either the verbal or visual system. Verbal stimuli directly activate verbal memory codes, whereas visual stimuli activate visual memory codes. For example, hearing the word "cat" first activates the verbal system, but seeing a picture of a cat directly activates the visual system. Referential processing is the building of connections between the verbal and visual systems. Hearing or reading the word "cat" will stimulate the appropriate logogen in the verbal system. Subsequently forming a mental image of a cat implies that the verbal

system has directly activated the image corresponding to cat. Associative processing leads to the activation of informational units within either of the systems (Paivio, 2010). The processes are elaborated diagrammatically in the following figure:



**Figure 2.2: Verbal and nonverbal symbolic systems of Dual Coding Theory.**

Adapted from: Clark & Paivio (2010).

Paivio, (2010) postulates that the core idea behind dual coding theory of memory is very simple and intuitive: He proposes that the human mind operates with two distinct classes of mental representation (or "codes"), verbal representations and mental images, and that human memory thus comprises two functionally independent (although interacting) systems or stores, verbal memory and image memory. Imagery potentiates recall of verbal material because when a word evokes an associated image (either spontaneously, or through deliberate effort) two separate but linked memory traces are laid down, one in each of the memory stores. Obviously the chances that a memory will be retained and

retrieved are much greater if it is stored in two distinct functional locations rather than in just one (Dubey and Barth, 2010).

Teachers should be most interested in ways to increase the likelihood that information will be dual encoded in long-term memory. Information encoded in both verbal and visual forms with strong and flexible links between the codes enhances retention, retrieval, and transfer. According to Kuo, & Hooper (2014) dual coding is more likely to occur when the content lends itself to imaging. For instance, concrete concepts, like "tree" or "house" are easier for people to visualize simply because they refer to tangible objects that have a physical form. Conversely, people do not automatically form internal images for abstract concepts, like "patriotism" or "kindness." In these cases, it is often useful to provide the learner with a prototype image that communicates the most important characteristics or attributes of the concept, such as two people shaking hands to represent "friendship." This prototypical image is mostly analogical to the concept e.g. the portrait of a blindfolded woman holding a set of scales to represent justice.

It can be seen that theoretical foundations of dual coding theory have definite implications on the value and use of instructional media. Marzano, Pickering and Pollock (2013) stated that instructional video enhance the development of non-linguistic representations in students, thus enhances the development of the content to be learned.

The use of instructional media also helps students generate linguistic representations. Visuals help student to process and remember learning content by facilitating the development of corresponding images. Again being a linguistic tool, text based instructional video enhances the development of logogens thereby dual coding the information. Thus the theory provides a plausible explanation and empirical evidence that concepts are better recalled when presented in both verbal and visual cues.

i) Behavioral Learning Theory

The theory of behaviorism as perceived by Sternberg, (2013) concentrates on the study of overt behaviors that can be observed and measured. It views the mind as a "black box" in the sense that response to stimulus can be observed quantitatively, totally ignoring the possibility of thought processes occurring in the mind. He further stated that, some of the key players in the development of the behaviorist theory include; Pavlov, Watson, Thorndike and Skinner. Behaviorism is founded on the formation and strength of stimulus-response (S-R) associations. From an instructional perspective, a stimulus is presented, such as a instructional video that prompts the learner to respond in an overt, observable manner. The relationship between the stimulus and the response is strengthened through the use of reinforcement (Sternberg, 2013).

Operationally, the stimulus can be defined as either the material to be learned or the instructional event that leads to the learner's initial response. One of the basic goals of behavioral methods is to attain a measure of control or predictability of given instructional stimuli. The repeated use of particular stimuli helps to establish predictable control of learner responses, placing student responses under a form of stimulus control. Using systematic stimulus control, responses can be shaped through the presentation of directions or the repeated presentation of the same stimulus requiring the same response, paired with appropriate reinforcement for the desired response. The response is the learner's overt behavior made in response to the instructional stimuli. The learner's response is the only recognized behavioral link to the instructional stimulus. Therefore, it is crucial that a causal link between stimulus and response be established in order to evaluate the effectiveness of the instructional stimulus. It is important that the learner clearly understand what response is required in order for the S-R bond to be formed. The response must be judged as appropriate or inappropriate in clear, objective terms, and this information is then conveyed to the learner as feedback. Instructionally, responses are

elicited through the presentation of instructional activities and shaped through the presentation of systematically controlled activities, responses, and response consequences. After a response is made and judged, a follow-up stimulus is presented to the student as a consequence to the response. This learner-activated stimulus, or reinforcement, is applied systematically to strengthen desired responses and is chosen conditionally on the desirability of the response. A key element of reinforcement is the principle of contiguity, where reinforcement is given closely in time with the response to be strengthened (Ughamadu, 2016).

During instruction, numerous stimuli are presented. Part of the learner's task, therefore, is to selectively identify relevant stimuli from irrelevant stimuli. Instructional video are just one source of visual stimuli competing for the student's attention. From the behavioral point of view, when two or more stimuli are provided, the learner will select the one that most easily results in the correct response. This is known as the "principle of least effort." A typical behavioral task would be to provide a student with a card displaying both the word and picture of an object, such as a cat. If the student's task is to identify the object, the principle of least effort predicts that the learner's attention will focus predominantly on the picture instead of the word in order to achieve a correct response (Yusuf, 2012).

He further contented that, the principle of least effort requires instructional designers to be wary of providing any stimuli, such as pictures, that may compete for the learner's attention. If the picture is perceived as providing the information necessary to respond correctly, it will dominate which S-R associations are formed and which are neglected. From a behavioral point of view, therefore, instructional video can be potent stimuli resulting in both appropriate and inappropriate learning. Instructional video can provide the foundation for strong S-R associations or they can be disruptive or cause interference.

Research has shown that learners vary in their susceptibility to interference by instructional video; learners with poor reading skills seem particularly vulnerable.

In essence, behaviorist principles of reinforcement, retention, and transfer are important design considerations, as learning is facilitated by reinforcing the correct performances.

## ii) Cognitive Learning Theory

The cognitive revolution became evident in American psychology during the 1950's. Cognitive psychologists like Piaget, Bruner, and Ausubel contend that learning is an internal process that cannot be observed directly. Learners first remember and then retrieve information from the memory. Cognitivists emphasize on how human mind works. They put particular emphasis on memory (Oganwu, 2014).

Oganwu, (2014), said cognitive theorists recognize that much learning involves associations established through contiguity and repetition. They also acknowledge the importance of reinforcement, although they stress its role in providing feedback about the correctness of responses over its role as a motivator. Cognitive theorists view learning as involving the acquisition or reorganization of the cognitive structures through which humans process and store information.

To cognitive theorist, practice is an important aspect of learning because it gives increased opportunities for reward and reinforcement. Cognitive structures are also created through practice, which leads to an efficient use of long term memory. Di Vesta, (2012), maintained that in contrast to focusing on strengthening S-R bonds, cognitive orientations to learning consider the actual thought processes occurring in between the stimulus and the response as the most important aspects to learning. The emphasis is on how a learner selects, perceives processes, encodes, and retrieves information from memory. The implication of this theory to instructional designers is that they could use various

techniques of teaching such as chunking, mnemonics etc. for meaningful organization of content and give practice for storing and retrieving information.

iii) Constructive learning theory

Alesandrini (2012) pioneered what became the constructivist approach. Constructivists believe that learners construct their own reality or at least interpret it based upon their perceptions of experiences, so an individual's knowledge is a function of one's prior experiences, mental structures, and beliefs that are used to interpret objects and events. What someone knows is grounded in perception of the physical and social experiences which are comprehended by the mind. According to Joseph (2015) The Assumptions of Constructivism to learning are: Knowledge is constructed from experience, Learning is a personal interpretation of the world, Learning is an active process in which meaning is developed on the basis of experience, Conceptual growth comes from the negotiation of meaning, the sharing of multiple perspectives and the changing of our internal representations through collaborative learning and Learning should be -situated in realistic settings; testing should be integrated with the task and not a separate activity.

Joseph, (2015) opined that to design an instructional video for learning from the constructivist approach requires that the designer produces a product that is much more facilitative in nature than prescriptive. Instructional content and assessment of the visual is to be based on the experience and self-evaluation of the learner.

#### **2.4 Related Empirical Studies**

Hafiz *et al.* (2017) their investigated the concept mapping learning strategy in teaching and learning geographys. In their research was conducted at senior high school in Jakarta. The method used a quasi-experimental with randomized control group design with the total number was 72 students as the sample. Data obtained through using test in the post-test after giving the treatment. The results of the research are: 1) Students' geographyal

connection ability has reached the good enough level category; 2) Students' geophysical connection ability who had taught with concept mapping learning strategy is higher than who had taught with conventional learning strategy. Based on the results above, it can be concluded that concept mapping learning strategy could enhance the students' geophysical connection ability, especially in trigonometry.

Mina (2017). Effect of Concept Mapping Teaching Strategy on the Academic Achievement of Senior Secondary School Students in Physics. *International Journal of Education and Evaluation*. 3(12), 328-891. The study investigated the Effect of Concept Mapping Teaching Strategy on the Academic Achievement of Senior Secondary School Students in physics. The design for the study was pre-test and post-test control group design. All the 20 senior secondary schools in Obio/Akpor metropolis constituted the population for the study. Two senior secondary schools were randomly selected and made into experimental and control groups. Physics Achievement Test (PAT) was prepared by the researchers and validated by two senior lecturers from education department, Ignatus Ajuru University of Education rivers state Nigeria and a reliability coefficient  $r=0.70$  was arrived at after testing. Physics Achievement Test (PAT) was administered to the students by the researchers. Data collected was analysed using z- test statistics. The teaching and learning of physics in Secondary Schools in Nigeria has lot of problems. This is paper looked at some of them which include acute shortage of teachers, the use of inappropriate methods etc. these affect difficult subject, and unnecessary. Changing physics education from acquiring basis physical theories to experimental physics is one way suggested for the optimal acquisition of physics subject matter. The results indicated that students taught with physics using concept mapped instructional strategy achieved higher than those taught using expository method. It was recommended that, teachers need to

diversify their method of teaching physics such as concept mapped teaching strategy as it will assist in higher academic achievement of learners.

Jane and Adeola (2017), also investigated into the effects of Concept Mapping Instructional Strategy on Students' Academic Performance and Interest in Technical Drawing in Edo State Nigeria.. A pretest, posttest, non equivalent control group, quasi-experimental research design was adopted. Two research questions and two hypotheses tested at 0.05 level of significance guided the study. 61 students made up the experimental group and 56 students in the control group for the study; giving a total of 117 year II technical students in 2015/2016 academic session drawn from the four Edo State owned technical colleges made up the sample for this study. Two instruments: Technical Drawing Achievement Test (TDAT) and Technical Drawing Interest Inventory (TDII) were used for data collection. Concept mapping approach and conventional lesson plans were prepared by the researcher. The instruments were face and content validated by five experts in Technical Education and Test and measurement. The reliability coefficient of TDAT was found to be 0.78 using Kuder-Richardson's estimate while that of TDII was 0.85 using Cronbach Alpha statistics. Research questions were answered using Mean while the hypotheses were tested using ANCOVA. The findings revealed among others that students taught technical drawing using concept mapping teaching strategy had higher mean achievement and interest scores than those taught with the conventional teaching method. It was recommended among others that technical teachers should use concept mapping in teaching technical drawing.

Jibrin & Zayum (2012) carried out a study on investigation of the Effect of Concept Map Teaching Strategy on the Academic Achievement of Senior Secondary School Students in Genetics. The design for the study was pre-test and post-test control group design. All the 20 senior secondary schools in Dengi metropolis constituted the population for the

study. Two senior secondary schools were randomly selected and made into experimental and control groups. Genetics Achievement Test (GAT) was prepared by the researchers and validated by two senior lecturers from education department, ABU, Zaria Nigeria and a reliability coefficient  $r=0.70$  was arrived at after pilot testing. Genetics Achievement Test (GAT) was administered to the students by the researchers. Data collected was analysed using z- test statistics. The results indicated that students taught Genetics using concept mapped instructional strategy achieved higher than those taught using expository method. It was recommended that, teachers need to diversify their method of teaching genetics such as concept mapped teaching strategy as it will assist in higher academic achievement of learners.

Gabriel (2016). Effect of Concept Mapping and Outline Note-Taking Patterns in Students Academic Achievement in Geography in Secondary Schools in Enugu South Lga of Enugu State.. A non-equivalent quasi-experimental research design was adopted by the researcher. Two hundred and five students in three intact classes from three secondary schools in Enugu South of Enugu State formed the sample. Two intact classes were randomly assigned experimental group one and taught with concept mapping notes; experimental group two and taught with outline notes. The third intact class was the control group and taught with the conventional notes. Two research questions and two hypotheses guided the study. Test of Geography Achievement and Retention (TOGAR) was used for data collection. Mean and standard deviation were used to answer the research questions while the hypotheses were test using Analysis of Covariance (ANCOVA). The result of the study revealed that the students of the experimental groups achieved better than the control group with those taught using concept mapping being the best. Recommendations were made.

## **2.5 Summary of Literature Review**

Evidence from the studies reviewed; reveal that concept map is quite an effective learning strategy. Numerous studies have been highlighted to be conducted in Nigeria. But very few have been conducted on Geography and in the study area. The researcher therefore would want to determine whether concept map strategy will be effective in the teaching and learning of geography in Minna, Niger State Nigeria setting (Classroom).

## CHAPTER THREE

### 3.0 RESEARCH METHODOLOGY

#### 3.1 Introduction

This chapter is presented under the following sub-headings: research design, population of the study, samples and sampling Procedure, instrumentation, validity of instrument, reliability of instrument, pilot study, instrument administration, data collection procedure and data analysis.

#### 3.2 Research Design

The study is quasi experimental with pretest, posttest test experimental and control groups. In the design, both the experimental and the control groups will be pre-tested to ensure group equivalence, thereafter exposed to treatment for 6 weeks and at the end of which post-test will be administered to determine students' achievement. The design is illustrated below:

CG → O1 → LM → O2 → EG → O1 → QEIM → O2 → Where:

Variable      Label

CG = Control Group

EG = Experimental Group

O1 = Pretest

O2 = Post test

LM = Conventional Note Taking

CMM = Concept Map Method

#### 3.3 Population of the Study

The population for this study will consists of all senior secondary two (SS2) students registered in government co- educational senior secondary schools located in Bosso Local Government. They are government owned schools; operate same academic calendar and

same curriculum. The total student's population consists of 1333 consisting of 547 males and 786 females. All schools offer courses in Geography with particular reference to measurement, which is relevant to this study.

### **3.4 Sample and Sampling Procedure**

A random sampling technique will be used in this study to select the samples. According to Sambo (2015) random sampling is a sampling procedure that assures that each element in a population has an equal chance of being selected. The researcher put the names of all the students in experimental group that is Bosso Secondary School in leather and then pulled out 40 names by-lot and the same as done to the control group that is model Senior Secondary School, Futminna. Hence, In this study, 2 schools have been randomly selected for the study.

Total numbers of 40 students will be pre-tested in order to ascertain their group equivalence. The sample groups known as the experimental group and control group. The experimental group will be exposed to quadratic equation instructional model in Geography while control group were taught the same concepts using Lecture method.

### **3.5 Instrument for Data Collection**

Two instruments will used in this study for data collection namely Geography Achievement Test (GAT).

Physics Achievement Test (GAT)

The physics achievement test consisted of set of thirty (30) multiple choice items designed to reveal the level of students understanding of the selected concepts in geography.

The thirty (30) multiple choice items consisted of five response option, one of which is the correct answer while the remaining four serve as distracters. The test items were in conformity with Bloom's taxonomy of the cognitive domain, i.e. knowledge, comprehension, application, analysis, synthesis and evaluation.

### **3.6 Validity of the Instruments**

For the purpose of this study, experts in geography education and measurement will be used to carry out the validation of the instruments. The validators chosen include two experts in geography education in department of science education, Federal University of Technology, Minna and the teachers teaching the classes of the senior secondary schools of the affected school in Minna, Niger State.

### **3.7 Reliability of the Instrument**

For the purpose of this study, a test retest form of reliability method of analysis using the spearson product moment correlation coefficient statistics will be used to determine the reliability of the Geography Achievement Test (GAT) through pilot study. The same test will be administered on two different occasions at two weeks interval as recommended by Tuckman (2012) the scores from the two administrations will be correlated as an estimate of the reliability of the test Sambo (2015). A pilot study will be conducted in Bosso Secondary School for two weeks. Two classes of SSS II Students will be randomly selected for the study.

### **3.8 Method of Data Collection**

The data will be collected using the Physics Achievement Test (PAT) will be used to generate two types of data viz:

Pre-Test Data (to ascertain their group equivalence)

Post- Test Data (to ascertain their achievement level)

The 2 types of data generated were then analyzed in relation to the research questions investigated.

### **3.9 Method of Data Analysis**

Descriptive statistics to be use are mean, standard deviation and frequency for analysis of research questions and inferential statistics t-test will be used to analyze the null hypotheses at  $\rho \leq 0.05$  level of significance.

## CHAPTER FOUR

### 4.0 RESULTS AND DISCUSSION

The organization of data for the study was obtain from the instrument administered to the two groups. The control group is made up of thirty - six (36) students in Bosso Secondary School Minna, while the experimental group is made up of forty-four (44) students from Model Secondary School Minna. The result was presented in table according to the analysis of the instrument administered to the two group.

#### 4.1 Results

##### 4.1.1 Pretest Result

**Table 4.1 Mean and Standard Deviation of Pretest Score of Control and Experimental Groups**

<b>Variable</b>	<b>N</b>	<b>Pre-test Score (<math>\bar{x}</math>)</b>	<b>SD</b>	<b>Post test Score (<math>\bar{x}</math>)</b>	<b>SD</b>	<b>Gain Score</b>
Experimental Group	44	21.70	3.84	35.36	3.62	12.61
Control Group	36	21.49	4.26	28.90	5.33	6.42

Table 4.1 above revealed that the students who were taught wealthier measurement using concept mapping has proportionately higher achievement than those who were taught using concept mapping. The observed variability was reflected before and after the test but the proportionate increase among students who were taught using concept mapping is higher than that observed among students in the conventional method with mean gain score of 12.61 and 6.42. This simply that the use of concept mapping in the teaching of concept mapping has a relative edge over the use of concept mapping.

**Table 4.2 Mean Score Gain of Male and Female Students Taught Wealthier and Measurement Using concept mapping.**

Variable	N	Pre-test Score ( $\bar{x}$ )	Post-test Score ( $\bar{x}$ )	Mean Gain Score	Gain Difference
Male	26	22.35	36.06	13.71	1.14
Female	18	20.78	34.36	13.58	

Table 4.2 shows the mean achievement score of male and female students taught wealthier measurement, the outcome of the result shows that the mean gain score of 13.81 and 13.58 for male and female respectively. The gain difference in score of the male and female is 1.14. This implies that male perform better than female while taught using concept mapping

#### 4.1.2 Analysis of Research Hypotheses

#### 4.13 Hypotheses One

**H<sub>01</sub>** There is no significant difference between the mean achievement scores of students taught Geography in secondary.

**Table 4.3: t-Test Analysis of mean achievement scores of students taught wealthier measurement using concept mapping instructional strategy. and those taught with lecture instructional strategy**

Variable	N	Df	$\bar{x}$	SD	t-val	p-value	Decision
Experimental Group	44	78	35.36	3.62	2.68	0.02	S
Control Group	36		29.91	5.33			

\*S = Significant

Table 4.3 shows the significant difference in the post-test gain scores in the performance of students taught wealthier measurement using concept mapping and those taught with lecture instructional strategy. The outcome of the result shows that the means score of those students taught lecture instructional strategy is 29.91, SD = 5.33, while those

wealthier measurement using concept mapping is 35.36 and the SD=3.62, df = 78, with p-value of 0.02 which less than alpha significance level of 0.05 that is p-value  $0.02 < 0.05$ . The null hypothesis is thereby rejected. Hence, that there is statistical significant different between the mean achievement score of students taught using concept

#### 4.1.4 Hypotheses Two

**H<sub>02</sub>** There is no significant difference between mean achievement scores of male and females' students taught Geography in secondary schools using concept mapping instructional strategy.

**Table 4.4: t-Test Analysis of mean achievement scores of male and female taught Geography using concept map**

Variable	N	Df	$\bar{x}$	SD	t-val	P-value	Decision
Male	26	42	36.06	3.04	1.36	0.89	NS
Female	18		34.36	4.21			

\*NS = Not Significant

Table 4.4 shows the t- test analysis for no significant difference in the post-test gain scores in the achievement of male and female students taught Geography using concept map. The outcome of the result shows that the male means score is 36.06 and the SD=3.04, df = 42, while the female mean scores of those taught without materials is 34.36, SD = 4.21, with p-value of 0.89, therefore the null hypothesis which is no significant difference in mean achievement score of male and female students taught using concept map was not rejected. Hence, there was no statistical significant different between male and female students' achievement score when expose to concept map.

## **4.2 Discussion of Result**

The analysis of research hypothesis revealed that experimental group (instructional model) did better than the control group (conventional method), although there is no difference in achievement of male and female students in the experimental group that where taught using concept map, the following are findings of the study in detailed.

The findings of the study revealed that there was significant difference in the post-test in the achievement of students taught Geography using concept map and those taught with conventional method. The outcome of the result shows that there is statistical significant different between the mean achievement score of students taught using i concept map and those taught using conventional method, with the p-value  $(0.02) < 0.05$ . This shows that the use of concept map improves the students understanding of quadratic equation more than the students taught using the conventional method.

The findings emanated from the study also disclosed that there is no statistical significant difference between male and female students' achievement score on exposure to concept map, that is the performance of students expose to concept map is not based on gender. This in line with the finding of (Jibrin & Zayum, 2012), the author investigated the effects of constructivists' instructional approach on students' achievement and retention in basic mathematical concepts in Geography. The findings of the study revealed that gender does not influence academic performance in geography.

## CHAPTER FIVE

### 5.0 CONCLUSION AND RECOMMENDATIONS

#### 5.1 Conclusion

Based on the findings of the study, on lecture instructional strategy learning instruction on the academic achievement of concept of Concept mapping by Geography students. it could be concluded that on lecture instructional strategy helps to improve the achievement of student. The study further highlighted the positive influence of on lecture instructional strategy on academic achievement of student in Geography.

From the findings of the study it could be concluded that there is significant difference in the academic achievement of students taught Geography using concept map and those taught with conventional method. Hence, on lecture instructional strategy improves the academic achievement of the study than the conventional method.

It could also be concluded from the findings emanated of the study that there no significant difference in the achievement scores of male and female students taught Geography using concept map. Hence, the use of the model is not gender bias.

#### 5.2 Recommendations

Based on the findings of the study the following recommendation was made:

1. The Ministry of Education should encourage the using concept mapping instructional strategy in teaching Geography in Senior Secondary School.
2. School Authority and teachers should be enlightened on the importance of **lecture** instructional strategy in teaching.
3. The students should also be enlightened on the importance of concept map of learning to their careers.

#### 5.3 Suggestion for Further Study

Based on the findings of the study the following are suggested for further research:

1. Assessment of factors affecting the adoption of concept map among teachers and students in senior secondary school in Bosso Local Government.
2. Influence of using concept mapping instructional strategy instruction on the academic achievement and retention of using concept mapping instructional strategy by geography students. In Urban and Rural areas in Niger State.

#### **5.4 Contribution to the Knowledge**

1. The study serves as an insight to the adoption of the using concept mapping instructional strategy in the teaching / learning of Geography in Niger State.
2. The study also adds up to the already exiting literatures in the implementation of concept map learning facilities in the teaching and learning of Geography.

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## APPENDIX A

### LESSON PLAN FOR CONTROL GROUP

#### LESSON 1

Week	One
Class	SS II
Sex	Males and Females
Average age	17 years
Methodology	Concept Strategy
Subject	Geography
Topic	The concept of weather climate and their associate terminologies
Behavioral objectives	<p>By the end of the lesson, students should be able to:</p> <ol style="list-style-type: none"><li>1. Define the terms —weather and climatell.</li><li>2. Differentiate between weather and climate.</li><li>3. Give an example of weather and climate conditions</li><li>4. Explain at least two terminologies associated with weather and climate</li><li>5. Develop interest in weather concepts</li></ol>
Previous knowledge	Students are aware of some changes that naturally occurred in the environment such as season, day, night etc.
Instructional materials	Computer, projector, and animated package of weather.
Introduction	<p>The teacher introduces the lesson by telling students a short story on weather and climate and ask the following questions which are meant to provoke meaningful thoughts from the students in terms of the previous and relevant knowledge they acquire in relation to the topic —weather and climatell:</p> <ol style="list-style-type: none"><li>1. What two major changes do you normally observed within 24 hours of the day? Expected answer: appearance of sun make day, when sun set night comes.</li><li>2. Why is that in a particular period of a year one must wear tick cloth? Expected answer: cold nature of the season. E.tc.</li></ol>

Presentation	The teacher present his lesson based on the following steps:
Step 1	<p>The teacher paste animated chart showing different condition of weather and allow students to carefully observe the animation and comment on the features observed. The teacher interacts with students and explains that the features observed are some conditions of the day in the atmosphere. Some of these features changed within short period of time and the phenomena are term —weather—. However, the same phenomena may extent over a long period of time. We called this —climate—.</p> <p>The teacher than project the definition of weather and climate using power point.</p>
Step 2	<p>Example: 1. Weather is the condition of lower atmosphere of a place over a short period of time.</p> <p style="padding-left: 40px;">2. Climate is the average condition of lower atmosphere of a place over a long period of time.</p>
Step 3	<p>Differences between weather and climate: the teacher grouped students into six and distributed two different animated flash card for them to observed differences between weather and climate. Each group should appoint leader to explain group’s finding. The teacher, after deliberations of the groups, interacts with the class to show differences between weather and climate.</p>
Step 4	<p>Terminologies associated with weather concepts: the teacher use power point to show and explain to students on some terminologies associated with weather concepts. Some of the terminologies includes:</p> <ol style="list-style-type: none"> <li>a. Snowy, cold, windy, rainy etc</li> <li>b. Land and see breath</li> <li>c. Environmental lapse rate e.t.c.</li> </ol>
Students’ activity	The teacher asks students to use the information provided in the animated flash cards and form their animation in their exercise books with some explanations on the animated weather formed.

The teacher evaluates his lesson by asking students some questions based

Evaluation on the lesson treated.

Example:

- What is weather?  
What is climate?
- What is the difference between weather and climate?

List the terms associated with weather concept. e.t.c

Conclusion The teacher conclude the lesson by summarizing the lesson, explain some areas of difficulties observed during evaluation. The teacher then ask the student to write the summary note on the board in their exercise book.

## LESSON PLAN FOR EXPERIMENTAL GROUP

Week	
Class	Three
	SS II
Sex	Males and Females
Average age	17 years
Methodology	Concept Map
Subject	Geography
Topic	instrument in measuring weather elements and precautions for using each instrument;
Behavioral objectives	By the end of the lesson, students should be able to: <ol style="list-style-type: none"><li>1. State the instruments for measuring weather elements.</li><li>2. Match each instrument with its corresponding element and unit</li><li>3. State the precautions for using each instrument</li><li>4. Develop interest in weather instruments</li></ol>
Previous lesson	Students have previously learnt about Elements of weather and their units of measurement.
Instructional materials	Concept Map chart showing weather instruments, animated meteorological station computer, projector and animated package of weather instrument.
Introduction	The teacher introduces the lesson by asking students some questions based on their previous lesson.  Example: What is weather element? <ul style="list-style-type: none"><li>- What are weather elements?</li><li>- What is the unit of measuring temperature?</li></ul> E.tc.
Presentation	The teacher present his lesson based on the following steps:
Step 1	The teacher paste animated chart showing different instruments of weather and allow students to carefully

observe the animation and comment on the features observed. The teacher interacts with students and

explains that the features observed are some instruments used in measuring weather elements. They are kept in meteorological station. Some of these instruments (e.g. thermometer) can be kept in Stevenson screen. The teacher then project the animated metrological station together with the list of weather instruments as follows:

### **Instruments used in measuring Elements of Weather**

1. Rain gauge
2. thermometer
3. Wind vane
4. anemometer
5. hygrometer
6. barometer
7. Sunshine recorder Etc.

The teacher explains to student on each instrument using <sup>Step 2</sup> power point projection of animated-media instructional strategy.

Example:

1. Rain gauge: This is an instrument used in measuring Precipitation or rain of the earth's surface from the atmosphere.
2. Thermometer: this is used in measuring temperature (Is the degree of hotness or coldness of a place)
3. Wind vane: is an instrument for measuring Wind direction
4. Anemometer: is an instrument for measuring Wind speed
5. Barometer: is an instrument for measuring Atmospheric pressure or the weight of air over time.
6. Hygrometer: is an instrument for measuring Relative humidity which is the measure of the

dampness of the atmosphere due to water in the gaseous state and which varies from place to place at different times of the day.e.t.c

Step 3

Precautions used with weather instruments. The teacher project animated weather instrument and show precautions for keeping each instrument.

Example:

- To get accurate records thermometers are kept in a standard shelter called Stevenson screen to protect them from the effect of Radiant heat of the sun and rain.
- Rain gauge: The distance between ground labeled and funnel top The metal funnel that leads to glass bottle enclosed within a copper cylinder connected to an inner container where the water is collected.

Step 4

The teacher guide students on how to match instruments, elements and their Correspondence units of measurement using animation.

Element	Instruments
Unit of measurement	
1. Rainfall mm	Rain gauge
2. Temperature °c or °f	Thermometer
3. Wind direction cardinal points	Wind vane
4. Atmospheric pressure millibars	Barometer
5. Relative humidity etc	Hygrometer %

Students' activity

The teacher asks students to use the animated weather instruments to draw the following in their work sheets:

1. Rain gauge
2. thermometer
3. Wind vane

- Evaluation
4. anemometer
  5. hygrometer
  6. barometer

The teacher evaluates his lesson by asking students some questions based on the lesson treated.

Example:

- Conclusion
1. State the instruments for measuring weather elements.
  2. What is rain gauge used for?
  3. State the precautions for keeping thermometer.

The teacher conclude his lesson by summarizing the entire lesson, explain some areas of difficulties observed during evaluation and allow students to make their own note on the concepts taught.

## QUESTIONS

1. The condition of lower atmosphere of a place over a short period of time is called.....

- (a) Climate                      (b) weather                      (c) temperature                      (d) latitude

2. The major difference between weather and climate is that weather.....

- (a) Rain is constant for a long time    (b) Change from day to day  
(c) Never changes throughout              (d) Changes after 35 years.

3.....Is the chief source of atmospheric heat. (a) Cloud (b) Moon (c) Sun (d) Stars.

**From the following statement, indicate the nature of weather of the day.**

4. If I rest under a tree or air condition, the weather of the day is..... (a) Snowy

- (b) cold                      (c) rainy                      (d) Sunny

5. I cannot take bath at 6am because the weather of the day is still.....

- (a) Sunny                      (b) Rainy                      (c) Cold                      (d) Windy

6. I have to use an umbrella from my hostel/house to geography laboratory; the weather of

the day is .....(a) Hot                      (b) cold                      (c) rainy (d) windy

7. Gases that exert weights on the earth atmosphere are called.....

- (a) Air temperature    (b) wind                      (c) rainfall                      (d) Air pressure

8. The following weather concept can be measured except.....

- (a) Air temperature    (b) Relative humidity    (c) Cloud cover                      (d) Air pressure

9. Amount of water or in the atmosphere is called.....

- (a) Humidity (b) pressure (c) temperature (d) rainfall
10. What is Wind? (a) stable air (b) directional air (c) air in motion (d) unmovable air
11. When temperature decreases with height, it is called.....
- (a) Continantality effect (b) ocean current (c) latitude (d) normal lapse rate
12. A place where weather conditions are measured is called.....
- (a) meteorological station (b) radio station (c) television station (d) home station
13. Hygrometer is an instrument used in measuring which of the following element?
- (a) Atmospheric pressure (b) Relative humidity (c) insulation (d) temperature
14. The wet bulb thermometer always shows..... than the dry bulb thermometer
- (a) high reading (b) long reading (c) Lower reading (d) moderate reading
15. Wind direction is measured by an instrument called.....
- (a) Wind velocity (b) Wind vane (c) Wind anemometer (d) Wind ammeter
16. Air is said to be saturated when it is 100%. Under which condition?
- (a) if the wet bulb indicates a lower reading
- (b) if the dry bulb indicates a higher reading
- (c) if there is no difference between the reading of wet bulb an dry bulb
- (d) if there is high difference between the reading of wet bulb and dry bulb
17. Anemometer is used to measure.....
- (a) Wind direction (b) Wind size (c) wind speed (d) wind color
18. A reading of 790mm is regarded as...
- (a) low pressure (b) moderate pressure (c) absolute pressure(d) high pressure
19. Pressure is measure in unit of force called...
- (a) milibars (b) Fahrenheit (c) degree centigrade (d) millimeter

20. The temperature of a place is measured by an instrument called \_\_\_\_\_  
 (a) Rain gauge (b) Barometer (c) Anemometer (d) Thermometer
21. Thermometer works on the principle that alcohol expand when ... and contract when ...  
 (a) cooled, heated (b) saturated, heated (c) heated, cooled (d) saturated, evaporated
22. To get accurate records thermometers are kept in a standard shelter called Stevenson screen to protect them from the effect of \_\_\_\_\_  
 (a) Radiant heat of the sun and rain (b) wind blows (c) trees and shade (d) collecting accurate data

**Use the following data to answer question 23 – 27**

Month	J	F	M	A	M	J	J	A	S	O	N	D
Temp (°C)	40	30	21	25	10	40	48	30	25	30	20	15

23. The month with the highest temperature is (a). December (b). July (c). June (d). May
24. The month with the lowest temperature is (a). December (b). July (c). June (d). May
25. The total annual temperature is \_\_\_\_ (a). 331<sup>oc</sup> (b). 334<sup>oc</sup> (c). 27.8<sup>oc</sup>  
 (d). 10<sup>oc</sup>
26. The annual range of temperature is \_\_. (a). 331<sup>oc</sup> (b). 334<sup>oc</sup> (c). 38<sup>oc</sup> (d). 10<sup>oc</sup>
27. The mean annual temperature is \_\_\_\_ (a). 27.8<sup>oc</sup> (b). 334<sup>oc</sup> (c). 331<sup>oc</sup> (d). 10<sup>oc</sup>
28. An SS II student measured soil temperature and found his result to be 16<sup>oc</sup>. He was asked to report this finding in degree Fahrenheit. What is his new temperature?  
 (a) 70.8<sup>of</sup> (b) 50.8<sup>of</sup> (c) 60.8<sup>of</sup> (d) 80<sup>of</sup>
29. Convert 50<sup>of</sup> to a temperature in degree centigrade... (a) 5<sup>oc</sup> (b) 10<sup>oc</sup> (c) 20<sup>oc</sup> (d) 50<sup>oc</sup>

30. The freezing point or the lowest point for centigrade scale is always  $0^{\circ}\text{C}$  while Fahrenheit is.....(a),  $45^{\circ}\text{F}$  (b)  $10^{\circ}\text{F}$  (c)  $0^{\circ}\text{F}$  (d)  $32^{\circ}\text{F}$

## **APPENDIX B**

### **MARKING SCHEME FOR WCAT**

1. B 2. B 3. C 4. D 5. C 6. C 7. D 8. C 9. A 10. C 11. D 12. A

13. B 14. C 15. B 16. C 17. C 18. D 19. A 20. D 21. C 22. A 23. B 24. D 25. B  
26. C 27. A 28. C 29. B 30. D 31.