EFFECT OF GRAPHIC-ADVANCE-ORGANIZERS ON INTEREST AND PERFORMANCE AMONG UPPER BASIC SCIENCE STUDENTS IN POTISKUM EDUCATION ZONE, YOBE STATE, NIGERIA

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MARCH,2021

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A THESIS SUMITTED TO THE SCHOOL OF POSTGRADUATE STUDIES, AHMADU BELLO UNIVERSITY, ZARIA
IN PARTIAL FULFILLMENT FOR THE AWARD OF MASTER DEGREE IN INTEGRATED SCIENCE EDUCATION

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ZARIA, NIGERIA

MARCH, 2021

DECLARATION

I declare that the work in this Dissertation entitled "**Effect of Graphic-Advance-Organizers on Interest and Performance among Upper Basic Science Students in Potiskum Education Zone, Yobe State, Nigeria"** has been carried out by me in the Department of Science Education. The information derived from the literature has been duly acknowledged in the text and a list of references provided. No part of this dissertation was previously presented for another degree or diploma at this or any other Institution.

_____ _____

Hassan Muhammad GAMBO **Date**
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CERTIFICATION

This Dissertation entitled **"Effect of Graphic-Advance-Organizers on Interest and Performance among Upper Basic Science Students in Potiskum Education Zone, Yobe State, Nigeria"** byHassan Muhammad GAMBO(P14EDSC8006) meet the regulations governing the award of the degree of Masters in Integrated Science Educationof the Ahmadu Bello University, and is approved for its contribution to knowledge and library presentation.

Professor I.A. Usman Chairman Supervisory Committee	Date
Professor S.S. Bichi Member Supervisory Committee	Date
ProfessorS.S. Bichi Head of Department	Date
ProfessorS. Abdullahi Dean, School of Postgraduate Studies	Date

DEDICATION

This dissertation is dedicated to my late father Mallam Isa Gambo Ali may Allah (SWA) grant him Jannatul Firdaus, my mother Adama Zakar, my father and uncle Alhaji Muhammad Gambo and his wives Zainab Musa and Daso M. Gambo and my wife and children for their steadfast love and desire to see me succeed.

ACKNOWLEDGEMENT

I wish first and foremost to appreciate the efforts of my major supervisorProfessor I.A. Usmanfor the thoroughness and dedication towhich he showed in going through my work; and also,to my second supervisor Professor S.S. Bichi for all his efforts and contributions to the success of my research may Allah grant them Aljannah Ameen.

I also want to appreciate the efforts of entire staff of Department of Science Education of the Ahmadu Bello University Zaria; Prof. A.A.M Shaibu, Dr. S.B Olorukooba, Prof. J.O Olajide, Prof. F.K Lawal, Prof. S.S Obeka, Dr. M.A Lakpini, Prof. M. M. Atadoga, Dr. M. K. Falalu, Dr. M.O. Ibrahim, Prof. B. Abdulkarim, Dr. S. Uba, Dr. A. A. Dada, M.S. Bichi, S. Danjuma, Mrs. Ramatuandtoall others who have taught me in one way or the other.

My endless prayers to my Parents, my late Father Mal Isa Gambo Ali, my mother Adama Zakar, my uncle and Guardian Alh. Muhammad Gambo, His Wives Zainab Musa and Daso Muhammad Gambo,for their prayers, courage and support throughout my life pursuit. Iappreciate my family for their endurance, support and prayers while i was away, my wifeHabiba Ahmad and children Shuaibu Hassan Gambo, Hussaina Hassan Gambo, Abdullahi Hassan Gambo and Maryam Hassan Gambo may God bless you and keep us together.

My gratitude goes my brothers and sisters Ado, Habiba, Hassan, Hussaina, Late Aisha, Hauwa, Fatsuma, Idriss, Hassan, Sadiya, Hadiza, Ibrahim, Mallam Gambo, Asmau, Maryam, Amina and Adama, Dady, Alhassan, Dan Kano, Dada Harira, Adamu, Aisha, Zakar,Ahmed,late Adamu Babayo, late Audu Sarki, Aunty Iyatu, Uma Hajja, Mama Binta, Hassan Musa Agwam and Family, Suleiman Idriss and Family,Alhaji Adulhamid Badejo and

entire family for their advice, courage and prayers during my stay at the university May God bless you all.

My gratitude and appreciation to my prestigious university A.T.B.U. who awarded and approved my study fellowship to obtain my masters.My profound gratitude goesto all my friends and colleague at work who have supported me with prayers; my mentor Professor I.M. Danjuma, Prof. M.U. Malumfashi, Dr. A.G. Jibrin,Dr. L. Abdulhamid, Prof. B. Yushau, Dr. M.O. Dawud, Dr. S.A Abubakar, Dr. A. Deba, Dr. S.D. Zayum, Mr. Akpena, Mal. I. Muhammad, Mal. Y. Bala, Mal. S. Sanda, Dr. K. Abdullahi, Mal. M.M.Mahmud, Dr. U.A. Abubakar, Mal. A. Makama, M. B. Suleiman, A.H. Toro, N. Dogo, N. Murtala, A. Rabiu, A. Saidu, A. Kwami, M. Kabiru, H.M. Junaid, M. Bello, A. Bello, T. Usman, Mal. Muhammad, Nuhu, Mal. Atiku, Mrs. H. A. Abba, B. Hamid, S. Ibrahim, S. Kwami, J. Bako, J. O. Taiwo, Aliyu,Abu Yasir, Abu Fati, S. Fada, Hassan Y, Jerry, Bukar Gashua God bless you all.

To my colleagues in ABU Zaria; Alh. Karami, Umar Badejo, Auwal ado, Aliyu Misau, Aliyu Tikau, Abdullahi Kiro, Habiba Kabir, Zainab Ahmad, Taofeeq Muhammad, Zainab Jigawa, Ibrahim Abdussalam, Muhammad Ibrahim,Nasiru Gusau and others that time will not permit to mention names thank you all. I also want to recognize the staff and students of G.D.S.S. Kara, G.D.J.S.S. Gashaka, and G.D.J.S.S.Arikime forusing their schools to collect data, isay thank you and God bless. Abdullahi (Coach), Ibrahim Arrigo, Yusuf Baffa, Kawu, Ibrahim Gana, Ibrahim Romario, Shayibu Big, Adamu Baggio, Kalla, Latagadab, Kabiru Jomo, Halima Sambo, Muhammad Nasir, Yaro, Baffa na Mubi, Ailuwa, Okasha., Umaru Saviola, Babangam, Muddeen, U. Yelwa, Yusuf, Auwal, Baba Dole, Haladu, Samanja and all official and players at Generation FC Potiskum My Students in A.T.B.U. most especially V. Kambu,

M. Suleiman M. Aminu, A. Dala, S. Zailani, F. Shehu, F. Malari, (Dan Mallam), A. Zakariya, U. Kassim, F. Abubakar, H. Yola, A. Luti, Esther Z. Abdulhamid, Faiza, Simbiat, U. Bayara, Haruna, Luqman, Lawiza for all your help in this work may God bless you.

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LIST OF ABBREVIATIONS

ANCOVA	Analysis of Covariance
ANOVA	Analysis of Variance
AOTA	Advance Organizer Teaching Approach
ATBS	Achievement Test in Basic Science
BSPT	Basic Science Performance Test
BSSIQ	Basic Science Students' Interest Questionnaire
CAT	Chemistry Achievement Test
CRT	Chemistry Achievement Test
ECAT	Ecology Concepts Achievement Test
EPODEWALAD	Ecology, Population, Deforestation, Waste Disposal and Land Degradation
FRN	Federal Republic of Nigeria
GSS	Government Secondary School
JSS	Junior Secondary School
MDGs	Millennium Development Goals
NCE	National Council on Education
NCE	Nigerian Certificate in Education
NECO	National Examination Council
NEEDS	National Economic Empowerment and Development Strategy
NERDC	Nigerian Educational Research Development Council
NISTEP	Nigerian Integrated Science Teacher Education Programme
PPMCC	Pearson Product Moment Correlation Coefficient

QASAO	Questionnaire on Attitude of Students toward the use of Advance Organizer
RRCAT	Redox Reaction Concept Achievement Test
SATPQ	Students' Attitude toward Physics Questionnaire
SPSS	Statistical Package for Social Science
SS	Senor Secondary
UNESCO	United Nations Educational Science and Cultural Organization
UNICEF	United Nations International Children Emergency Fund
USA	United State of America
WPAT	Word Problem Achievement Test

OPERATIONAL DEFINITION OF TERMS

Graphic-Advance-Organizers It is a spatial or graphical representation of text concepts. It is an instructional tool that can help students to recognize, structure information and concepts to relate with the other concepts.

Lecture Method: In this study it chalk and board was use teach energy concept to the students.

Performance: A process to measure a student's knowledge and skills acquired in energy concept of Basic Science.

Interest: Is an act that motivate the learners to respond to learning of Basic Science?

Prior Knowledge: The existing knowledge already acquired by a learner to which he/she can meaningfully relate new learning materials of Basic Science.

ABSTRACT

This study investigated the Effect ofGraphic-Advance-Organizers on Interest and Performance among Upper Basic Science Secondary School Students in Potiskum Education zone, Yobe State, Nigeria.The study was quasi experimental control group involving pretest and posttest that utilized the non-randomized designusing intact classes.The study was conducted involving population of Eight Thousand and Five (8,057) students, sample size of Two Hundred and Seventy-Six (276) students experimental (n=153) and control (n=123).A sample of four schools from the population were randomly selected which were pretested and subjected to ANOVA.Two out the four schools that have similar mean scores were selected for the study.Simple random sampling by balloting was used to assign the two schools selected to experimental and control groups. The instruments used for data collection are Basic Science Performance Test (BSPT) and Basic Science Students' Interest Questionnaire (BSSIQ). Descriptive statistics was used to analyze responses to the four (4) stated research questions and Hypothesis 1 was analyzed using Wilcoxon Signed Rank Test, hypothesis 2 and 4 were computed by ANCOVA while hypothesis 3 was analyzed by Kruskal Wallis.The analyses and results of the data collected were analyzed using the Statistical Package for Social Science (SPSS) and the level of significance adopted for rejecting or retaining the stated hypotheses was set at $P \leq 0.05$.The findings from the study indicates that: there was a significant difference between the mean interest level of students in the experimental group before and after the treatment. There was a significant difference in the mean posttest scores of the experimental and control groups. There was a significant difference between the mean interest level of male and female students in the experimental group before and after the treatment. There was no significant difference in the mean posttest scores of male and female of the students taught using Graphic-Advance-Organizers. It was concluded that Graphic-Advance-Organizers has the potential of enhancing Junior Secondary School Students' Interest and Performance in Basic Science. Based on the findings of the research it was recommended among others that there should be training and retraining by SUBEB, STAN etc. of Basic Science teachers on the use and design of Graphic-Advance-Organizers, secondly Graphic-Advance-organizers should be used by Basic Science teachers in teaching at Junior Secondary schools, also the use of Graphic-Advance-organizers should be encouraged in co-educational schools since it is gender friendly.

CHAPTER ONE

THE PROBLEM

1.1Introduction

Basic Science formally called Integrated Science is one of the science subjects developed to enable students learn scientific skills, principles and values at the junior secondary school levels. It is a multi-disciplinary subject that comprises concepts in Biology, Chemistry, Physics, environment and society taught as a unified science. It is taught at lower, middle and upper basic education levels. Basic Science is one of the core subjects for basic education and is a foundation of subsequent science learning. It exposes students to basic of skills of scientific enterprises and provides the learner with necessary skills required for learning of science which is the foundation on which subsequent science learning is built (Okeyefi & Nzewi, 2015). Educationist have proposed different definition of the subject Basic Science. Datom (2015) saw Basic Science as a grassroot subject that introduces children into the field science, considering it integrated name between the core science subjects. The knowledge of Basic Science is a pre-requisite to further learning in other physical sciences such as physics, Chemistry and Biology. A good foundation in the field of Medicine, Engineering Pharmacist, Agriculture to mention just a few (Shuaibu, 2012). Considering the importance of Basic Science in the field mentioned above, the Federal Government of Nigeria in National Policy on Education (2014) emphasized the need for planned experience that will build the child understanding in the subject.

With reference to the National Policy on Education (FRN,2014), the teaching of Basic science from lower basic through the upper basic level is intended to achieve the following aims, to:

i. Inculcate in the learners the spirit of inquiry and creativity through exploration of nature and environment.
ii. Lay a sound basis for scientific innovation and reflective thinking.
iii. Develop in the child the ability to adapt to the child's changing environment.
iv. Give the child opportunities for developing manipulative skills that will enable the child to function effectively in the society within the limits of the child's capacity.

Various activity-based teaching strategies have been employed for the purpose of improving the teaching and learning of Basic Science at the JSS level. These strategies include inquiry method, demonstration method, process approach, cooperate learning and laboratory activity method (Usman, 2007).

Some of the problems encountered in teaching and learning of Basic Science especially in the basic education level can be attributed to so many factors such as poor classroom management, teachers' attitude toward the teaching of Basic Science and poor instructional methods and strategies used in teaching and learning of Basic Science. Also,another is students' lack of interest in learning science (Okeyefi& Nzewi, 2015). With all these problems, the need arises to use a strategy such as Graphic-Advance-Organizer to see whether it will enhance meaningful teaching/learning, develop students' interest and understanding of the concepts taught in Basic Science.

Advance organizers are links that have capacity to introduce and also organize the new learning material and learners' experience. Meyer (2003) reportsthat advance organizer is information presented by an instructor that helps the student organize new incoming information. This is achieved by directing attention to what is important in the learning

material, highlighting relationships, and providing a reminder about relevant prior knowledge.Ausubel compared meaningful learning to rote learning, which refers to when a student simply memorizes information without relating that information to previously learned knowledge. As a result, new information is easily forgotten and not readily applied to problem-solving situations because it was not connected with concepts already learned.

In constructivist learning, students engage in active cognitive processing, such as paying attentionto relevant incoming information, mentally organizing incoming information into a coherent representation, and mentally integrating incoming information with existing knowledge (Mayer, 2003).

A Graphic Organizer (GO) is a graphical or spatial representation of text concepts. It is aninstructional tool that can help students to organize, structure the information and concepts to relatewith the other concepts. In addition, the spatial arrangement of GOs allows the students to identify themissing information or absent connections in one's strategic thinking (Ellis, 2004). GOs have many namesincluding visual maps, mind mapping and visual organizers. As an instructional tool, Graphic Organizers used to illustratestudents' prior knowledge about a topic or section of text that have been highly recommended to be usedin classrooms.

The idea of Graphic Organizers is based on Ausubel's assimilation theory of cognitive learning (Ausubel, Novak& Hanesian, 1978).

Interest is the attractions which forces or compels a child to respond to a particular stimulus (Obodo, 2002). It could also be considered as the feelings of an individual towards a particular object or an activity. Meaning that the child could develop interest on any object or activity that is found to be attractive or stimulating to him. Therefore, in a classroom

situation, the learner could be attentive only when the instruction handed over is of interest to him. The curiosity and interest of the students according to Aychin and Coskun (2011), manifest in the performance of the students. The authors reiterate that students whose interests have not been developed do not attend class regularly. Such students neither listen to the lesson carefully nor do their homework.

1.1.1 Theoretical Framework

The theoretical framework of this study is rooted to Ausubel's theory of advanced organizer. Ausubel (1963) described the organizer as a tool that bridges the gap between what the learner already knows and what they have to learn at any given moment in their educational career. Cognitive psychologists believe that all of a person's prior knowledge is stored in the cognitive structures of the brain. Several advance organizers theories in particular lend support to the use of graphic organizers in helping students process and retain information. Schema theory, dual coding theory and cognitive load theory provide the basis for explaining the characteristics of graphic organizers that support the learning process.According to schema theory, memory is composed of a network of schemas. As organizers is just like scaffold that link between what pupils already knew and what they do not, knowledge is well organized and is retained for long period of time. Student's interest is promoted and performance increases.

Graphic organizers help meaningful learning in several ways. It is an activity that provides the student with an opportunity to organize, summarize, analyze and evaluate different ideas. Thus, it promotes the development of critical thinking skills, which can then be used for other meaningful learning activities (Kumar& Rizwaan, 2013).In this study,the researcher

therefore adoptedAusubel's theory of advance organizers in the teaching of Basic Science to see whether it will improve students' performance in Basic Science or not.

1.2 Statement of the Problem

Basic Science is one of the core subjects for basic education and is a foundation of subsequent science learning. It exposes students to basic skills of scientific enterprises and provides the learner with necessary learning experience for proper science foundation upon which the subsequent science learning is built. Research findings have continued to reveal that our classrooms are heavily dominated by the use of traditional teaching methods (Barde, Ezugwu, Muhammad & Mustapha, 2003). These methods emphasize on the procedure of instruction in which majority of learners are merely passive listeners, while teacher plays the role of dispenser of knowledge. Recent researches have debunked the use of this mode of instruction because ofinadequacies to solve and address learner's immediate problems.

Despite severalefforts by the Nigerian Government to make teaching and learning of Basic Science more effective and meaningful at the basic level, learning is confronted with a lot of inhibiting factors such as persistent failure, lack of student interest toward the subject, poor reasoning abilities and cognitive preference as well as poor learning stylesamong the students (Okeyefi & Nzewi, 2015).

Yobe State Universal Basic Education Board(YSUBEB) external examiner's report (2019) in Yobe state indicated that one of the problems militating against the effective teaching of Basic Science is the consistent use of traditional (lecture) method of teaching otherwise known as chalk and talk method. The report stated further that most teachers shy away from innovative/activity based instructional strategies such as Graphic-Advance-Organizer. The present study therefore investigated the effectiveness of Graphic-Advance-Organizers in

Basic Science classroom in Potiskum Zone, Yobe State, Nigeria to determine its influence in enhancing students' Interest and improve Performance in the subject.

1.3 Objectives of the Study

This study has the following objectives to:

i. determine the effect of Graphic-Advance-Organizers on students' interest toward Basic Science.
ii. determine the effect of Graphic-Advance-Organizerson performance of Upper Basic Science students.
iii. find out the effect of Graphic-Advance-Organizers on gender and interest in Upper Basic Science
iv. determine the effect of Graphic-Advance-Organizers on gender and performance in Upper Basic Science.

1.4Research Questions

Based on the stated objectives, the following research questions were raised to guide the study.

i. What is the difference between the mean interest levelsofstudents before and after being taught Basic Science concepts using Graphic-Advance-Organizers?
ii. What is the difference between the mean performance scores of students taught Basic Science concepts using Graphic-Advance-Organizers and those taught using lecture method?

iii. What is the difference between the mean interest level of male and female students before and after beingtaught Basic Science concepts using Graphic-Advance-Organizers?

iv. What is the difference between the mean performance scores of male and female students taught Basic Science concepts using Graphic-Advance-Organizers?

1.5 Research Hypotheses

The following null hypotheses were formulated andtested at $P \leq 0.05$ level of significance.

Ho_1. There is no significant difference between the mean interest levelof students before and after beingtaught Basic Science concepts using Graphic-Advance-Organizers.

Ho_2 There is no significant difference between the mean performance scores of students taught Basic Science concepts using Graphic-Advance-Organizers and those taught using lecture methods.

Ho_3. There is no significant difference between the mean interest levelof male and female students before and after beingtaught basic science concepts using Graphic-Advance-Organizers.

Ho_4. There is no significant difference between the mean performance scores of male and female students taught Basic Science concepts using Graphic-Advance-Organizers.

1.6 Significance of the Study

The findings of this study would hopefully be of benefit to Basic Science educators in the following ways:

Basic Science Teachers:

The findings of this study will hopely be useful to Basic Science teachers to improve their teaching strategy in order to enhance good performance and arouse students' interest

Basic Science Students:

The findings will also enhance Basic Science students' interest toward the subject and improve their academic performance since it incorporates visual representation of the concept taught.

Curriculum Planners:

The results of the finding would hopely help the policy makers and curriculum developers to see the need for Graphic-Advance-Organizers in enhancing the understanding of Basic Science concepts and develop interest in the teaching and learning.

Researchers:

The findings of this study will add new knowledge to the existing literature in Basic Science education. It will also serve as a foundation for further researches.

Professional Bodies such as science Teachers Association of Nigeria(STAN), Mathematical Association of Nigeria (MAN)among others.Findings of this work could be used by these professional bodies to organize seminars, conferences and workshops for Basic Science teachers onthe use of Graphic-Advance-Organizers.

1.7 Basic Assumptions

This study has the following assumptions:

i. Graphic-Advance-Organizerswill improve students' performance when taught Basic Science.
ii. Students develop certain level of interest toward basic science
iii. Graphic-Advance-Organizers can be measurable.
iv. The use of Graphic-Advance-Organizers can have significant impact on both male and female students (Gender friendly)

1.8 Scopeof the Study

The study was aimed at finding the Effect of Graphic-Advance-Organizers on Interest and Performance among Upper Basic Science Students in Potiskum Education Zone, Yobe State. Junior Secondary School II students wereinvolved for the study because JSSI are just new to the system while JSS III were preparing for examination. Two schools werechosenusing simple balloting method.

Basic Science concepts using Graphic-Advance-Organizers were taught tothe experimental group while lecture method was used to teach the control group. The conceptstaught for this study were extracted from the Basic Science curriculum, Energy, with the subheadings broken down into forms of energy, sources of energy, energy conversion and uses of energybecause it represents three core science subjects (Biology, Chemistry and Physics). More so, the topic contains several activities with the representation of the three disciplines and one of difficult topics students usually failed during examination. Two instruments were used for this study; Basic Science Performance Test (BSPT) and Basic Science Student's Interest Questionnaire (BSSIQ)

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This study investigates the Effect of Graphic-Advance-Organizers on Interest and Performance among Upper Basic Science Students in Potiskum Education Zone, Yobe State. This chapter reviews literature related to the study and were organized under the following subheadings:

2.2 Concept of Basic Science

2.2.1 Philosophy and objectives of basic science

2.3 Teaching Strategies in Science

2.4 Concept of Advance Organizers

2.5 Concept of Graphic Organizers

2.6 Interest and Performance in Science

2.7 Gender and Performance in Science

2.8 Overview of Similar Studies

2.9 Implications of Literature Reviewedfor the Present Study

2.2 Concept of Basic Science

Basic Science came up as a challenge in the 60s after the launching of Sputnik 1, in 1957 by Russia when several attempts were made to bring about the improvement in the teaching and learning of science. Basic Science was introduced into Nigerian secondary schools in 1972 at the junior secondary school level. The core objectives of the Basic Science program were clearly spelt out. These objectives are still difficult to achieve due to so many factors, such as inappropriate teaching strategy (Usman, 2007).

Various activity-based teaching strategies have been employed for the purpose of improving the teaching and learning of Basic Science at the JSS level. These strategies include inquiry method, demonstration method, process approach, cooperate learning and laboratory activity method (Usman, 2007). In December 2005, the National Council on Education (NCE) directed Nigerian Educational Research Council (NERDC) to carry out the assignment of reviewing and restructuring the then existing curriculum for primary and junior secondary schools to fit into 9-year basic education programme. This 9-year basic education programme stipulated the child should spend 9 years in primary and junior secondary school levels. The NCE also approved the new curriculum structure namely Lower basic education curriculum (primary 1-3), Middle basic education curriculum (primary 4-6) and Upper basic education curriculum (JSS 1-3) with subject listing in the context of National Economic Empowerment and Development Strategy (NEEDS) and the Millennium Development Goals (MDGs). There came the basic science that was formally called Integrated Science, (NERDC, 2007).

Basic science formally called Integrated Science is one of the science subjects developed to enable students learn scientific skills, principles and values at the junior secondary school levels. It is a multi-disciplinary subject that comprises concepts in Biology, Chemistry, Physics, environment and society. It is taught at lower, middle and upper basic education levels. Basic Science is one of the core subjects for basic education and is a foundation of subsequent science learning. It exposes students to basic of skills of scientific enterprises and provides the learner with necessary and learning of science foundation on which to build subsequent science learning (Okeyefi & Nzewi, 2015).

Several attempts were made in defining Basic Science. Basic Science is seeing as nature in the unity with which it sees it (Okeyefi & Nzewi, 2015). Basic Science is defined as a grass

root subject that introduces children into the field of science (Datom, 2015). According to Echi (2006), Basic Science present and expresses the fundamental unity of scientific knowledge and principles. Basic Science simply means teaching science in such a way as to present scientific ideas as a unified science (Shafiu,2015). Usman (2003) suggested four broad groups of Basic Science, viz:

i. Unity of all knowledge (holistic view, that is, knowledge essentially one and united).
ii. The conceptual nature of science (that is, various concepts or conceptual units are merged together to make up the framework and later identified as a single concept)
iii. Unified process of scientific inquiry (that is, emphasis of integration is on the methodology which brought together similarities among the science example, conceptualization, definition of a problem, statement of hypothesis, data collection, experimentation, data analysis and generalization).
iv. An-interdisciplinary study which emphasizes the collaborative venture between subjects and viewing it as topics or theme level from logically different viewpoints where the learner is left to synthesize it in any way, he/she choose.

The Federal Ministry of Education in the National Policy on Education (FRN, 2013), core-curriculum for Basic Science from JSS I-III emphasized the need for planned learning experience to be child centered. The design of the core-curriculum for Basic Science also includes some basic assumptions such as:

a. The pupil entering the junior secondary school programme had no prior knowledge of science.
b. The basic professional qualification for those who will teach course will be the Nigerian Certificate in Education (NCE).

With reference to the National Policy on Education (FRN,2014), the teaching of Basic Science from lower basic through the upper basic level is intended to achieve the following aims:

i. Inculcate in the learners the spirit of inquiry and creativity through exploration of nature and environment.
ii. Laying a sound basis for scientific innovation and reflective thinking.
iii. Develop in the child the ability to adapt to the child's changing environment.
iv. Give the child opportunities for developing manipulative skills that will enable the child to function effectively in the society within the limits of the child's capacity.

Based on these guiding principles, Basic Science course is to be taught beginning with the understanding of the meaning of science and how scientists work; since it is an Activity-Based Approach. Thus, Basic Science has come to be core subject in the Nigerian Upper Basic Levels. Generally, Basic science is defined as a conceptual unity of science. This definition suggests that there are certain concepts that are common to all the science e.g.energy. It is identified as a unified process of scientific enquiry because scientist go about their work in the same way they collect and analyze data, make observation, inference and conclusion.

2.2.1 Philosophy and Objectives of Basic Science

The philosophy of teaching Basic Science in Nigeria can be discussed from two angles:

1. Basic Science materials on Science Teachers Association of Nigeria
2. Core-curriculum of Basic Science

The National Council on Education (NCE) at its meeting in Ibadan in December 2005 directed the Nigerian educational research and development council (NERDC) to review

restructure and re-align the existing curricula for JSS to fit into the 9-year basic education program.Between January and March 2006, the NERDC convened a meeting of experts to produce the 9-year basic education curriculum which obtained three major issues shaping the development of nations of world that include; globalization, Information/Communication Technology and Entrepreneurship education the overall objectives of its curriculum are to enable the learner to:

i. develop interest inscience and technology
ii. acquire basic knowledge and skills in science and technology
iii. apply their scientific and technological knowledge and skills to meet societal needs
iv. take advantage of the numerous carrier opportunities offered by science and technology
v. become prepared for further studies in science and technology

In the same light UNESCO-UNICEF (1971) provided the following characteristics for Integrated Science:

i. it breaks down and crosses over the traditional boundaries created between the separate sciences.
ii. it emphasizes the underlying methodology and process which characterizes the scientific outlook.
iii. it embodies a scientific study of the environment and environment and technological requirement of everyday life.

Based on the above guiding principles, the core-curriculum for Basic Science was developed with the objectives aimed at enabling the child, who is exposed to it, acquire the following skills:

i. observing carefully and thoroughly

ii. reporting completely and accurately what is observed

iii. organizing information acquired

iv. generalizing on the basis of acquired information

v. predicting as a result of the generalizations

vi. designing experiments (including controls where necessary) to check predictions

vii. using models to explain phenomena where appropriate

viii. continuing the process of inquiry when new data do not conform to prediction

If all these visions are to be observed, it is important for Basic Science teachers to understand the nature, philosophy and objectives of the Basic Science curriculum. Evidence from literature shows those preparing effective basic science teachers depend on the extent of understanding the problem of specialization of knowledge.

2.3Basic Science Teaching Strategies

Teaching method is described as the means of transmitting subject content to students. Various teaching methods have been developed and are available for use by the teachers of various subjects. It is often said that a good teaching is not always tied to any particular method. This implies that, teachers should vary their teaching methods or techniques for effective teaching and learning. Basic Science teachers are therefore at liberty to use whichever methods they considered suitable to serve their purpose. The effective teaching of Basic Science could be measured by examining the methods of teaching applied in school examinations vis-a-vis the performance of students in school examinations (Adeyemi, 2008). As such therefore, the methods employed to teach Basic Science are numerous. The most frequently used teaching methods in Basic science as identified by Adeyemi (2008), include the following:

i. Lecture Method or Expository Method

ii. Excursion Method (Learning through fieldwork)

iii. Demonstration Method

iv. Inquiry Method

v. Project Method

vi. Discussion Method

vii. Class Activity Method

Lecture Method: It is widely used method in Basic Science. In this method the teacher presents the lesson to students verbally while the students listen and write down the key point of the lesson, hence it is described as "talk and the listen" approach to teaching. As teaching technique, lecture method is teacher-centered because a lot of telling is done by the teacher while the learners act as passive recipients of information. Unlike other teaching strategies, the lecture deprives the learners of opportunity to participate fully in the learning process for which reason the method has been criticized for developing passivity in the classroom. The lecture has its strengths as teaching technique. Adeyemi (2008) gave some of these strengths, namely: it helps teachers cover vast area at a limited time as it deals with lengthy explanation; it is cheap and less expensive as it does not demand any significant financial expenditure; it helps the students to cultivate the skills of note-taking and it is good for adult classes and people of higher mental ability. Some of the limitations of lecture method include: it makes the learners passive recipients of information/knowledge; it is didactic and teacher-centered; it is boring particularly in large-size classes and where it is lengthy; it does not promote positive student-teacher relationship; and it does not provide more accurate means of checking students' progress.Moreover, Olorukooba (2015) postulated that, “the

objectives of teaching science are; to acquire the knowledge of science, to acquire the processes of developing scientific skills, and acquisition of scientific knowledge and attitudes. Also, Lecture Method is not the best way to achieve the objectives of teaching science".

Demonstration Method: It is another method of teaching Basic Science. The method allows the students to see the teacher actively engaged as a model rather than merely telling the information. Students learn mental or physical skills by performing those skills under supervision. Demonstration is therefore an instructional strategy in which the teacher does a lot of "showing and doing" activities while the students listen and observe the teacher. After the teacher has finished the performance of a particular activity, the students might be required to perform same activity in order to test their understanding. If the teacher shows a particular process, act of skills or technique with no explanation accompanying it, this is known as "pure demonstration". Demonstration with commentary occurs if demonstration is accompanied with verbal explanation. In participative form of demonstration, students participate in the demonstration given by the teacher.

While the lecture method makes appeal to the sense of hearing, demonstration implies making appeal to the sense of sight and sense of hearing too. Demonstration arouses students' interest and makes learning more meaningful and memorable to students. Some of the limitations of this method are that it is risky especially where students are required to make use of dangerous equipment or chemicals; it is time-consuming and its success depends upon the availability of instructional materials.

Excursion Method: The importance of excursion as instructional strategy has been recognized by science teachers at all levels. Field work or excursion, as it is also called, is

one of the teaching procedures that make instruction real and memorable Ajibade and Raheem (2010) described it as inalienable and corporate part of teaching and learning of Basic Science. Excursion refers to an organized visit to a place of interest outside the school in order to allow the students to see and do things for themselves. Basic science teachers can organize a trip to such places as dam sites, irrigation sites, mines, oil refineries, erosive sites, water treatment plants, power station etc. The purpose of the trip is to take the students beyond the confined area of the classroom, to give them an opportunity to see and observe for themselves the information explained by the teacher in the classroom. The field outside the classroom serves as the true laboratory for science experiments.

This method (excursion) fosters good teacher-students' relationship, makes learning more realistic and memorable and allows students to see the ways in which economic, social physical processes are integrated and interact in a particular place. However, excursion is said to be time-consuming, expensive to organize and during trip it is difficult to maintain good conduct among students.

Project Method: It is also used for teaching Basic Science. The method refers to any individual or group activity involving the investigation and solution of problem planned and carried out to a conclusion by student or students under the guidance of the teacher (Kalgo, 2008). The project starts with problem identification and the identified problem must be of interest to student(s). The teachers' role is to guide the students. Where the investigation is being carried out by a group a student, there is no guarantee that all the students in the group will participate.

Discussion Method: This is employed in Basic Science classrooms to present lessons. In discussion method, the teacher divides the class into groups- small group, large group or

whole class group for the purpose of teaching and learning. The teacher usually gives the topic(s) of discussion to students in advance so that they can seek for information, organize it and present it during the discussion. The teacher must also ensure that all group members follow the discussion and concludes the findings after all group leaders have finished their presentations. The success of this method depends upon the teachers' ability to select relevant and real problem, guide the group in the course of discussion and treat everyone impartially.

The bulk of advantages of this method are that: it develops communication skills among learners, the students learn to share and respect other people's view points and develops confidence in the students. Some the disadvantages of discussion method are that: brighter students tend to monopolize the discussion at the expense of less bright ones, if not well-organized the discussion might degenerate into trivial issues and above all the method does not allow for wider coverage of syllabus.

Inquiry Method: This is also called problem-solving, involves seeking or asking for information about something. Inquiry-based teaching approach provide useful platform for engaging students in practical, hand-on science investigation that can bring them in interaction with living and non-living aspect of the environment (Huber & Moore, 2011). This method, as argued by the authors, can be a very potent instructional strategy for geography teachers in the teaching of their subject particularly where the real answer to the problem is not known.

Other methods of teaching basic science are Question and Answer method, experimentation, laboratory method (Adeyemi, 2008). It should be noted at this juncture that most of the teaching methods described above, with exception of cooperative learning, have been criticized for being ineffective in geography teaching. There is therefore an urgent need to

search for alternative instructional methods that would enhance the teaching and learning of basic science ideas, fact, information and knowledge which in turn improve students' academic performance.

Adeyemi, 2008 asserts that the dominance of teacher-talk in class instruction involves only the learners' sense of learning which practice could be boring after a while. Therefore, the more the number of sense involves in the instructional process the more enduring the learning become. Conventional method is being largely used in the teaching of Science, Technology and Mathematics (STM) which does not enhance students' learning outcomes, and therefore recommended that more effective teaching strategies be used as conventional teaching methods result in rote learning. Moreover, there is need for instructional strategies that give more freedom to the learners to find information for a longer period and also put to use appropriately.

Furthermore, within the current higher educational environment, there is a drive towards the development of greater independence and personal reflection requiring students to take ownership of their learning, and the need to identify the appropriate strategies that will achieve such goals (Clark, 2007). Teaching methodology that will ensure the performance of students as well as the total number of students examined becomes important. In order for the acquisition of new knowledge to take place and to be meaningful, prior knowledge or schema needed to be activated within the structures by means of introductory instructional strategy. Therefore, this research work investigated the Effect of Graphic-Advance-Organizers on Interest Performance of Upper Basic Science Students and determine an improvement in the performance of the students usingthis teaching strategy is used.

2.4 Concept of Advance Organizers

According to Ausubel, “the most important single factor influencing learning is what the learner already knows” According to Novak (1998), “Relationships between concepts are formed when two concepts overlap on some level. As learning progresses, this network of concepts and relationships becomes increasingly complex.Ausubel compared meaningful learning to rote learning, which refers to when a student simply memorizes information without relating that information to previously learned knowledge. As a result, new information is easily forgotten and not readily applied to problem-solving situations because it was not connected with concepts already learned.

Rote learning is a memorization technique based on repetition. The idea is that one will be able to quickly recall the meaning of the material by repeated practices. Some of the alternatives to rote learning include meaningful learning, associative learning, and active learning. In Rote learning, students acquire knowledge, recall it but they are not able to use this knowledge for solving problems of the daily life.In constructivist learning, students engage in active cognitive processing, such as paying attentionto relevant incoming information, mentally organizing incoming information into a coherent representation, and mentally integrating incoming information with existing knowledge (Mayer RE, 2003). Meaningful learning is recognized as an important educational goal. It requires that instruction go beyond simple presentation of Factual Knowledge and that assessment tasks require more of students than simply recalling or recognizing Factual Knowledge (Bransford, Brown, & Cocking, 1999; Lambert & McCombs, 1998).

Advance Organizers Strategy

Recent advancements and modern teaching strategies have enhanced the learning and retention

of new information and advance organizers is one of them. According to (Mayer, 2003), it is an information that is given prior to teaching any concept, and it helps the students to organize and interpret new information. At the start of the lesson, presentation of the advance organizers can be used in the form of probing questions, story or any other way that may help in connecting the new ideas with the previous concepts or ideas which must be learnt by the students. Teachers may use Advance Organizers keeping the following principles;

1. General concepts should be presented first and then moved towards specific concepts.
2. Integration of instructional material with previous information should be done in an organized way.

Learning by Building on Previous Knowledge

Novak agreed that 'Ausubel's theory is applicable and more powerful for teaching science education than the developmental psychology of Piaget. Both Ausubel and Piaget have offered some key insights for sciences. Failing to recall is caused mainly due to loss of connections between the ideas so the persons can find their way in their long-term memory to retrieve the answer they want. According to Arends1, "the major pedagogical strategy proposed by Ausubel was the use of advance organizers". It is the job of the organizers to "Delineate clearly, precisely,and explicitly the principal similarities and differences between the ideas in a new learning passage, on the one hand, and existing related concepts in cognitive structure on the other."

Scope and Practical Application of Advance Organizers

Ausubel (1968) indicates that "Meaningful learning theory applies only to reception (expository)learning in school setting. He distinguishes reception learning from rote learning and discovery learning; the former because it does not involve Subsuming i.e. meaningful material) and the latter because the learner must discover information through problem solving." Advance organizers serve three purposes:

1. To direct the attention towards the importance of the coming material.
2. To highlight the ideas and create relationship amongst the ideas.
3. To remind the students about important information they already have.

Advance Organizers can be useful devices at the start of a unit, before a discussion, before a question-answer period, before giving a homework assignment, before student reports, before a video, before students read from their science book, before a hand on activity, and before a discussion of science concept based on student's laboratory experiences.

Benefits of Advance Organizers

Advance organizer enhances the learning of the students; these can also be called as linking agents, as they link the previous knowledge to the newly learnt knowledge. It is designed to indicate the relevant prior knowledge of a learner and it is usually presented at a higher level of abstraction, generality and inclusiveness than that of the planned lesson. There are several additional benefits of advance organizers to student achievement including that they "can easily be connected to content standards across the curriculum" (Dell' Olio), "That the flexibility of advance organizers make it easy to appropriately modify them for students with special needs, and that they explicitly inform students what they will be learning thus reducing the possible stress of the unknown which has been shown to negatively impact student achievement" (Konecki & Schiller 2003). Advance organizers are beneficial to

encourage students to directly participate in their learning and to be self-reflective throughout the lesson. At the start of the unit teachers can use the advance organizer/s to facilitate whole class discussion about upcoming information, getting students thinking and talking about what they already know.

Rote learning is not very much useful in teaching and learning Basic science. The students took more interest in Basic science if they will be taught with the help of advance organizers. Students will take much interest and they will begin to see everything as a part of Basic science.

The advance organizers enhance the learning and retention ability of the students.

2.4.1Concept ofGraphic Organizers

Graphic organizers are visual and graphic displays that depict the relationships between facts, terms, and or ideas within a learning task (Hyerle, 2000). These visual organizers have been linked to certain ways that information is to be presented and learned. “Visual organizers generate and unveil models of interrelationships developed by learners, along with the unique patterning capacity of each learner’s mind” (Hyerle, 2000). This tool is used to construct representations of information. This educational knowledge is used for remembering, communicating, and negotiating meanings between interrelated pieces of information. Visual tools are used to rediscover information, ideas and experiences that may have become cognitively disconnected. “Maps are used to find our way to new information, much like a treasure map of the mind for seeking new meaning in texts and other materials” (Hyerle, 2000).

Graphic organizers like comparison charts help many students to express ideas in a visible or perceptible way in order to process new information (Salinger, 2003). Teachers should give

students a way to visually organize information for better reading comprehension during and after the lesson. They should aid students in bringing forth prior knowledge as well as developing linkages between prior knowledge and new information (Howard, 2005).

Graphic organizers have been found to enhance learning in at least three different ways. Prior to reading, they can be used to familiarize the reader with the information in the text as well as to allow students to acknowledge and share their understandings of the lesson objectives. They can also be used to enhance students' prior knowledge of the topic being discussed (Howard, 2005). By using this information teacher should be able to come up with different ways for students to respond to lecture and text and encourage student use of various organizational structures such as graphic organizers (Ruddell, 2001).

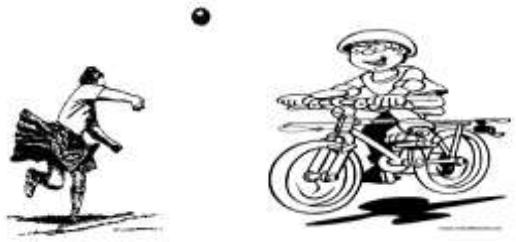
Creating a graphic organizer for an instructional lesson plan is an effective way to get students involved in the learning process (Howard, 2005). When students are asked to help in lesson planning by suggesting questions they want answered about a topic and ideas they want to further explore, learning becomes a "community effort". In this process, not only do teachers influence student thinking, but students influence teacher thinking. This interaction helps with sharing of decision making about context, structures, strategies, questions, and tasks (Lenz, Deshler & Kissam, 2004). Graphic organizers have many uses in the classroom and can be used across the curriculum and in increasing patterns of complexity (Moore, 2003). Students are able to learn how to learn while they are in the process of gaining new knowledge. They are not only able to learn content but they are becoming readers that know how to ask questions while reading, construct images of ideas being conveyed in text, and summarize what is being read. Students can also refer tothe map during the lesson in order to make connections with the new information (Barton & Heidema, 2002). The primary

function is to position several related terms, ideas, or concepts around one central element in a graphic or spatial organizer, then to help the students understandthe relationships that link the different parts together (Howard, 2005).

An efficient way of enhancing content knowledge is by using the “four squares” as shown in Figure 2.1. This graphic organizer spatially represents the interrelationships of the concepts to students and aids in the combination of related ideas in innovative ways. A bonus for using the “four squares” procedure referred to above is that the process of creating them with or without the teacher can help with time constraints throughout the school day by using classroom time and student materials effectively and resourcefully (Brunn, 2002). Visual learning tools can also be types of node-link diagrams, such as the web diagram, where different shapes that represent the main ideas of the lesson link the lines that label the connection between main ideas (Howard, 2005). In these types of graphic forms, the cause and effect events are set in a chain link that show how each event added to the end result as shown in Figure 2.1.

The composition of the nodes and links help to enhance instruction because they help students to understand the difficult passages in some readings (Ciardiello, 2002). The use of different graphic organizers (Fig.2.1) allows thinkers, readers, and writers to transform ideas and concepts into a visual, graphic display that they can use for reading or writing assignments (Howard, 2005). Students get to see how the ideas they will learn about relates to their previous knowledge about the topic being studied. These organizers become idealized graphic representations of text structures. These graphic plans help students to form mental pictures of how texts are organized in order to better understand what they have learned (Sinatra, 2000).

Definition:	**Examples**:
Is the ability or capability to do work	Running, Jumping, Dancing, lifting an object, riding a bicycle, driving a car, throwing a stone, pushing/pulling an object etc.



Source: Howard (2005)

The Four Square is a type of graphic organizer (also known as the Frayer Model) that can be altered for vocabulary lessons based on the specific needs of the subject matter being taught in understanding important inter-concept relations by presenting information spatially. These tools help to ease the grasping of information from texts that are read in a wide variety of settings (Howard, 2005). Students can comprehend the concepts in content area studies better within the context of a graphic or spatial organizer, especially Frayer Model vocabulary, then they can without the illustration of the concepts' components (Howard, 2005).

This study is important in that it gives science teachers research-based information about graphic organizers that can be valuable for them and their particular lesson plan needs. Graphic organizers can be used to gain knowledge of relationships among concepts in a content area. Hierarchical graphicorganizers (Figure 2.2) require examination and explanation of content and seem to improve recall and transfer of learning. Hierarchical

graphics require combination of contents, which aids in problem-solving (Howard, 2005). While other characteristics of graphic techniques may affect learning outcomes, the primary differences will result from the types of cognitive processes that students go through while they are creating the graphics. To lead students through a process of thinking about contents, teachers can arrange simple graphic organizers in sequences that represent different levels of content cognition. It has also been found that visual organizers help students to take control of their own intellectual processes(Howard, 2005)

In specific classes tested learners constructed concept maps that reflected their understanding of science concepts better than traditional forms of testing. The results of another study suggested that the effect of concept mapping on science achievement appears to also have success with lower achieving students (Snead & Sneed, 2004). In a third study it was found

that students who started with graphic organizers showed advanced achievement on their delayed post-test over the students beginning with a laboratory experiment only (Ritchie & Volkl, 2000). In all three studies, the students who used graphic organizers were able to apply text knowledge better than without. These results suggest that the method of presenting information, such as the usage of graphic organizers, played an important role in whether the student was able to understand the information presented during instruction.

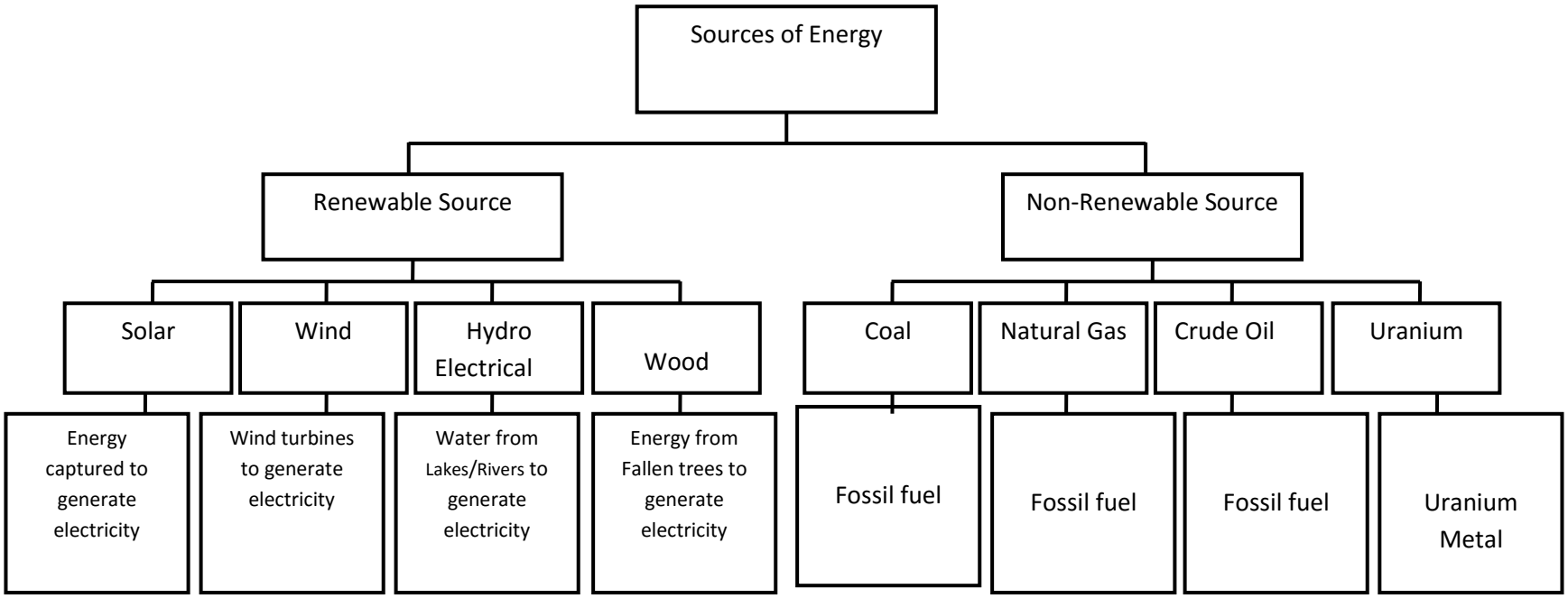
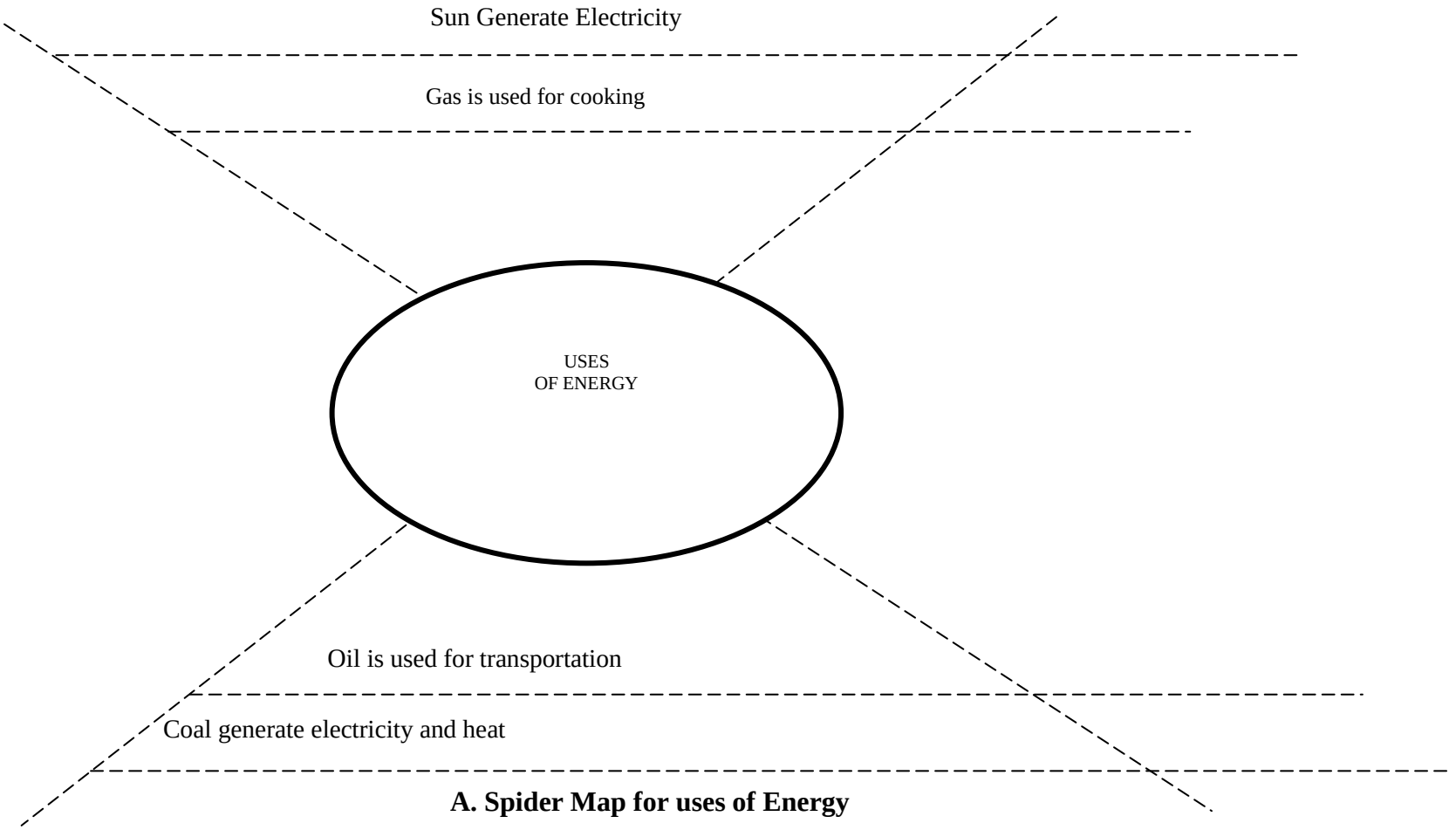


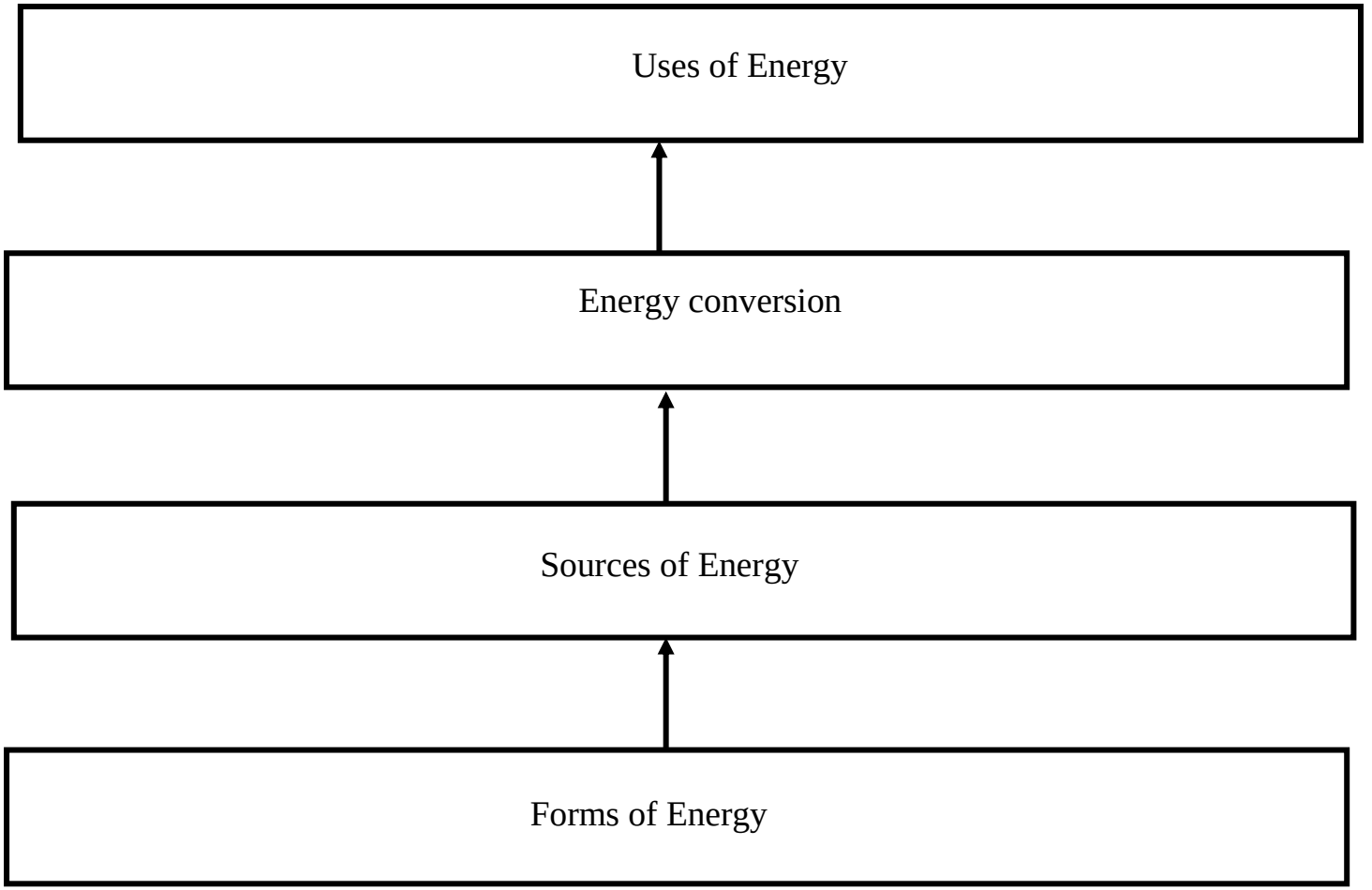
Fig. 2.2: Hierarchical Organizer on Sources of Energy
Source: Snead and Sneed (2004)

It is important that students are able to grasp science concepts that are presented to them, but this is sometimes difficult due to the literacy level of the students being taught. Incorporating literacy strategies into the daily lesson does two things: promotes the advancement of literacy in the student and enhances science learning of concepts. There are many different strategies that have been suggested to teachers in order to promote literacy across the curriculum, but a large amount of them are visual tools such as graphic organizers. Examples of literacy strategies that are graphic organizers are the Spider Map , in Figure 2.3A, (used to describe a central idea: a thing, process, concept, or proposition with support); the Series of Events Chain, in Figure 2.3B, (used to describe the stages of something; the steps in a linear procedure; a sequence of events; or the goals, actions, and outcomes of a historical figure or character in a novel); the Continuum Scale, in Figure 2.3C, (used for time lines showing historical events or ages, degrees of something, shades of meaning, or ratings scales); the Problem/ Solution Outline, in Figure 2.3D, (used to represent a problem, attempted solutions, and results).

A graphic organizer consists of spatial arrangements of words (or word groups) intended to represent the conceptual organization of text" (Stull & Mayer, 2007). The main purpose in all graphic organizers is to arrange words in such a way to organize text for a reader. There are large assortments of graphic organizers with a wide selection of patterns, shapes and formats that can be changed around by the learner and the teacher to fit the concept being taught (Chang, Sung, & Chen, 2002). In a study conducted by Stull and Mayer (2007), it was concluded that the increased activity of the learner, that of them physically creating the graphic organizer, should not be interpreted as deep learning. This means that it would be considered in the lower levels of Bloom's Taxonomy but it would use to enhance classroom literacy strategies: the illustrations of Graphic Organizer (Thinking Maps) is presented in Figure 2.3:

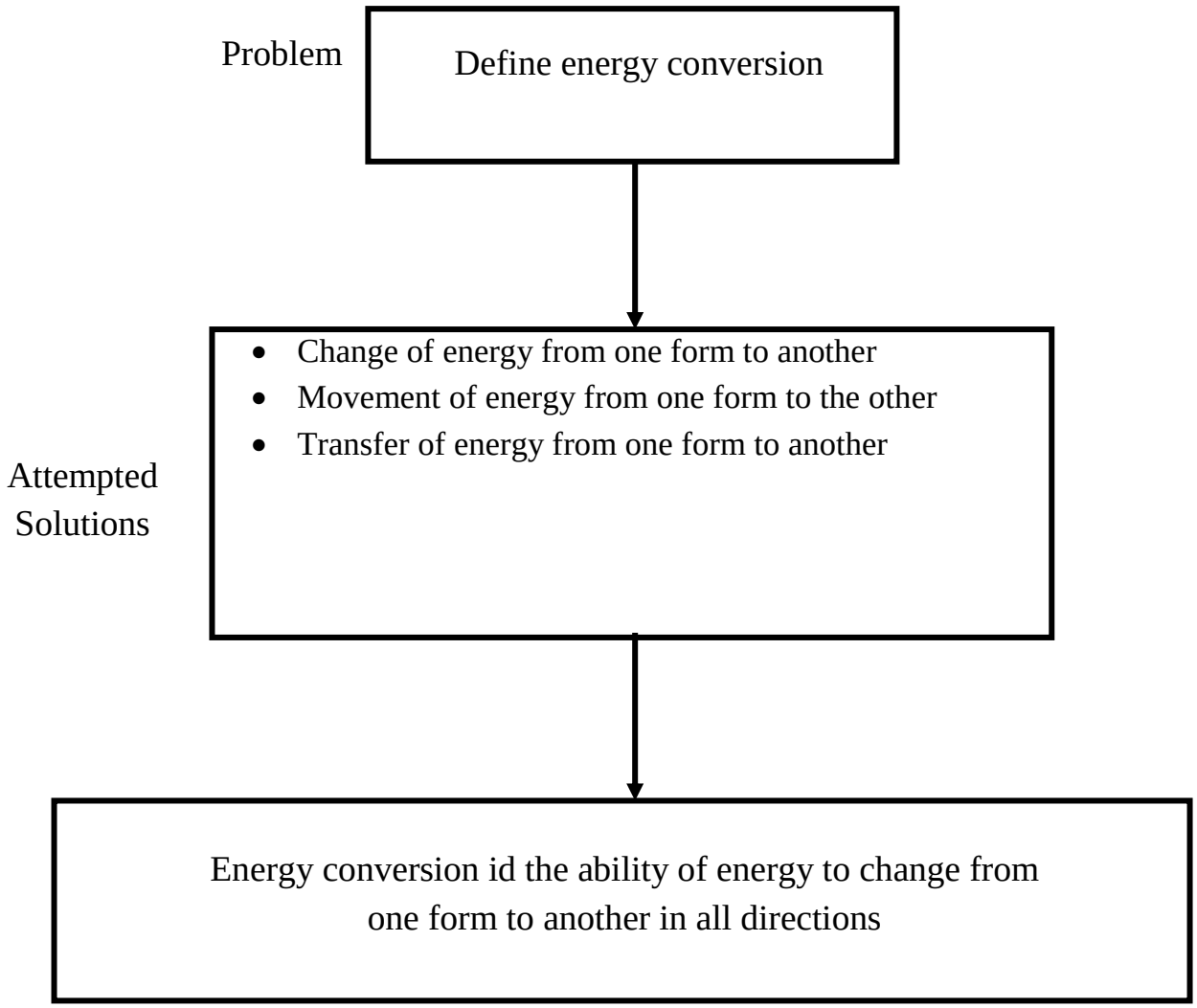


A. Spider Map for uses of Energy

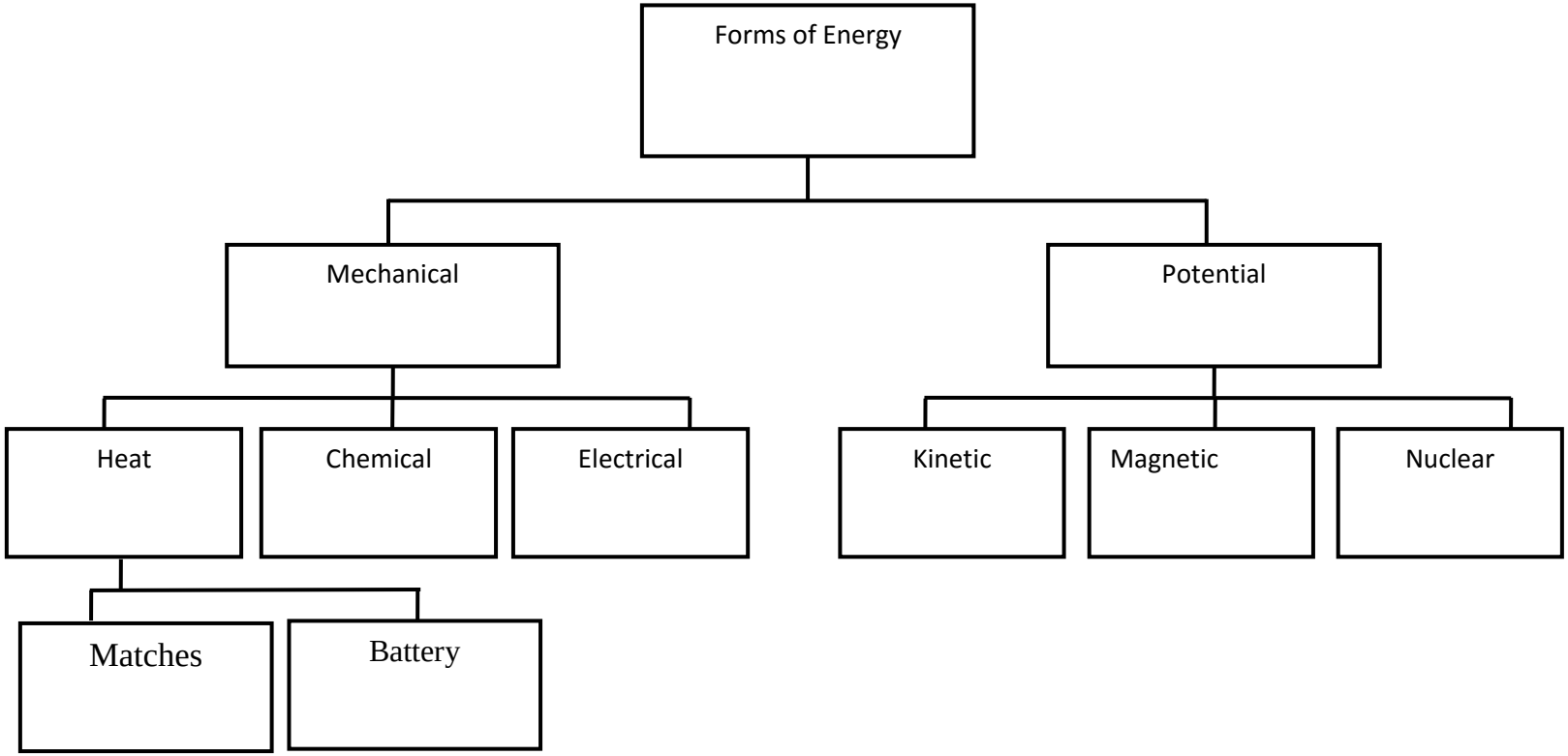


B. Series of Events Chain for Energy

ENERGY



c. Problem/Solution outline of energy conversion



Source: Stull and Mayer (2007)
Figure 2.3: D. Network Tree on Forms of Energy

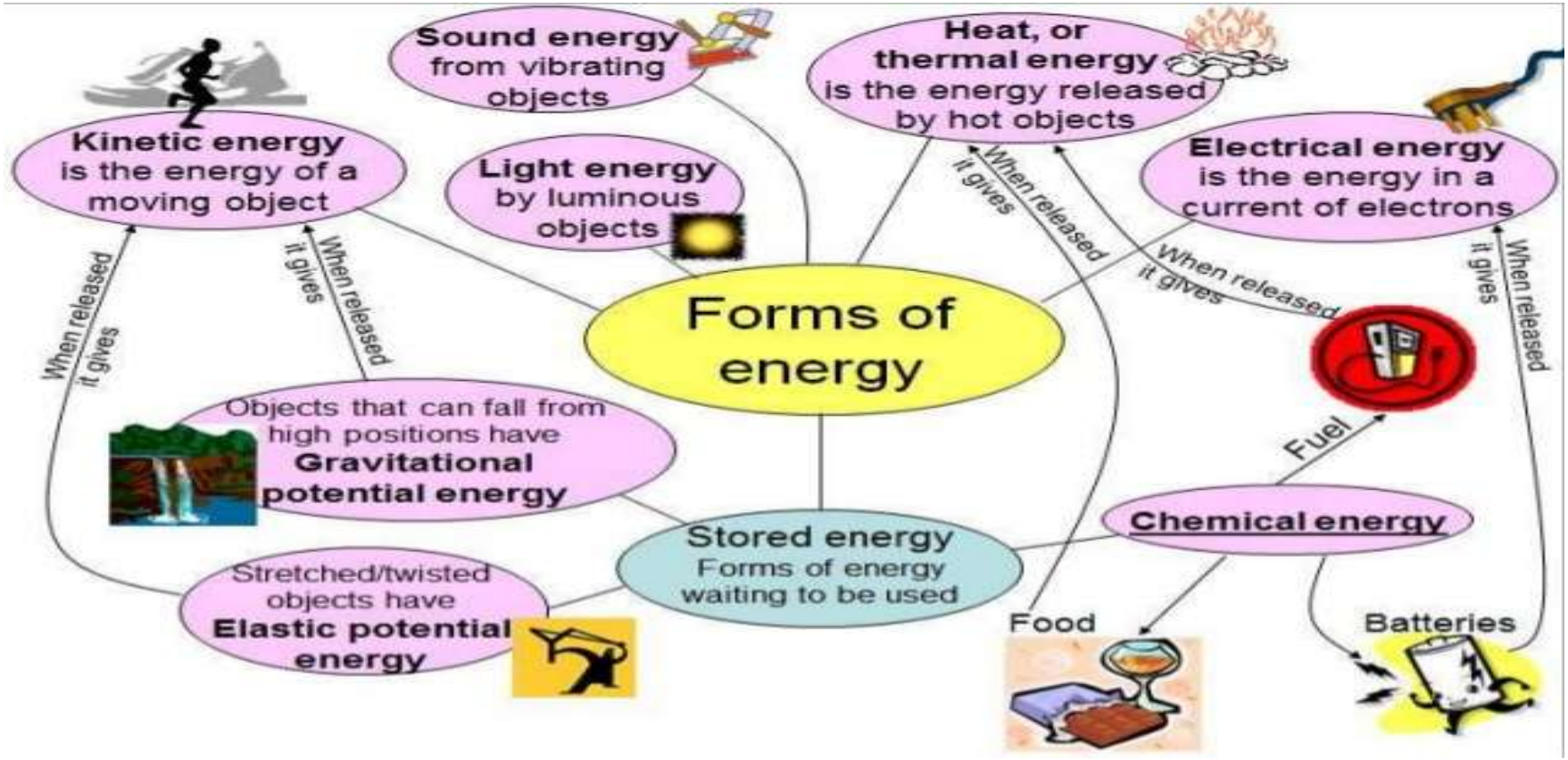


Figure 2.4: Concept Map- type of Graphic Organizer
Source: Stull and Mayer(2007)

2.5Interest and Performance in Science

Learning is all about absorption, processing and retaining that is why it is going hand in hand with interest, because you can never involve yourself on that thing that you may not have interest on it Chauhan, (2001) the introduction of novelty into the teaching /learning process creates interest in the individual when the teacher presents the subject matter in a variety of ways to maintain the curiosity and interest of the students.

Obeka (2010) views interest as the course of certain actions which acts as drive or motivations that propels to act in certain ways and as the effect of an activity from which a child is learn to pay attention as the lesson goes on if he or she is interested in the particular lesson and the method of learning. It is a type of attitude when share in some characteristics of cognitive, affective and psycho or components.Aggarwal (2008) define interest as a feeling that prompts us to spontaneous activity. It is a motivating force that impels us to attend to a person, a thing, or an activity as well as effective experience that has been stimulated by the activity itself. According to the researcher, once interest is aroused in studies, games, literature and good conduct, the child will consider no sacrifice and effort too great to attain proficiency. Thus, interest can be the cause of activity and the result of participation in activity.

Mangal (2010) observed that Interest is the key factor and driving force that help us in paying attention as well as remaining engaged in our so attended activities. It is a great motivating force and reservoir of one's inner potential capable of molding and shaping one's behavior and personality make-up in a particular field. Interest are not permanent and fixed, they changed as a result of maturation, learning and other internal as environmental conditions and factors.Hussain, Maanif and D'Cruz (2000), asserted that many theorists and researchers

have found that it is important to recognize the consent of maturation and interest not as single entity but as multi-factional one. The researcher also believed that teachers are able to drive the students to learn the language and to sustain students' interest in language, learn if they can provide activities that are interrelated between in-class and out-of class language activities communicative game integrative (shirt/small, action transform larger activities); Pleasant stat and non-threatening: Enthusiastic; Group-based; Meaningful or relevant; Challenging. These activities help promote self-confidence experiences of success learning satisfaction and good relationships among learners and between teachers and students.

Obeka (2009) observed that in spite of zeal, determination and sincere interest, students' interest and ability can be clambered by the use of ineffective teaching method such as the traditional lecture. Other factors affecting interest in learning as pointed by Aggarwal (2008) and Mangal (2010) are; personal factors (socio-economic status, learners' mental health and development, his age, sex, child' ideals, motives and wishes): environmental factors (education and training, cultural status, opportunities to the child for exploring interests). Interest is now recognized to be a critical cognitive and affective motivational variable that guides attention, facilitates learning in different content areas and for learners of all ages and develops through experiences (Obeka, 2010).

Interest of the learner can be measured. Aggarwal (2008) posited that scholar's attention on knowing the interest of an individual can be attributed to four factors; interest is an impelling factor; its' relationship with abilities; it indicates the probability of the actual work relating to a subject; and; measurement may suggest alternative fields- academic and vocational which the students have not yet seriously considered. Scholars (Aggarwal, 2008, Mangal, 2010) have identified variety of methods by which interest can be measured. Graphic-Advance-

Organizers Teaching Strategy will be used in determining whether or not the strategy can generate interest in learning Basic Science.

2.6 Gender and Performance in Science

Academic performance in students' learning has been a matter of concerned in the present-day research. Ogundukun and Adeyemo (2010) defined academic performance as the display of knowledge attained or skills developed by students in the school subject. It is the level of performance in the subject as exhibited by an individual. Academic performance is the exhibition of knowledge attains or skills developed by learners in the school subject usually designed by test scores or by marks assigned by teachers which can be low orhigh.

In agreement with the discussion,Popoola (2010) ascertained that, academic performance is an expression used to present student scholastic standing and which is a function of a various factors such as method of teaching, teachers' qualifications, child's home background, school environment, attitude, interest among others. The concept of "gender" in teaching and learning process has attracted the attention of many psychologist, biologists, and researchers as a result of which a lot of literatures exist on different aspects of the concepts.

Several researches conducted by scholars on the effect of academic performance on gender in science education significant differences between boys and girls (Bichi,2002, Usman,2007, Obeka, 2009) while others opined no difference between genders academic performance (Usman, 2010).Alpha (2007), in his research on Gender disparity on performance in mathematics of senior secondary school, opine that performance of boys is higher than that of girls. In support of this, Usman (2007) in his work "relationship between students' performance and their academic achievement in Biology using NISTEP mode of teaching

revealed that senior secondary male biology students perform well in any rigorous work than their female counter part.

In a similar vain, Obeka (2009) conducted a research on EPODEWALAD and Power Simulation games of Geographic and Environmental Education. His finding, among others, revealed that gender was a significant factor in students' performance in environmental education concepts of geography with male students performed better than their counter parts.On the contraryBichi (2002) work on effects of gender on historically enriched curriculum on academic performance in evolution concept using senior secondary Biology students. His finding revealed disparity among gender in support of girls.

Nuruddeen (2013) findings from research studies, which have demonstrated differences due to gender in various academic achievements, have become popular and generally accepted by scholars. Females tend to score higher on verbal test and always do better on coding tests, which call for short memory, speed and draftiness. The males on the other hand, invariably achieved higher score on arithmetic, although there is no enough evidence that males and females differ in average intelligence, the constitutions of intelligence, in the two sexes are far from similar.Oloyede (2011) in her findings showed that there was no significant difference between the achievements of male and female chemistry students taught with pictorial and written organizers.

Nuruddeen (2013) argued that many scholars have carried out research on gender and reported out varying result for example;gender was a major factor that determined achievement. Nuruddeen (2013) says the influences of students' gender in their academic achievement had been a concern to researchers in education, yet no consistent result had emerged. These situations therefore sustain the curiosity of researchers, making it necessary

for the need to understand how academic achievement is influence by gender on instructional package.

The work of Maikano (2007) revealed that there is no significant difference in the academic performance of male and female students taught ecological concepts using the outdoor laboratory instructional strategy. Mari (2010) supports this assertion in his study on entry qualification and performance. The result showed that male and female students admitted with the same entry qualification have no difference in their performance. Also, Usman (2010) opined that teaching methods (outdoor and indoor) enhances academic achievement of students in integrated science concepts in spite of their gender.In this study, an attempt was made to determine if interest and academic performance in Graphic-Advance-Organizers in Basic Science is gender sensitive. Data obtained from students' academic performance using pretest and posttest of Basic Science Performance Test (BSPT) was used, grouped based on gender and analyzed using Wilcoxon and ANCOVA to determine if there is significant difference in gender and academic performance.

It is evident that poor academic performance of junior secondary school students in Nigeria affects all subject areas, Basic Science inclusive. The major challenge is how to effectively teach the students in order to improve their academic performance. The task of improving the performance of junior secondary school students presents a complex challenge to teachers who are key players in meeting the diverse learning needs of every student in the classroom. The search for instructional strategies to help teachers meet this challenge has attracted much attention from many researchers in the recent past. Teachers' methodology has been linked to academic performance of students. Various instructional strategies have been recommended

for uses which have wider applicability across different subject areas and positive effects on academic performance.

2.7 Overview of Similar Studies

This study Titled Effect of Graphic-Advance-Organizer on Interest and Performanceamong Upper Basic Science Students in Potiskum Education Zone Yobe State, Nigeria.Various overview studies/researches have been conducted in this country or elsewhere in the world, which are either directly or indirectly related to this study. The researcher overview some of these studies one after the other.

Many scholars and researchers have used Graphic Organizer in various subject areas such as Biology, Mathematics, Physics and Chemistry etc. However, in the field of Basic Science particularly onEnergyconcept no much work has been carried out. This gives the researcher the motive of this research.Antoine (2003), conducted a research on The Effect of Graphic Organizers on Science Education: Human Body Systems in NBCT B.S., Louisiana State University, USA. The purpose of the research was to determine whether graphic organizers foster better student achievement in science classrooms than guided note taking with PowerPoint presentations. The population of the study comprised 345 High school students and 226 Middle school students making up the total of 571 students. 61 students were sampled out of the total population in southern Louisiana. Design of the study was pre-test, post-test experimental design using lecture and power point, devised by Text book software test makers along with prepared Graphic organizers. Data were analyzed using Microsoft excel software and Mann Whitney and Kruskal Wallis. Results obtained showed that use of graphical Organizer instruction was significantly better for students' achievements when compared to the use of power point instruction. This research work was on Academic

performance using graphical organizers. Therefore, the present study investigates the Effect of Graphic-Advance-Organizer on Interest and Performance of Upper Basic Science Students in Potiskum Education Zone Yobe State, Nigeria.

Hudson S. and Fred N. (2009), investigated the effect of using advance organizers on students' motivation tolearn biology. The research design used was quasi-experimental design where the non-randomized Solomon Four group was adopted. The focus was on the topic pollution. Thesample comprised of 166 form three (third grade in the secondary school cycle) studentsin Bureti District, Kenya. Data was collected by using Students' Motivation Questionnaire(SMQ). A t-test, one-way ANOVA and ANCOVA statistical techniques were used toanalyze the data. The findings indicate that students taught using advance organizers had ahigher level of motivation than those taught using conventional teaching methods. Thefindings further indicate that following the intervention, male students had a significantlyhigher level of motivation than their female counterparts.

Oloyede (2011) worked on an investigation into the Effect of Pictorial and Written Advance Organizers on Students' Achievement in Senior Secondary School Chemistry was carried out with 138 senior secondary school two (SS2) chemistry students on the concept of energy change. The results showed that advance organizers enhance the achievement and retention of the learning materials in chemistry by the students. On the whole, pictorial organizer was found to be more effective in facilitating students' achievement and retention in chemistry than written organizer. There was no significant difference between the achievement of male and female chemistry students taught with pictorial and written organizers. It was recommended that chemistry teachers should be encouraged to adopt pictorial advance organizers in teaching the concept of energy change in chemistry. This research work was on

effect of Advance Organizer on Academic performance. Therefore, the present study investigates the Effect of Graphic-Advance-Organizer on Interest and Performance of Upper Basic Science Students in Potiskum Education Zone Yobe State, Nigeria.

Agbenyeku (2012), investigated the effect of advance organizers on the performance and retention of ecology concepts among senior secondary school students in Giwa educational zone. The study was conducted using a population of 145 students from G.S.S Kwangila (n=70) and G.S.S Basawa (n=75), using intact classes. The subjects through random sampling by balloting were assigned to experimental and control groups. A Quasi-experimental non-equivalent control group of pretests, post-test and delayed post-posttest design was used. The subjects were taught for six weeks using advance organizers and lecture methods for the experimental group and lecture method only for the control group. For the pretest, posttest and delayed post posttest, the instrument used was the Ecology Concept Achievement Test (ECAT). Four null hypotheses were tested; t-test statistics was used to determine the level of significance of the two groups at $P \leq 0.05$. The major findings from the study indicate that: there is a significant difference in the mean academic performance scores of the experimental and control groups. There is a significant difference in the retention level of the students taught using advance organizers compared to those taught using lecture methods only. Hypothesis 3 and 4 regarding gender issues; the use of advance organizers also favoured female students over the male students and female students slightly retained more than male students.

Based on the findings of the research it was recommended that there should be training and retraining of biology teachers on the use and design of advance organizers, secondly advance organizer should be used by biology teachers in teaching in schools, also the use of advance

organizers should be encouraged in co-educational schools since it is gender friendly. Therefore, the present study investigates the Effect of Graphic-Advance-Organizer on Interest and Performance of Upper Basic Science Students in Potiskum Education Zone Yobe State, Nigeria.

Ugbe, and Dike (2012), examined the relative efficacy of advance organizer teaching strategy on learning the concept of electrochemistry in the Senior Secondary School Chemistry in Cross River State of Nigeria. Two hypotheses were formulated to guide the study. A total of 60 Senior Secondary two (SS2) chemistry students (25 females and 35 males) were involved in the study out of a population of 110 (SS2) chemistry students. A quasi-experimental pretest –posttest control group design was used for the study. The instruments used in gathering data for the study were chemistry Achievement Test (CAT) and chemistry Retention Test (CRT). All the instruments had a reliability coefficient of 0.65 using Kuder-Richardson formula 21, t-test analysis was used in the analysis of data. From the study, it was observed that advance organizer enhances the led to the recommendation that chemistry teachers should be encouraged to adopt advance organizers teaching strategy in teaching senior secondary school chemistry. This research work was on effect of Advance Organizer on Academic performance. Therefore, the present study investigates the Effect of Graphic-Advance-Organizer on Interest and Performance of Upper Basic Science Students in Potiskum Education Zone Yobe State, Nigeria.

Adedeji, Folorunso and Adedeji (2013), study the Effects of Historical Simulations as Narrative and Graphic-Advance-Organizers on Nigerian Junior Secondary School Students' Learning Outcomes in Basic Science in Nigeria. The main purpose was to compare the attitudes of students toward learning of Basic Science when SIS and SCIS are used as

advance organizers in learning; and examined the effects of SIS and SCIS on the retention ability of students. The research design was non-equivalent pre-test, post-test control group quasi-experimental. The population comprised all Junior Secondary School (JSS) II students in Osun State. The sample comprised 126 JSS II Basic Science students in their intact classes from three schools selected by random sampling technique. The instruments used for the study were the Achievement Test on Basic Science (ATBS) and Questionnaire on Attitude of Students toward the use of Advance Organizers (QASAO). Data collected were analyzed using t-test, One-way Analysis of Variance (ANOVA) and Post hoc (Turkey) multiple comparison test.

The results showed that historical simulations (SIS and SCIS) were significantly effective in improving students' performance in Basic Science. It was concluded that advance organizer strategies, SIS and SCIS, could be used to effectively enhance students' learning and retention of Basic Science and also promote their interest in the subject. This research work was on learning outcome using two teaching strategy of Historical Simulation and Narrative Graphic Organizer. Therefore, the present study investigates the Effect of Graphic-Advance-Organizer on Interest and Performance of Upper Basic Science Students in Potiskum Education Zone Yobe State, Nigeria.

Wachanga, Arimba and Mbugua (2013), investigated the effects of Advance Organizer Teaching Approach on students‟ achievement in Chemistry. Quasi experimental research was employed since intact chemistry classes were involved. Solomon's Four Non-Equivalent Control Group Design was used. The study involved secondary schools in Maara District, Kenya. The target population was 13,036 secondary school students while the accessible population was 3,540 Form Three chemistry students. Purposive sampling was used to select

four district co-educational secondary schools in Maara District. The sample size involved 161 Form Three chemistry students who were in four groups E1, E2, C1and C2. Chemistry Achievement Test (CAT) was used for data collection. The CAT was administered to groups E1 and C1 before teaching started. Statistical package for social sciences (SPSS) was used for data analysis. Descriptive statistics (mean, percentages, and standard deviation) and inferential statistics (ANOVA, ANCOVA, and t- test) were used for data analysis at $\alpha = 0.05$ level. The study found out that there were significant effects of the use of advance organizers in Chemistry learning. Students who were taught using AOTA achieved better in Chemistry learning than those who were taught through RTM. The findings of this study also indicate that gender has no significant effects on CAT scores in Chemistry learning when AOTA is used. Based on this study teachers and curriculum developers should adopt and strengthen the use of advance organizers as a teaching strategy to enhance Chemistry learning by students. Therefore, the present study investigates the Effect of Graphic-Advance-Organizer on Interest and Performance of Upper Basic Science Students in Potiskum Education Zone Yobe State, Nigeria.

Abdul-Majeed T. (2015), investigated the effectiveness of graphicorganizers on students' writing ability as well as their attitudes towards this essential languageskill. The sample of this study was composed of 24 Saudi male subjects registered in thepreparatory program at Umm Alqura University during the academic year 2012- 2013. Thisstudy (a within subject design) was conducted in three phases and lasted for six weeks. Twomain sources were used to generate data for the study: (1) samples of students' writing beforeand after the graphic organizer’s intervention (2) a writing attitude survey which wasadministered twice before and after intervention. The writing scores of the participants beforeand after the graphic

organizers' intervention were compared and analyzed quantitative usingthe test of significance to see if there were any differences between means of the scores. Thedata generated through the writing attitude survey was analyzed qualitatively to detect anychanges in students' attitudes. The results of this study proved that the graphic organizersmodel had significantly improved the students' writing ability and had positively impacted theirattitudes towards this skill. These results suggest that graphic organizers can be an effectivesupport in teaching writing of learners of English as a foreign language.Therefore, the present study investigates the Effect of Graphic-Advance-Organizer on Interest and Performance of Upper Basic Science Students in Potiskum Education Zone Yobe State, Nigeria.

Akinbobola (2015), investigated on the effects of pictorial, written and verbal advance organizers on students' attitude in Nigerian senior secondary school Physics. The study adopted a 4 x 2 factorial design. A total of 180 senior secondary two (SS2) Physics students took part in the study. Students' Attitude towards Physics Questionnaire (SATPQ) was the instrument used to collect the data with a reliability index of 0.88 using Pearson Product Moment Correlation (PPMC) approach and the data collected were analysis using analysis of covariance and t-test. The results showed that pictorial organizer was the most effective in enhancing students' attitude towards Physics learning. This was then followed by written organizer while verbal organizer was found to be the least effective. The results also showed an insignificant gender difference in the attitude of students towards Physics when taught with pictorial, written and verbal advance organizers. It is recommended that advance organizers should be used in schools to facilitate students' attitude towards Physics. Therefore, the present study investigates the Effect of Graphic-Advance-Organizer on Interest

and Performance of Upper Basic Science Students in Potiskum Education Zone Yobe State, Nigeria.

Ekenobi and Mumuni (2015), carried out a research on Efficacy of advance Organizers Strategies on Student's Cognitive Achievement in Redox Reaction concept. This study adopted a re-test, pre-test control group, quasi-experimental design in a 3x2 factorial matrix to investigate the efficacy of advance organizers strategies on chemistry students' cognitive achievements in Redox reaction concept. A total of two hundred and twenty (220) senior secondary two (SS2) chemistry students (118 males and 102 females) purposively selected from three out of six public co-educational senior secondary schools that met sampling criteria in Obio/Akpor education zone, Rivers State, Nigeria constituted three non-equivalent intact classes that participate in the study. A Redox Reaction Concept Achievement Test (RRCAT) instrument with Kuder-Richardson's reliability co-efficient of 0.90 was used to obtain data. Descriptive statistics (mean, standard deviation and percentages) and inferential statistics (ANCOVA and Scheffe's post hoc analysis) were used for data analysis a $P \leq 0.05$ alpha levels. The findings established that graphics advance organizers strategy consistently produced the highest levels of achievement gain and was therefore found to be most efficacious in promoting meaningful understanding and enhancing higher cognitive achievements in Redox reaction concept at all levels of the cognitive domain among the three strategies compared. Gender did not significantly influence the achievement of students in Redox reaction concept. It was recommended among others that chemistry teachers and educators should adopt graphics and textual advance organizers strategies as purposeful and efficient instructional strategies and resources in teaching Redox reaction so that students could reap the full benefits of active classroom involvement. This research work was on

effect of Advance Organizer on Academic performance. Therefore, the present study investigates the Effect of Graphic-Advance-Organizer on Interest and Performance of Upper Basic Science Students in Potiskum Education Zone Yobe State, Nigeria.

Owolabi andAdaramati (2015),investigated the effects of graphic organizer and gender on students' academic achievement inalgebraic word problem. Three research questions and three null hypotheses were used in guiding this study.Quasi experimental research was employed and Non-equivalent pre and posttest design was used. The studyinvolved the Senior Secondary School 2 (SS2) students in Lagos state. The sample comprised of 40 respondentsdistributed across three treatments groups 13 in Experimental group 1(EG1), 12 in Experimental Group2 (EG2) and15 in Control Group (CG). A Word Problem Achievement Test (WPAT) was usedto collect data for both the pre and posttests. Mean and standard deviations were used to answer theresearch questions while ANCOVA and multiple comparisons were used in testing the three null hypotheses at $P \leq 0.05$.The results of the analysis indicated that (i) the experimental groups performed better than the control group (ii)the treatment appeared to be more effective among male students than their female counterparts (iii) the maineffect of treatment was significant and (iv) the main effect of gender as well as the interaction effects oftreatment and gender were not statistically significant. This research work was on gender and academic performance. Therefore, the present study investigates the Effect of Graphic-Advance-Organizer on Interest and Performance of Upper Basic Science Students in Potiskum Education Zone Yobe State, Nigeria.

Tanveer, Farkhunda and Arshad (2015), investigated the effect of Advance Organizers Strategy on the performance of the 9th grade science students. The main objective of this

study was to find out the effectiveness of Advance organizers and to compare the performance of experimental group with control group. The research design was true experimental pre-test, post-test design. The sample consisted of fifty randomly selected students of 9th grade. Data was analyzed using t-test at 0.05 significant level. The results of the study showed that the use of Advance Organizers Strategy had a positive effect on the performance of experimental group. The use of Advance Organizers Strategy found to be helpful for enhancing retention ability of the students. The results of the study lead to the conclusion that Advance Organizers Strategy is useful to improve retention ability of the students.Therefore, the present study investigates the Effect of Graphic-Advance-Organizer on Interest and Performance of Upper Basic Science Students in Potiskum Education Zone Yobe State, Nigeria.

Enekwechi E. E. (2016), examined the effect of advance organizers on secondary school students' academic achievement in chemistry and their scientific attitude. It used the pre-test post-test control group quasi-experimental design with eighty-four senior secondary 2 (SS2) chemistry students as subjects selected from two sampled schools. Chemistry Achievement Test (CAT) and Scientific Attitude Questionnaire (SAQ) were the instruments used for collection of data. The reliability of the CAT was finally determined using Spearman-Brown Prophesy Formula which yielded a coefficient of 0.82 while the Cronbach Alpha reliability coefficient for SAQ was 0.91. Analysis of covariance (ANCOVA) was used as the statistical technique for the data analysis. The hypotheses were tested at 0.05 level of significance. The findings indicated that students taught Chemistry with advance organizers achieved better and had a higher level of scientific attitude than their counterparts taught with the conventional method. The study therefore recommended that Chemistry teachers should

adopt the use of advance organizers in order to improve students' achievement and scientific attitudes. Therefore, the present study investigates the Effect of Graphic-Advance-Organizer on Interest and Performance of Upper Basic Science Students in Potiskum Education Zone Yobe State, Nigeria.

Ogbeba and Agernor (2016)**,** investigated the effect of study questions as advance organizers on students' retention in Basic Science in Makurdi Local Government Area of Benue State, Nigeria. Two research questions and 2 hypotheses guided the study which adopted a quasi-experimental, non-randomized, control-group, pre-test, posttest, research design. Purposive sampling was used to draw 167 students from a population of 1682 Upper Basic 2 students who were used for the study. Data were collected using the Basic Science Achievement Test (BSAT) which reliability co-efficient was determined to be 0.86 using Kuder Richardson formula 20 K-R20. Data collected were analyzed using Statistical Package for Social Sciences (SPSS). Mean and Standard Deviation scores were used to answer the research questions while Analysis of Covariance (ANCOVA) was used to test the hypotheses at 0.05 level of significance. The study found that experimental subjects significantly outperformed the control subjects in mean retention $F(1,164) = 21.72$, $p=0.00<0.05$ while there was no significant difference between male and female students in retention $F(1,77)=0.44$, $p=0.51>0.05$. It was therefore recommended that teachers of Basic science should provide students with study questions as advance organizers to enhance parity in the retention of knowledge across gender. Therefore, the present study investigates the Effect of Graphic-Advance-Organizer on Interest and Performance of Upper Basic Science Students in Potiskum Education Zone Yobe State, Nigeria.

Emmanuel U., Emmanuel A. O., Edwin O., and Eugenia A. (2017), worked on the Effect of Graphic Organizers on theUnderstanding of Prose Fictionin ESL Classroom. This study, therefore, presents a research-based investigation of the usefulness of GOs in the appreciationof prose literature in Nigeria, with a view to foregrounding their use in Nigerian schools. Specifically, the study seeks to findout whether senior secondary students in prose literature-in-English in Nigeria who are taught with GOs perform betterin prose and comprehension assessments. Four project secondary schools with total of 100 students were purposivelyselected for the study. The schools were grouped into two: graphic-based schools (GBS) and non-graphic-based schools(NGBS). Whereas the GBS was exposed to instruction via eight graphic organizers, the NGBS served as control. Subjectedto descriptive statistics and one-sample *t* test analysis, the investigation reveals that graphic organizers make students takecharge of the learning process in prose literature classes, and it concludes that these visual instructional elements guaranteestudent understanding and achievement. The study, thus, recommends the incorporation of graphic organizers in the teachingand learning processes across subjects in Nigerian schools.Therefore, the present study investigates the Effect of Graphic-Advance-Organizer on Interest and Performance of Upper Basic Science Students in Potiskum Education Zone Yobe State, Nigeria.This paper concludes bydiscussing the implications of these findings on current practice.

2.8 Implications of Literature Reviewed for the Present Study

Studies have shown that meaningful learning can be assisted through the use of Graphic Organizers. Students who used Graphic Organizers as a learning strategy performed better rather than the students who used underlining, discussing with co-students (Antoine, 2003, Adedeji, Folorunso & Adedeji 2013 & Owolabi & Adaramati, 2015), reported that the use of

Graphic Organizer Teaching and learning strategy improve students' academic performance while compared to other teaching methods and also stimulate student's active participation in learning science.According to Oloyede (2011), Wachanga, Arimba, and Mbugua (2013), and Ekenobi and Mumuni (2015),advance Organizers not only enable students to record and categorize information. Most of the literature reviewed work on academic performance and the strategy was used during the course of instruction whereas in the present study the topics were presented to the students before the class in a graphic form as an advance organizer.

This research used different types of advance organizers such as four square, spider map, event chain, network tree, concept map among others during thecourse of instruction and will strictly be consistent with Ausubel's theoretical position, which include that advance organizers are not designed for day to day use; instead, theyare used to provide a structure at the beginning of a major unit of study. Therefore, whenadvance organizers are designed for this research it is designed in such a way that itprovides a structure for students thinking, not just a structure for lessons. In this way,students are engaged in active learning, adding to the other potentially passive activenessthat is offered in the classroom.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This study investigated the Effect of Graphic-Advance-Organizers on Interest and Performance among Upper Basic Science Students in Potiskum Education Zone, Yobe State. In this chapter, the methodology waspresented under the following subheadings:

3.2 Research Design

3.3 Population of the Study

3.4 Sample and Sampling Techniques

3.5 Instrumentation

3.6 Administration of Treatment

3.7 Data Collection Procedure

3.8 Procedure for Data Analysis

3.2 Research Design

The study was quasi experimental control group involving pretest and posttest that utilized the non-randomized design. Two intact classes were used because school administration usually do not allow disruption of the classes. Two groups wererandomly assigned into Experimental Group (EG) and Control Group (CG). Each group was given Pretest in order to determine their ability levels and the level of interest before treatment. The experimental group was exposedthe visual representation of the topics to be taught in form of advance

organizer before treatment using the graphic strategy and the control group was not exposed to the topics before the treatment. They were taught using lecture method.

The treatment was given for five (5) weeks. Posttests were given at the end of the period to all groups to ascertain the Effect of Graphic-Advance-Organizers on Interest and Performance among Upper Basic Science Students.

The design of the study was represented in Figure 3.1.

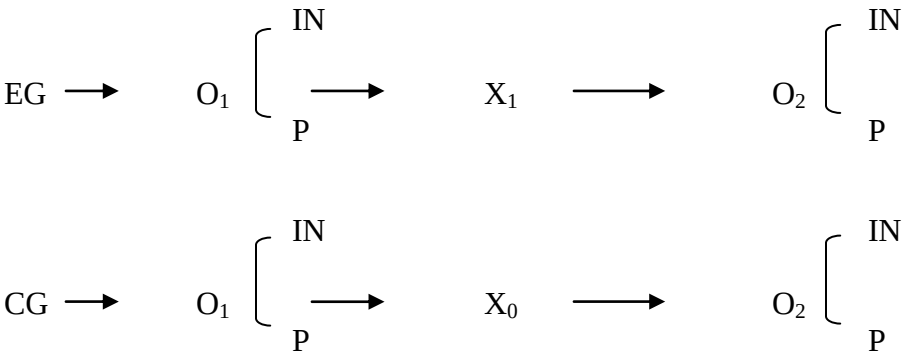


Fig.3.1: Research Design

Where:

EG=Experimental Group, **CG**=Control Group. $\mathbf{X_1}$=Treatment,$\mathbf{X_0}$= No Treatment,

$\mathbf{0_1}$=Pretest, $\mathbf{0_2}$=Posttest. **IN**= Interest, **P**=Performance

3.3 Population of the Study

The population of the study consists of allpublic Junior Secondary School II Students in Potiskum Education Zone of Yobe State. There was a total enrolment ofFour Thousand,Eight Hundred and Fourteen (4,814) males and Three Thousand Two hundred and Forty-Three (3,243) females making up a total ofEightThousand, and Fifty-Seven (8,057) students. The average age of the students was between Thirteen to Fourteen (13-14) years. Also, the

predominant tribes are Ngizim, Bolewa, Ngamo and Kare-Kare. The detail of the population of this study was summarized in Table 3.1.

Table 3.1: Population of the Study(JSSII Students in Potiskum Education Zone)

S/N	Schools	Location	Type	Male	Female	Total
1	G.D.J.S.S Arikime	Potiskum	Co-Edu.	634	210	844
2	G.D.J.S.S Badejo	Potiskum	Co-Edu.	154	121	275
3	G.D.J.S.S Bula	Potiskum	Co-Edu.	54	20	74
4	G.D.J.S.S Chadi	Potiskum	Co-Edu.	243	322	565
5	G.D.J.S.S Dakasku	Potiskum	Co-Edu.	65	54	119
6	G.D.J.S.S Danchuwa	Potiskum	Co-Edu.	63	32	95
7	G.D.J.S.S Dorawa	Potiskum	Co-Edu.	243	109	352
8	G.D.J.S.S Dumbulwa	Potiskum	Co-Edu.	133	140	273
9	G.D.J.S.S Garbawa	Potiskum	Co-Edu.	130	123	253
10	G.D.J.S.S Jumma'a	Potiskum	Co-Edu.	123	76	199
11	G.D.J.S.S Kara	Potiskum	Co-Edu.	782	632	1414
12	G.D.J.S.S Mamudo	Potiskum	Co-Edu.	110	88	198
13	G.D.J.S.S Yarimaram	Potiskum	Co-Edu.	241	106	347
14	G.D.J.S.S Daya	Fika	Co-Edu.	100	38	138
15	G.D.J.S.S Fika	Fika	Co-Edu.	56	43	99
16	G.D.J.S.S Gadaka	Fika	Co-Edu.	334	265	599
17	G.D.J.S.S Gashaka	Fika	Co-Edu.	342	312	654
18	G.D.J.S.S Godowoli	Fika	Co-Edu.	124	78	202
19	G.D.J.S.S Kukar Gadu	Fika	Co-Edu.	322	121	443
20	G.D.J.S.S Maluri	Fika	Co-Edu.	54	56	110
21	G.D.J.S.S Ngalda	Fika	Co-Edu.	433	216	649
22	G.D.J.S.S Zadawa	Fika	Co-Edu.	74	81	155
	Total			**4,814**	**3,243**	**8,057**

Source: **Potiskum Zonal Education Office (2019)**

3.4 Sample and Sampling Techniques

Simple random sampling technique involving 'Balloting Method' was used to select four schools out of the total population. This was done by taking the number of the schools written on piece of papers, shuffled and pick out four available pieces of paper in an unbiased manner (randomly). The four randomly selected schools were given Basic Science Performance Test and the scores were subjected to Analysis of Variance (ANOVA). The result was used to compare the mean scores of the classes from the different sampled schools to determine the comparability level of each class. Two schools with similar means scores were selected and randomly assigned as Experimental and Control Group. This technique was used in order to ensure that, variable that may likely impinge on the result of the study are adequately taken care off. Therefore, the use of the technique reduces sampling error and ensures even distribution of the different variables observed among the students.

Non randomized sampling was used to select Two hundred and Seventy-Six (276) students because intact class was used for the study. The schools used for the study were GDJSS Kara represented with letter (A) and GDJSS Gashaka represented with letter (B). The use of letters to represent the names of schools is to hide the identity of the schools.In each of the two schools selected, simple random balloting of the classes was used to select the class to be used which all are marked no and one is marked yes.GDJSS Kara servedas experimentalgroup with population of Sixty-Six males and Eighty-Seven females making up One Hundred and Fifty-Three (153)students and GDJSS Gashaka with Seventy males and Fifty-Three females making up One Hundred and Twenty-three (123) students totaling Two hundred and Seventy-Six (276)students. This sample was considered adequate in line Sambo

(2008) who states that a minimum of Thirty (30) sample size is viable for experimental. The sample size for this study was presented in Table 3.2

Table 3.2: Sample for the Study

Schools	Group	Male	Female	Total
A	Experimental	66	87153	
B	Control	7053123		
Total	**136**	**140**	**276**	

3.5 Instrumentation

Two instruments were used for data collection, namely:

i. Basic Science Performance Test (BSPT) and

ii. Basic Science Student's Interest Questionnaire (BSSIQ).

Basic Science Performance Test (BSPT) with thirty items multiple-choice questions. These contained four options A-D, with only one correct option and administered as pretest and posttest. The test items were extracted from past state examinations question and National Junior Examination question by the National Examination Council (NECO). The questions were distributed to cover the concepts involved using Test Blue Print. A twenty-Five-itemquestionnaire tagged Basic Science Student's Interest Questionnaire (BSSIQ) was adapted to find out the level of interest of students toward the learning Basic Science. The participants were required to respond to each of the BSSIQ on a four-point Likert-type scale ranging from Strongly Agree to Strongly Disagree. The detailof BSPT is presented in Table 3.3

Table 3.3: Table of Specification based on Numbersof Question per Topics

Content/Objective	Weight%	Knowledge	Comprehension	ApplicationTotal
Forms of Energy	23	3(1,2,19)	2(2,11)2(6,30)7	
Source of energy	202(8,25)2(4,17)2(28,18)6			
Energy Conversion	27 3(2,21, 27)2(9,23)3(7,12,29)8			
Uses of energy	171(15)2(16,20)2(10,14)5			
Energy Classification	132(13,26)1(24)1(22)4			
Total	**10010**	**10**	**10**	**30**

Source: (Researcher's Field Work, 2019)

3.5.1 Validation of Instruments

The instruments for data collection were subjected to both content and face validity. The content validity was done to ensure that the test items reflect the test blue print. The validation was done by three (3) senior lecturers with a minimum of qualification of PhD in the faculty of Education A.B.U. Zaria. Two of the lecturers were from Department of Science Education for BSPT and one from Department of Psychology for BSSIQ. These lecturers were given the topic, research questions and research hypotheses to enable themvalidate the content, language appropriateness of items and clarity of statement in the instruments. (See App I)

3.5.2 Pilot Testing

Pilot testing was conducted with a group of 30 students in one Junior Secondary *S*chool (G.D.J.S.S. Arikime) that is not part of the study sample but part of the population to determine the reliability of the instruments. The school selected for this purpose is similar to those of the main study in term of location, ownership and status levels.

i. Basic Science Performance Test (BSPT): The instrument was administered to 30 students at the beginning of the first week and collected back for scoring. After an interval of two weeks the same instrument was re-administered to the same group of 30 students (re-test). The test scores were correlated using Pearson Product Moment Correlation (PPMC). Sambo (2008) proposed the minimum interval of two or more weeks between first and second administration (Appendix G).

ii. Basic Science Students' Interest Questionnaire (BSSIQ): was also pilot tested at the same school. However, unlike BSPT the BSSIQ test items was administered once to the group of 30 students and split half method (odd-even) was used to test the reliability of scores on 30 students. Here, the test scores were split into two equivalents halve arranged as odd and even numbered. The test scores of the instrument were correlated using Spearman Rank Correlation (SRC) Appendix H.

The essence of this pilot study is to:

a. find out the characteristics of the instruments item analysis.

b. determined the appropriateness of the length of time required to answer items in the two tests separately

c. ascertain the appropriateness of the wording of the two instruments

d. find the reliability of the instruments.

e. find out the administrative and logistics problems that may hinder the main study.

3.5.3 Reliability of Instruments

The reliability coefficient of Basic Science Performance Test (BSPT) instrument was established using Pearson Product Moment Correlation (PPMC). Basic Science Students' Interest Questionnaire were tested for r-coefficient using Spearman Rank Correlation. The

coefficient value of r determines their levels of reliability for use in data collection. The result collected was compared and correlated, using Pearson Product Moment Correlation (PPMC) and it was found that, the BSPT instrument has a reliability of 0.70, this implies that the instrument is consistent and reliable for the study. As for Basis Science Students' Interest Questionnaire (BSSIQ) it was administered to thirty (30) students and their results were divided into two, odd and even number, and then finally correlated using Spearman Rank Correlation, from the result obtained rho was found to be at 1 which indicate strong positive relationship, thus, the instrument is reliable to measure students interest.

3.6 Administration of Treatment

The conceptswere taught to the students by the researcher on Energy, with the subheadings broken down into forms of energy, sources of energy, energy conversion and uses of energy,for five (5) weeks. Before the teaching, the samples were divided into experimental and control groups in which both groupswerepretested.

3.6.1 Treatment of the Experimental Group

The experimental group was exposed to teaching using Graphic-Advance-Organizer teaching strategy. In the experimental group,the topics to be treated for the next lesson wereintroduced to the students in a graphic form as an advance organizerin form of either homework,while the control group were only taught during the lesson period. At the end of treatment, the study subjects were post tested using Basic Science Performance Test (BSPT) and Basic Science Student's Interest Questionnaire (BSSIQ) to measure if there is any significant difference on the performance and interest of study subjects.

The lesson plans for Graphic-Advance-Organizers teaching strategy that was be used in the study was illustrated in the steps and flow charts as follows:

Introduction: the concept of Graphic-Advance-Organizer is clearly defined and explained to the student prior the commencement of the class by the teacher.

Phase 1: Presentation of the organizer

- **teacher's Activity:**

  The teacherintroduced the concept of energy to the students by clarifying the aim of the lesson.

  The teacher shows the organizer containing the concept.

- **Student's Activity**

  Students listen carefully

  Students observed and study the organizer carefully and reorganizes.

  They define the topic and give examples

Phase II:Presentation of the learning materials

- **teacher's Activity:**

  The teacher continues the class by further explaining the conceptof energy citing relevant examples where necessary

- **Student's Activity**

  Students listen carefully

  Students observed and study the organizer carefully and reorganizes.

- students respond to question from the teacher

Phase III: Strengthening the cognitive organization

The teacher promotes active reception in learning

Elicit critical approach and clarifies

Evaluation: the teacher evaluatesthe class by asking students some questions on the conceptof energy discussed.

Follow-up Activity: A detail note on the concept of energy was prepared and related examples included.

Instructional Effect: To enable the learner identify the concept of energy in his/her own understanding.

Phase	Teacher's Activity	Student's Activity
Phase I: presentation of the Graphic-Advance-Organizer	Clarifies the aim of the lesson Shows chart containing the organizers with the concept of energy	Students listen carefully Students observed and study the chart carefully
Phase II: Presentation of the learning materials	Teacher continues the class explaining more on the concept of energy	Students listen and ask question Students participate fully in the discussion
Phase III: Strengthening the cognitive organization	Promote active reception of learning	
Evaluation	Elicit critical approach and clarifies Ask students question on the concept of energy Give homework on the sub concept of energy	Attempts questions asked
Follow-up Activity	Prepare a detail note on the concept of energy presented	
Instructional Effect	Enable the learner identify the concept of the energy	

Figure 3.2: Flowchart of Graphic-Advanced-Organizers
Source: (Adopted from Antoine, 2003)

3.6.2Teaching the Control Group

The control group was taught the same energy concepts by the researcher using conventional lecture method. Five (5) periods of forty (40) minutes per lesson for five weeks was used. At the beginning the teacher introduced the lesson by presenting the objectives of the lesson to the students. This was followed by verbal presentation of contents where students were encouraged to listen and write down notes. After the lesson, the teacher opened a discussion for the lesson. Comments, questions and discussion were entertained.

3.7 Data Collection Procedure

For the purpose of data collection, the following sequential steps were used. The Basic Science Performance Test (BSPT), Basic Science Students' Interest Questionnaire (BSSIQ) followed by pretest and posttest administered by the researcher through the use of marking scheme. The data was collected after marking the students' answer scripts. There in, the scores collected from tests were recorded, calculated, and subjected to data analyses respectively and were also separated into male and female responses based on gender and presented for analysis.

3.8 Procedure for Data Analysis

The data collected were analyzed using mean, mean rank, and standard deviation, Mean Gain, for research questions while Wilcoxon, Kruskal Wallis (H-test) Statistics andANCOVAwereused to test hypotheses at alpha level of $P \leq 0.05$ level of significance stated as follows.

Ho_1. There is no significant difference in the mean interest level of students taught Basic Science concepts using Graphic-Advance-Organizers.

The statistical tool used to test this hypothesis was Wilcoxon Sign-rank test because it has one group and two variables.

Ho_2 There is no significant difference between the mean performance scores of students taught basic science concepts using Graphic-Advance-Organizers and those taught using lecture methods.

The statistical tool used to test this hypothesis was ANCOVA.

Ho_3. There is no significant difference between the mean interest level of male and female students taught basic science concepts using Graphic-Advance-Organizers.

The statistical tool used to test this hypothesis was Kruskal Wallis.

Ho_4. There is no significant difference in the mean performance scores of male and female students taught basic science concepts using Graphic-Advance-Organizers.

The statistical too used to test this hypothesis was ANCOVA, because the scores of pretestswere used as Covariate.

CHAPTER FOUR
ANALYSIS, RESULTS AND DISCUSSIONS

4.1 Introduction

This study was carried out to investigate the Effect of Graphic-Advance-Organizers on Interest and Performance among Upper Basic Science Students in Potiskum education zone. The analyses and results of the data collected were analyzed using the Statistical Package for Social Science (SPSS) and the level of significance adopted for rejecting or retaining the stated hypotheses was set at $P \leq 0.05$.

This chapter is presented under the following subheadings:

4.2 Data Analysis

4.3 Summary of Findings

4.4 Discussion

4.2 Data Analysis

The instruments used for data collection in the course of this study were,

1. Basic Science Performance Test (BSPT)
2. Basic Science Students' Interest Questionnaire (BSSIQ)

Data collected during the study were:

i. Performance mean scores from pretest and posttest for both experimental and control groups

ii. Performance mean scores from pretest and posttest for both male and female in experimental group.

iii. Students' Interest Responses in experimental group before and after the treatment.

iv. Male and Female Students' Interest Response in experimental groups before and after the treatment

4.2.1 Answering the Research questions

Descriptive statistics in form of mean, Mean Rank, Standard Deviation and Mean Difference of the students' scores were used to answer the research questions.

Research Question One: What is the difference between the mean interest levels of students before and after being taught Basic Science concepts using Graphic-Advance-Organizers?

The result of the analysis is presented in Table 4.1

Table 4.1: Mean Rank Statistics on Difference in the Interest of Students Taught Basic Science Concepts using Graphic-Advance-Organizers Before and After the Treatment.

Variable	Ranks	N	Mean Rank	Sum of Ranks	Mean Gain
	Interest Before	145	66.45	1756.50	
Interest					26.00
	Interest After	145	92.45	7973.50	

Table 4.1 revealed that differences exist in the mean interest level before and after exposure to Basic Science concepts using Graphic-Advance-Organizers among the experimental group. The experimental group students Mean Interest Mean Rank are 66.45 before and 92.45 after exposure to treatment. Also, theMean Rank Gain is 26.00. This implies that their interest level after exposure has greatly and significantly increased after exposure to the Graphic-Advance-Organizers.

Research Question Two: What is the difference between the mean performance scores of students taught Basic Science concepts using Graphic-Advance-Organizers and those taught using lecture method?

Table 4.2: Mean, Standard Deviation and Mean Difference for Students' Performance among the two groups

Group	N	Mean	Std. Deviation	Mean Difference
Experimental	153	14.86	5.19	
				2.54
Control	123	12.32	4.45	

Table 4.2 shows that the difference in the mean performance scores for experimental group (14.86) and control group was (12.32) and Mean Difference (2.54) in favour of experimental group. Therefore, the mean performance scores for students taught energy concept using Graphic-Advance-Organizers was higher than the mean performance scores for those taught with lecture method among Upper Basic Science Students in Potiskum Education Zone, Yobe State, Nigeria.

Research Question Three: What is the difference between the mean interest level of male and female students before and after being taught Basic Science concepts using Graphic-Advance-Organizers?

Descriptive statistics of Mean Rank and Mean Rank Gain was used to analyses responses. The result of the analysis is presented in table 4.3

Table 4.3: Mean Rank Statistics on Difference in the Interest level of Male and female Students in Basic Science Concepts Before and After the Treatment.

Variable	Gender	N	Pretest Mean rank	Posttest Mean rank	Mean Rank Gain
Interest	Male	66	101.83	215.56	113.83
	Female	79	86.02	182.94	96.92

Table 4.3, showed that there is difference in the mean interest level of male and female experimental before and after exposure to treatment.

Research Question Four: What is the difference between the mean performance scores of male and female students taught Basic Science concepts using Graphic-Advance-Organizers?

Descriptive statistics of Mean, Standard Deviation and Mean Gain were used to answer the research question. The result of the analysis is presented in table 4.4

Table 4.4: Mean, Standard Deviation and Mean difference for Male and Female Students' Performance

Variable	Gender	N	Mean	Std. Deviation	Mean Difference
Experimental	Male	66	16.79	4.89	3.39
	Female	87	13.40	4.95	

The results shown in table 4.4 indicates the mean performance scores of male and female students taught energy concepts using Graphic-Advance-Organizers. The mean difference in the mean performance scores for male is 16.79 and female is 13.40 with a mean difference of 3.39 in favour of the male students. Therefore, the male students have high performance scores than their female counterpart.

4.2.2 Hypotheses Testing

The following null hypotheses were tested at $P \leq 0.05$ as follows:

$H0_1$: There is no significant difference between the mean interest level of students before and after being taught Basic Science concepts using Graphic-Advance-Organizers.

To test this hypothesis, a Wilcoxon Rank Test was conducted at $P \leq 0.05$ level of significance. The Wilcoxon test is used because the test item of Interest is a non-parametric data belonging to the one sample population before and after treatment. The results are shown in Table 4.5

Table 4.5: Non-Parametric Test of Wilcoxon Rank on difference in the Interest level of Students taught Basic Science Concepts using Graphic-Advance-Organizers before and after the treatment.

Variable	Experimental	N	Mean Rank	Sum of Ranks	U-test	Df	P	Remark
	Interest before	145	66.45	1756.50				
Interest					6.545	1	0.001	Sig.
	Interest after	145	92.45	7973.50				

Significant at P<0.05

Table 4.5 revealed that there was significant difference in the mean interest level of Students before and after taught Basic Science concepts using Graphic-Advance-Organizers among the experimental group. Reasons being that the calculated P-value of 0.001 is less than the 0.05 alpha level of significance and the computed at U-test of 6.545. This implies that their interest level was enhanced after exposure to the Graphic-Advance-Organizers. Therefore, the null hypothesis which stated that there is no significant difference in the interest level of Students taught Basic Science concepts using Graphic-Advance-Organizers among the experimental group, is hereby rejected.

Ho_2: There is no significant difference between the mean performance scores of students taught Basic Science concepts using Graphic-Advance-Organizers and those taught using lecture methods.

Analysis of Covariance (ANCOVA) statistics was used to test the null hypothesis stated at $P \leq 0.05$ level of significance. The result is presented in Table 4.6:

Table 4.6: Analysis of Covariance (ANCOVA) for Students' PerformanceScores in Experimental and Control Group

Source	Sum of Squares	Df	Mean Square	F	P-Val	Decision
Corrected Model	1484.012[a]	2	742.006	37.083	.001	**S**
Intercept	2030.792	1	2030.792	101.491	.001	S
Covariates	1042.144	1	1042.144	52.082	.001	S
Groups	410.551	1	410.551	20.518	.001	**S**
Error	5462.608	273	20.010			
Total	58963.000	276				
Corrected Total	6946.620	275				

Significant at P<0.05

From Table 4.6, the result demonstrated a significant difference in the mean performance scores of students in experimental and Control groups. The results of F=20.52 at P =0.001, which showed a significant difference in the performance scores among the students taught with Graphic-Advance-Organizers and those taught with lecture method. That is, P=0.001is less than P=0.05**,** therefore the null hypothesis which states that there is no significant difference in the mean performance scores of students taught Basic Science concepts using Graphic-Advance-Organizers and those taught using lecture method is rejected.

Ho_3: There is no significant difference between the mean interest level of male and female students before and after being taught Basic Science concepts using Graphic-Advance-Organizers.

To test this hypothesis, the Non parametric test of Kruskal Walliswas used, because the test variable interest of both Male and female experimental group is a non-parametric variable which was measured in Likert Scale option of ranks. The result is shown in Table 4.7.

Table 4.7 Kruskal Wallis Test on Male and Female Students' Interest level in Experimental before and after the Treatment

Variable	Gender	N	Pretest Mean Rank	Posttest Mean Rank	DF	H	P	Remark
Interest	Male	66	101.83	215.56	3	137.52	0.001	Sig.
	Female	79	86.02	182.94				

Significant at P≤0.05

In Table 4.7, the results of Kruskal Wallis statistics revealed that there was a statisticallysignificant difference in the interest levelof Male and Female student after being taught Basic Science concepts using Graphic-Advance-Organizers. Reasons being that the computed P=0.001 is less thanP<0.05which shows a significant difference in the mean interest of male and female students when both are exposed to the treatment of Graphic-Advance-Organizersin favour of male students.Therefore, the null hypothesis which stated that there is no significant difference between the interest of male and female student before and after being taught Basic Science concepts using Graphic-Advance-Organizers is hereby rejected. A Bonferrori Post-hoc Test was conducted as shown in Table 4.8 as a post Kruskal Wallis Test.

Table 4.8 Dunn-Bonferrori Post-hoc Test of Interest in Experimental Group

(I) Test Groups	(J) Test Groups	Mean Difference (I-J)	Std.Error	Sig.	Remark
Male Pre	Male Post	-12.00000*	3.49785	.004	S
	Female Pre	6.10261	3.35086	.418NS	
	Female Post	-5.89739	3.35086	.477	NS
Male Post	Male Pre	12.00000*	3.49785	.004	S
	Female Pre	18.10261*	3.35086	.000	S
	Female Post	6.10261	3.35086	.418	NS
Female Pre	Male Pre	-6.10261	3.35086	.418	NS

	Male Post	-18.10261*	3.35086	.000	S
	Female Post	-12.00000*	3.19713	.001	S
	Male Pre	5.89739	3.35086	.477	NS
Female Post	Male Post	-6.10261	3.35086	.418	NS
	Female Pre	12.00000*	3.19713	.001	S

Significant at P≤0.05

From Table 4.8, the mean difference was significant at P=0.001 which is less than P<0.05 alpha level among male and female in the experimental group. Therefore, the Post-hoc test of male post, female pre is 0.418 (NS) which confirmed that there was a significant difference between male and female mean interest level scores before and after the treatment in favour of male students.

Ho_4: There is no significant difference in the mean performance scores of male and female students taught Basic Science concepts using Graphic-Advance-Organizers.

An Analysis of Covariance (ANCOVA) was used to test the null hypothesis stated at P≤0.05 level of significance. The result is presented in Table 4.9.

Table 4.9: Analysis of Covariance (ANCOVA) for Male and Female Students' Performance Scores in Experimental

Experimental Group	Sum of Squares	Df	Mean Square	F	Sig.	Decision
Corrected Model	863.925[a]	2	431.962	20.071	.015	**S**
Intercept	1571.099	1	1571.099	73.002	.011	**S**
Covariates (Pretest)	433.757	1	433.757	20.155	.012	**S**
Gender	272.731	1	272.731	12.673	.323	**NS**
Error	3228.193	150	21.521			
Total	37890.000	153				
Corrected Total	4092.118	152				

From Table 4.9, the result demonstrated a significant difference in the mean performance scores of males and females students in experimental group. The results of P =0.323, which showed no significant difference in the performance scores among the males and females

students taught with Graphic-Advance-Organizers. That is, P=0.323 is greater than 0.05**,** therefore the null hypothesis which states that there is no significant difference in the mean performance scores of male and female students taught basic science concepts using Graphic-Advance-Organizerswas retained, meaning that Graphic-Advance-Organizers is gender friendly.

4.3 Summary of Findings

The findings of the study are as follows

1. There was a significant difference between mean interest level of students taught Basic Science concepts using Graphic-Advance-Organizers before and after the treatment.
2. There was a significant difference between the mean performance scores of students taught Basic Science concepts using Graphic-Advance-Organizers and those taught using Lecture method.
3. There was a significant difference between the mean interest level male and female students taught Basic Science concepts using Graphic-Advance-Organizers
4. There was no significant difference between the mean performance scores of male and female students taught Basic Science concepts using Graphic-Advance-Organizers

4.4Discussion of Findings

The main purpose of this study was to determine the Effect of Graphic-Advance-Organizers on Interest and performance among upper basic Science Students in Potiskum Education Zone, Yobe State. Four research Questions were investigated and Four null hypotheses were tested at $P \leq 0.05$. The results were discussed and presented as follows:

Results of the analysis presented in Table 4.1 and 4.5showed a significant difference in the mean interest levels of the experimental groups. The results indicated a mean scores of

students that was significantly higher than the pretest mean scores in the experimental group. The significant difference suggests that, use of Graphic-Advance-Organizers promote interest in learning of Basic Science concepts. One of the reasons for the observed difference is that Graphic-Advance-Organizers can be as anchoring devices for promoting interest in learning. This is in line with the findings of Adedeji, Folorunso and Adedeji (2013), who reported that the use of Graphical Advance Organizers promote students' interest toward Basic Science, enhance students learning and retention.

Another reason for the observed difference could be that the Graphic-Advance-Organizers serve as a subsuming bridge between prior knowledge and incoming new knowledge which therefore aids assimilation of new knowledge. The result was also supported by the findings of Owolabi and Adaramati (2015), who concluded that there is a general positive effect of Graphic-Organizers that is knowledge and concept maps in facilitating knowledge comprehension and retention of learning.

The results of the analyses presented in Tables 4.2 and 4.6, which shows that there was a significant difference between the mean performance scores of students taught Basic Science concepts using Graphic-Advance-Organizers than those taught with lecture method. The experimental group had a higher mean posttest scores of concepts taught than the control group. This showed that the Graphic-Advance-Organizers presented to the experimental group enabled them to retain the Energy concepts taught. Information is more effectively retained when it is fitted into a system of mutually supporting ideas which is in line with the study of Antoine (2003), whose work support the view that the use of Graphic Organizers enhances better students' academic performance, facilitates access to all human knowledge in a friendly and efficient way. Learners who have well-organized cognitive systems tend to

efficiently retain information. On the other hand, learners who have poorly organized cognitive systems tend to rapidly forget information.

The results of the analyses presented in Tables 4.3 and 4.6 showed that there wassignificant difference between the mean interest level of males and females taught with Graphic-Advance-Organizers thatis males'interest in learning Basic Science was enhanced more than girls' interest. However, the mean difference between male and female was observed to be insignificant when null hypothesis three was tested. This was in agreement with Oloyede (2011), and Ugbe and Dike (2012), Ekenobi and Mumuni (2015) whose separate studies opined that the use of graphic organizers favoured male than their female counterpart. It is observed that difference exist slightly that boys are more susceptible to the use of Graphic-Advance-Organizer than girls, and that Graphic-Advance-Organizer is gender friendly

The results of the analyses presented in Tables 4.3 and 4.9, which showed that there was no significant difference between the mean academic performance of males and females taught with Graphic-Advance-Organizer, the posttest mean scores indicated that both the male and females performance improved after being exposed to the teaching with Graphic-Advance-Organizer. Therefore, the hypothesis that stated there is no significant difference between the mean performance scores of male and female students taught Basic Science using Graphic-Advance-Organizers was retained. Boys retained better than girls with regards to the use of Graphic-Advance-Organizer which support the findings of Antoine (2003), Akinbobola (2015), Ekenobi and Mumuni (2015), who found that the use of advance organizers is gender friendly.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This study was carried out to determine the Effect of Graphic-Advance-Organizers on Interest and Performance among Upper Basic Science Students in Potiskum Education zone. The data collected were analyzed using the Mean, Mean Rank, Standard Deviation, Mean Gain, Wilcoxon, Kruskal Wallis and ANCOVA statistics. This chapter was presented under the following sub headings:

5.2 Summary

5.3 Conclusion

5.3.1 Contributions to Knowledge

5.4 Recommendations

5.5 Limitations of the Study

5.6 Suggestions for Further Study

5.2 Summary

This study was carried out to determine the Effect of Graphic-Advance-Organizers on Interest and Performance among Upper Basic Science Students in Potiskum education zone, Yobe state, Nigeria. Two hundred and Seventy-Six (276) JSS II students were involved for the data collection. The study involved teaching with Graphic-Advance-Organizer, as the treatment in an attempt to compare the performance in Basic Science concepts of students taught with the use of Graphic-Advance-Organizer and those taught with lecture method.

The concept selected for the study were from topics form Basic Science text book which is Energy Concepts with subheadings as forms of energy, source of energy, energy conversion

and uses of energy. Four null hypotheses were stated and tested at 0.05 alpha level. Basic Science Performance Test (BSPT) made up of 30 multiple choice questions and Basic Science Students' Interest Questionnaire (BSSIQ) made of 25 four-type Likert's Scale were the instruments used to measure performance and interest level of students before and after treatment Data collected were analyzed using Wilcoxon Rank Test,Kruskal Wallis and ANCOVA statistics to test the null hypotheses. The results and discussion were reported in chapter four. The findings revealed the following:

i. There was a significant difference between mean interest level of students taught Basic Science concepts using Graphic-Advance-Organizers before and after the treatment.

ii. There was a significant difference between the mean performance scores of students taught Basic Science concepts with Graphic-Advance-Organizers, and those taught using lecture method.

iii. There was a significant difference between the mean interest levels of male and female students taught Basic science concepts using Graphic-Advance-Organizers before and after the treatment.

iv. There was no significant difference between the mean performance scores of males and females taught Basic Science concepts in the experimental group

5.3 Conclusion

Based on the analysis of the results and discussion of the findings, the following conclusions were reached:

1. The use of Graphic-Advance-Organizers promote Student's interest inBasic Science. Use of Graphic-Advance-Organizers enhanced performance in Basic Science concepts among learners at Junior Secondary School level.

2. The use of Graphic-Advance-Organizers is gender friendly as it promotes meaningful learning of concepts, interest and academic performance of both genders.

5.3.1 Contributions to Knowledge

The study was to establish that:

1. Teaching Basic Science using Graphic-Advance-Organizers promote students' interest and enhanced performance.
2. This study was first of its kind to the knowledge of the researcher in Potiskum Education Zone, Yobe State, Nigeria. It could be replicated by other researchers in other zones.
3. Also, the researcher develops Basic Science Performance Test (BSPT) that can be adapted or adopted by researchers to be used in similar research studies.
4. The use of Graphic-Advance-Organizers in teaching Basic Science is gender friendly as it enhanced students' interest and improved performance.

5.4Recommendations

From the findings of this study, the following recommendations are made:

a. The study found the use of Graphic-Advance-Organizers effective in promoting interest and enhancing meaningful learning in Basic Science, thus teachers should be encouraged to use Graphic-Advance-Organizers in teaching Basic Science concepts where prior knowledge is lacking.
b. Professional associations such as Science Teachers Associations of Nigeria (STAN), and research centers like Nigerian Educational and Research Development Council (NERDC) should develop Graphic-Advance-Organizers packages that teachers can use to bridge the gap between prior knowledge and new material to be learnt. Also the STAN and NERDC

should train teachers on how to design Graphic-Advance-Organizers and use it in the classroom to promote meaningful learning and develop interest of students.

c. Basic Science teachers should adopt the use of Graphic-Advance-Organizers in the teaching of difficult and wide topics in Basic Science such as Energy.
d. Teacher trainers should take note and incorporate development of Graphic-Advance-Organizers into the teacher education curriculum.
e. There should be training and re-training of Basic Science teachers on the use and design of Graphic-Advance-Organizers through workshops.
f. The use of Graphic-Advance-Organizers should be encouraged in co-educational schools, being gender friendly, all gender could maximally benefit from its use during instructions.

5.5Limitations of the Study

The limitation observed during the course of the study:

1. The study was limited to only energy concepts at JSSII level in Potiskum Educational Zone. This make generalization of the result fairly narrow and not applicable nationwide.
2. Another limitation to this study was that teachers in the schools that were used do not agree to partake in the teaching when explained how tedious treatment was which made the researchers' involvement in teaching the experimental group.

5.6Suggestions for Further Studies

The study has the following suggestions;

a. This study could be extended to other institutions, colleges of education, polytechnics and universities in Nigeria for widening and generalizing the scope of this study.

b. The results obtained in this research were for Energy concepts in Basic Science, the method can therefore be tried in other disciplines such as mathematics, Social Studies, English Language, Business Studies and Agricultural Science in Junior Secondary School.

c. This study should also extend to the use of different types of Advance Organizers such as Narrative advance organizers, Graphic-Advance-Organizers use as predesign.

d. There is a need to use different methods of instructions for the teaching of Basic Science concepts such as process approach or discovery enriched with Graphic-Advance-Organizers

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APPENDIX A

BASIC SCIENCE PERFORMANCE TEST (BSPT)

Instruction

1. Write your identification number and tick the gender in the space provided.
2. Read each question carefully.
3. Go to your answer sheet and shade correct option/letter/alphabet.
4. Shade only one alphabet on each question.
5. Please shade or mark the correct question appropriately.

ATTEMPT ALL THE FOLLOWING QUESTIONS

1. The type of energy a mango fruit possess while hanging on the tree is…….
   a) Kinetic b) Heat c) Potential d) Chemical
2. When a torch is used to light a dark room, what energy conversions are likely to take place?
   a) Chemical to light b) Electrical to heat
   c) Heat to light d) light to electrical
3. Kinetic energy simply means …….
   a) Energy in Position b) Energy in Motion
   c) Gravitational Energy d) Food energy
4. The following are natural source of energy except …….
   a) Food b) sun c) battery d) coal
5. Which of these is not a form of energy?
   a) Wind b) Electrical c) Heat d) Nuclear
6. The energy stored in food is called…….
   a) Light b) Chemical c) electrical d) mechanical
7. The energy conversions during riding of a bicycle are…….
   a) Mechanical to kinetic to potential b) kinetic to potential to light
   c)Chemical to mechanical to kinetic d) electrical to mechanical to sound

8. All these are source of energy except----------
   a) Food b) petrol c) dry cell battery d) stone
9. Energy cannot be changed from one form to another, True or False?
10. When we eat food we lose energy. True or false.
11. Energy stored in food and fuel is called----------
    a) Mechanical b) light energy c) solar energy d) chemical energy
12. If you rub your palms together for some time, you feel warm. The action amount to converting----------
    a) Potential to kinetic to heat energy b) potential to chemical to heat
    c) Solar to mechanical tokinetic energy d) chemicalto heat to kinetic
13. Which of the following is not a form of energy?
    a) Heat b) speed c) sound d) light
14. Which of this energy conversion take place during phone call?
    a) Chemical to electrical to sound b) electrical to sound to electrical
    c) Soundtomagnetic to sound d) magnetic to sound to chemical
15. Burning of fire wood for cooking at home is an example of energy change from…….
    a) Electrical to chemical to light energy b) heat to light to chemical energy
    c) Light to Electrical to heat energy d) chemical to heat to light energy
16. The form of energy that a battery possesses is …….
    a) Chemical energy b) mechanical energy
    c) Potential energy d) sound energy
17. The common forms of energy used in rural areas are……
    a) electrical &magnetic b) heat & light
    c) Chemical& electrical d) sound & sound
18. Which of the following conversion is correct when a battery lights up a bulb?
    a) Light to electrical to heat b) sound to potential to heat
    c) Chemical to electrical to light d) electrical to chemical to sound
19. At the early age young seedling needs stored food to----------
    a) Protectit from danger b) feed the parasite
    c) Cover it from diseases d) give it energy to grow

20. Chemical energy can be changed to different forms? True or False
21. Which of the following is not an electrical appliance in our homes?
    a) Television b) coal pot c) electric iron d) radio
22. The following are the advantages of modern appliance over the traditional ones except
    a) They save labour b) they are more efficient
    c)they are durable d) they are not durable
23. The amount of ---------- depends on the extent of work done.
    a) Food b) mass c) chemical d) energy
24. There are various ---------- of energy.
    a) Forms b) classes c) groups d) Levels
25. The primary source on which we are dependent for all our energy is ….....
    a) Food b) sun c) fuel d) Light
26. Sun transmit radiant energy to the earth for all lives inform of ----------
    a) Electrical & sound b) sound & chemical
    c) Heat& light d) magnetic &kinetic
27. Light energy is converted into food by green plants through ----------
    a) Digestion b) mastication c) absorption d) photosynthesis
28. Which of the following is not a secondary source of energy?
    a) Sun b) food c) fuel d) wood
29. Animals take in ---------- by eating plant products.
    a) Fatigue b) energy c) courage d) Air
30. The Three basic classification of energy are----------, ---------- and ----------
    a) Artificial, traditional and Tertiary b) natural, source and modern
    c) Natural, manufactured and petroleum d) petroleum, water and Food

APPENDIX B

MARKING SCHEME OF BASIC SCIENCE PERFORMANCE TEST (BSPT)

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

Total = 1-mark X 30 = 30 marks

APPENDIX C

ANSWER SHEET FOR BASIC SCIENCE PERFORMANCE TEST (BSPT)

SECTION A: Bio-data

Name of School: …….

Gender **Male [ ]** **Female [ ]**

SECTION B: Instruction

Please shade the correct option appropriately.

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

APPENDIX D

BASICSCIENCE STUDENTS INTEREST QUESTIONNAIRE (BSSIQ)

Dear Respondent,

The bearer of this research instrument is student of Master of Education in the Department of Science Education, Faculty of Education, Ahmadu Bello University, Zaria. The items presented are designed to determine the degree of your Interest in Basic Science. You are therefore requested to rate yourself on the questionnaire items. You are guaranteed an outmost confidentiality as the information provided is use strictly for this research only.

Please take note of the following keys:

SA - - - - - Strongly Agreed

A - - - - - Agreed

D - - - - - Disagreed

SD - - - - - Strongly Disagreed

Thanks!

Hassan Muhammad GAMBO

SECTION A: Bio-data

Name of School: …….

Gender: Male [ ] Female [ ]

SECTION B: Instruction
Please tick **(**√**)** the appropriate column that suits your interest.

S/N	ITEMS	SA	A	D	SD
1	My lack of interest in Basic science comes from anxiety and fear that basic science topics are difficult to understand.				
2	I may never learn Basic science until my interest is stimulated by the use of modern methods in teaching Basic science.				
3	My best wish is to attend University level of education through the learning of Basic science				
4	I like Basic Science because it studies the thing that are in the environment and help me to know about myself.				
5	I am interested in Basic Science because the learning materials used in teaching the topics are available in the local environment				
6	In Basic Science lesson, i like to have more class work and homework which help me to understand more.				
7	In Basic Science lesson, I like to have textbooks and workbooks because they help learn more.				
8	My interest in Basic Science topics depends on the methods of teaching the teacher adopt.				
9	I am interested in Basic Science because the knowledge I obtain from the subject can be applied in other subject areas.				
10	Teaching with use of laboratory facilities always arouse my interest in Basic Science.				
11	I always work hard so that i can get higher marks in Basic Science than any other classmate.				
12	If science clubs and societies are introduce in my school, they will arouse my interest in the study of Basic Science.				
13	I like all the topics and contents in Basic Science class.				
14	My interest in studying Basic Science is so important to my future involvement in science and technology education.				
15	Teacher's explanations on Basic Science topics increase my interest in the subjects.				
16	Lack adequate use teaching aids to teach the Basic Science concepts, affect my interest in the subject negatively.				
17	If i am being motivated by the teacher, I will develop interest in Basic Science.				
18	My strong interest in Basic Science topics and zeal to stay on task till i finish them will depend on how interesting the lesson is.				
19	I will be more interested in activity-oriented method of teaching Basic Science if only the teacher can monitor and				

S/N	ITEMS	SA	A	D	SD
	guide me when performing task.				
20	I can explain Basic science concepts most when the teacher leads me to demonstrate an activity.				
21	Use of teaching aids by Basic Science teachers will motivate me in studying the Subject.				
22	Most teachers of Basic Science are not subject specialist.				
23	Teaching and learning of Basic Science concepts is tedious because it involves more than one strategy at a time.				
24	Teachers of Basic Science attitude and behaviour toward the subject made have interest in the subject.				
25	I learn basic science well if the teacher teaches and guide me using instructional materials like charts, pictures, models, specimens or diagram.				

APPENDIX E

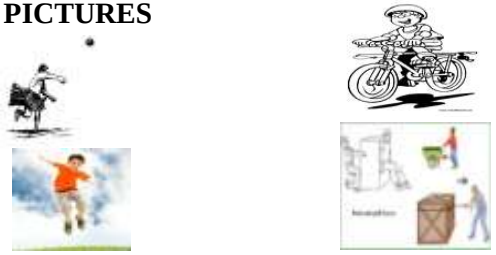
LESSON PLAN FOR EXPERIMENTAL GROUP

(LECTURE METHOD ENRICHED WITH GRAPHIC-ADVANCE-ORGANIZERS)

LESSON No.1

School G.D.J.S.S. Kara
Subject Basic Science
Class JSS II
Topic Energy
Duration 40 minutes per period
Average age 13 years
Instructional Materials- Box of chalk, Books, Stone etc.

General Objectives: to acquire an idea about the concept energy

Phases	Teacher Activity	Student Activity
Phase IPresentation of the Organizer	**DEFINITION** Is the ability or capacity to do work **EXAMPLES** Running, jumping, dancing, lifting an object, riding a bicycle, driving a car, throwing a stone, pushing/pulling an object, etc. **SENTENCE** Without energy, neither humans nor machines can do work. Everything we do in this world has to do with energy. The S.I. Unit of energy is Joule (J) **PICTURES**  Look at this chart, what do you notice here?	Student listen carefully Students observe and read the chart carefully and reorganize Definition of energy

Phases	Teacher Activity	Student Activity
Phase II Presentation of the learning material	The teacher continues the class by explaining demonstrating certain work in the class that require the use of energy jumping, running, lifting an object etc. Based on this the teacher asked the student to mention another example that are different from his own. What do you mean by energy?	The students listen and compare their examples with that of the teacher.
Phase III Strengthening the cognitive organization	Promote active receptive learning: Teacher ask the students to discuss about energy and also about the basic application of energy in the real life.	The students work in groups and attempt to answer questions.
Evaluation	The teacher gives the next topic in a graphic form for student to work on and bring the next class	Students copy and go home with to answer
Follow up Activity	The teacher prepares a detailed note on the energy, examples of energy and basic application of energy.	
Instructional Effect	The teacher makes the learners identify what energy is and how useful it is and develop the habit of precise thinking and interest of learning.	

(LECTURE METHOD ENRICHED WITH GRAPHIC-ADVANCE-ORGANIZERS)

LESSON No.2

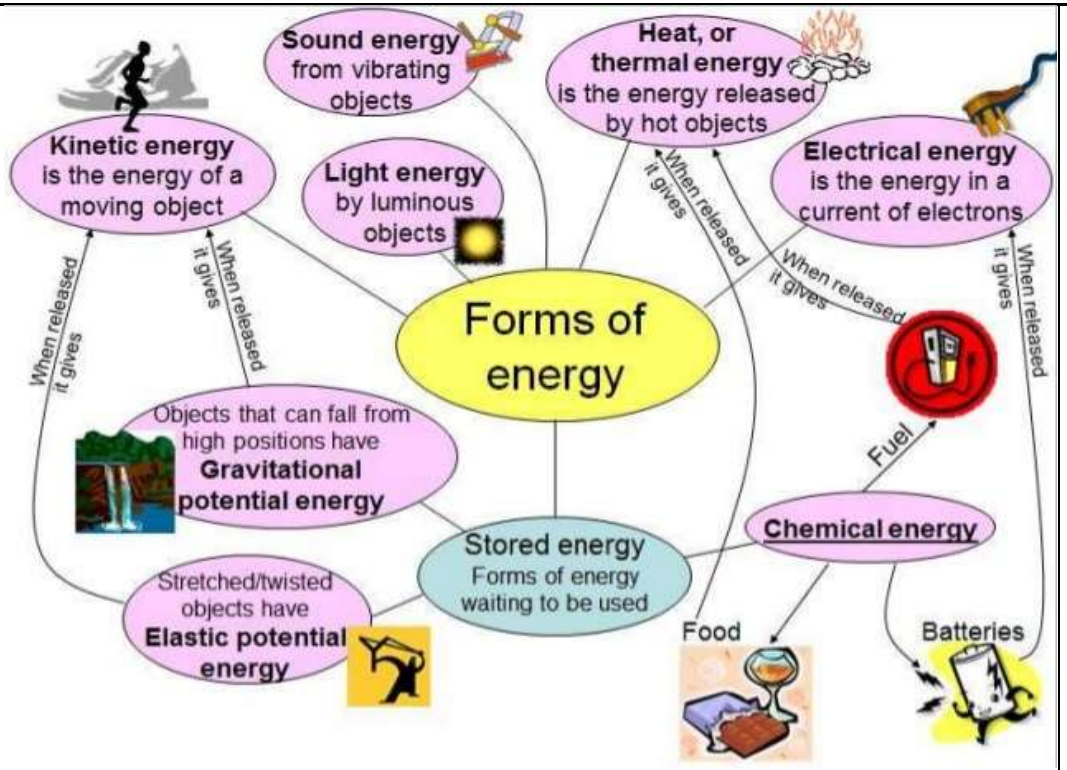
School G.D.J.S.S. Kara
Subject Basic Science
Class JSS II
Topic Forms of Energy
Duration 40 minutes per period
Average age 13 years
Instructional Materials- Electric fan, Books, Food, stretched spring, elastic band, electric stove, kerosene, matches.

General Objectives: to acquire an idea about the forms of energy

<table>
<tr><th>Phases</th><th>Teacher Activity</th><th>Student Activity</th></tr>
<tr><td>Phase I
Presentation of the Organizer</td><td>Clarifies the aim of the lesson:
The teacher clarifies that our lesson will be ‘Forms of Energy’. At the end of the lesson the learner will be able to identify some various forms of energy, describe some forms of energy.
The teacher shows a chart containing forms of energy and their descriptions
<table>
<tr><th>Energy</th><th>Description</th><th>Pictures</th></tr>
<tr><td>Kinetic</td><td>Is an energy possessed by a moving body, eg electric fan, moving car.</td><td></td></tr>
<tr><td>Potential</td><td>Energy possesseddue to position of rest. e.g. books on a table, elastic band not stretched. etc.</td><td></td></tr>
</table></td><td>Student listen carefully

Students observe and read the chart carefully and reorganize</td></tr>
</table>

	Mechanical	Comprises of kinetic and potential energy. E.g. windmill possesses kinetic energy when in motion and potential energy when it stops rotating. etc.		
	Chemical	Energy caused by chemical reaction. E.g. energy released from food we eat, energy released from burning fuel wood. Etc.		
	Electrical	Energy caused by electric field. E.g. electric in an electric stove. Etc.		
	Magnetic	Energy from magnetic field. e.g. bar magnetic used to pick office pin on a table. Etc.		

		The students listen and compare their examples with that of the teacher.
	Look at this chart, what do you notice here?	The students answered the question.
Phase II Presentation of the learning material	The teacher continues the class by explaining how energy is divided into different as narrated in the chart with their corresponding examples.Based on this the teacher asked the student to mention another example that are different from his own.	Students listen and ask question
Phase III Strengthening the		The students work in

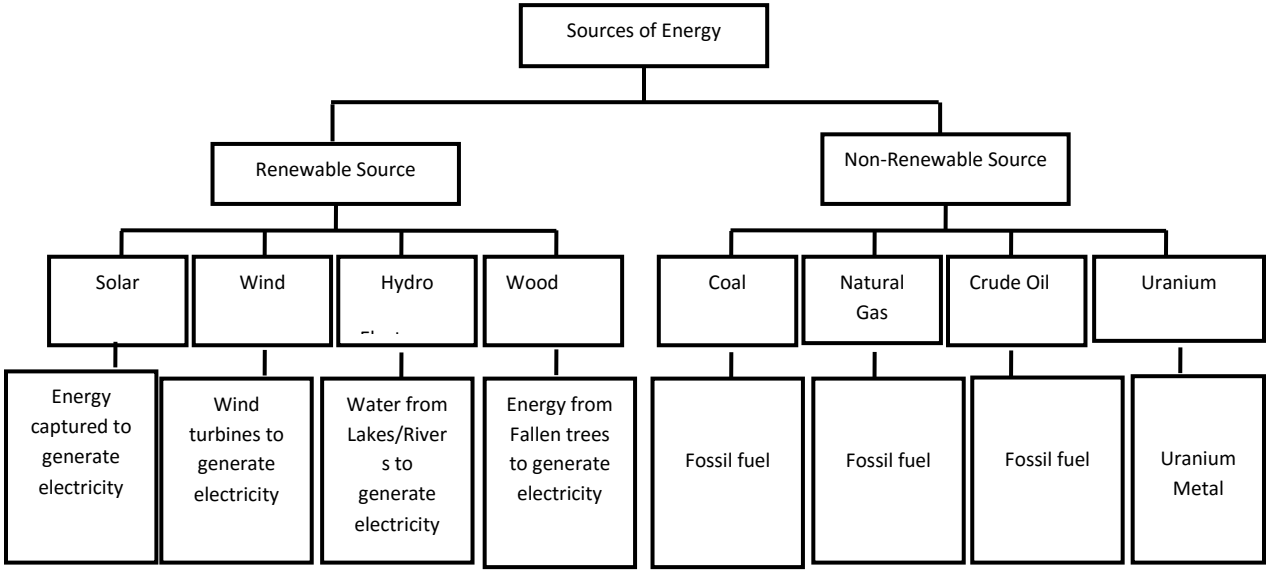
cognitive organization Evaluation Follow up Activity	Promote active receptive learning: Teacher ask the students to discuss about form of energy based on their understanding. How do you describe forms of energy? Mention what form of energy is in torch light? The give students home work on constructed organizer on form of energy	groups to discuss on the forms of energy students copy and attempt to work on the organizer
Instructional Effect	The teacher prepares a detailed note on the energy, examples of energy and basic application of energy. The teacher makes the learners identify what energy is and how useful it is and develop the habit of precise thinking and interest of learning.	

(LECTURE METHOD ENRICHED WITH GRAPHIC-ADVANCE-ORGANIZERS)

LESSON No.3

School G.D.J.S.S. Kara
Subject Basic Science
Class JSS II
Topic Sources of Energy
Duration 40 minutes per period
Average age 13 years
Instructional Materials- Charcoal, battery, Food, Charts, Drawings, etc

General Objectives: to acquire an idea about the sources of Energy

Phases	Teacher Activity	Student Activity
Phase I Presentation of the Organizer	Clarifies the aim of the lesson:The teacher clarifies that our lesson will be 'Sources of Energy'. At the end of the lesson the learner will be able todescribe the sources of energy, mention some sources of energy you know, list the two sources of energy, identify some energy and how the convert energy 	Student listen carefully Students observe and read the chart carefully and reorganize

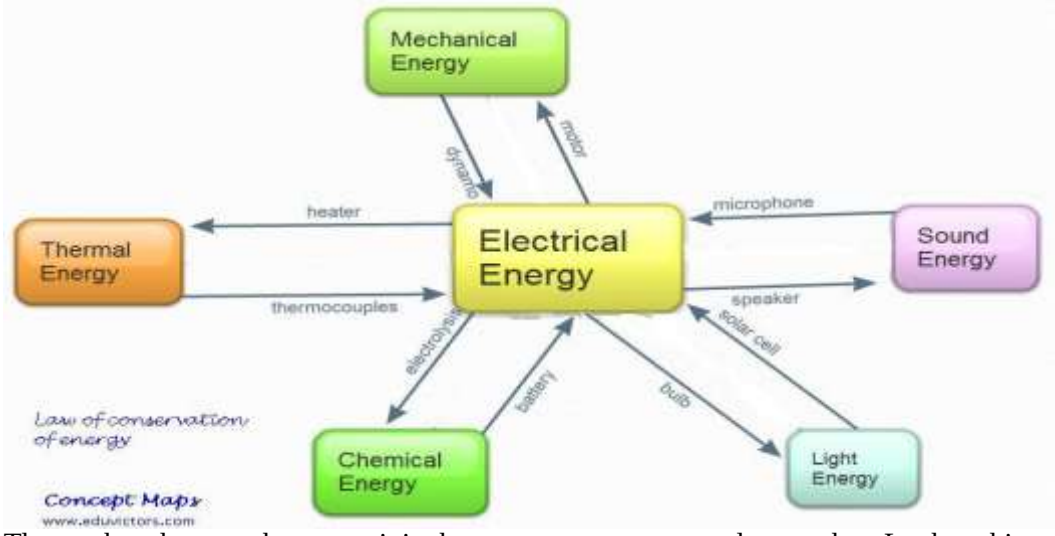
	The teacher shows a chart containingsources of energy and their descriptions Look at this chart, what do you notice here?	Description of sources of energy
Phase II Presentation of the learning material	The teacher continues the class by explaining sources is divided into two that is Renewable source and Non-renewable sources. The renewable is solar, wind hydroelectricity, and wood. Solar is capture to generate electricity, wind turbines, water from lakes/rivers and wood from fallen trees are all used to generate electricity. While Non-renewable sources are coal as fossil fuel, natural gas also as fossil fuel, crude oil use as fossil fuel and uranium is used uranium metal.	The students listen and compare their examples with that of the teacher.
Phase III Strengthening the cognitive organization	Promote active receptive learning: Teacher ask the students to discuss more about sources of energy around. How do identify the sources of energy you know?	The students work in groups to discuss on the sources of energy
Evaluation	The give students home work on constructed organizer on uses of energy	students attempt to answer question
Follow up Activity	The teacher prepares a detailed note on source of energy.	
Instructional Effect	The teacher makes the learners identify what are sources of energy around our homes and useful they are to us.	

(LECTURE METHOD WITH GRAPHIC-ADVANCE-ORGANIZERS)

LESSON No.4

School G.D.J.S.S. Kara
Subject Basic Science
Class JSS II
Topic Energy conversion
Duration 40 minutes per period
Average age 13 years
Instructional Materials- Electric stove, matches, Battery, Wire, Radio, Handset, Bulb

General Objectives: to acquire an idea about Energy conversion

Phases	Teacher Activity	Student Activity
Phase I Presentation of the Organizer	Clarifies the aim of the lesson: The teacher clarifies that our lesson will be 'Energy conversion'. At the end of the lesson the learner will be able torelate the concept of energy to energy conversion  The teacher shows a chart containinghow energy are converted to another. Look at this	Student listen carefully Students observe and read the chart carefully and reorganize

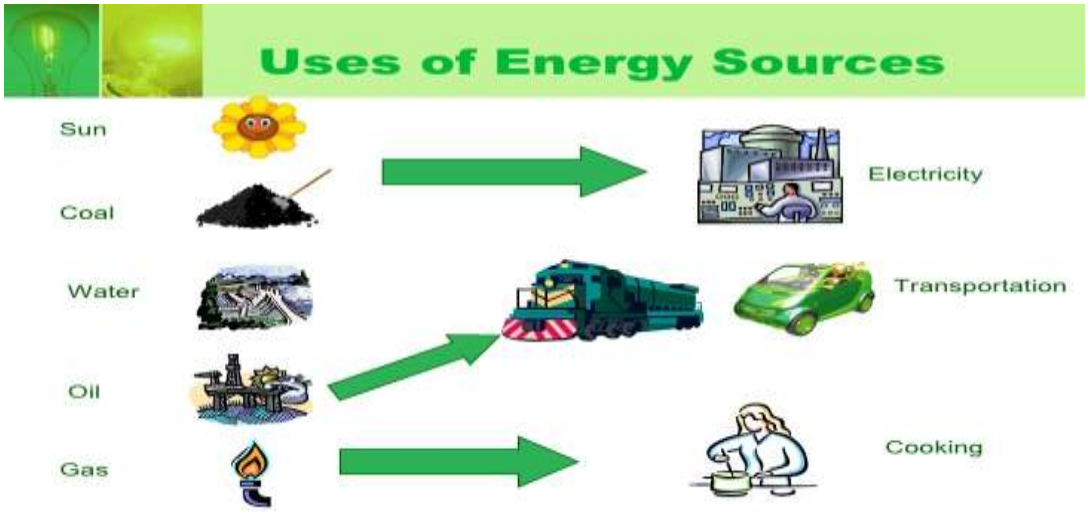
Phase II Presentation of the learning material Phase III Strengthening the cognitive organization Evaluation Follow up Activity	chart, what do you notice here? The teacher continues the class by explaining demonstrating certain energy are converted as food we which converted into chemical energy, sound energy to electrical in microphone and so on. Based on this the teacher asked the student to mention another example that are different from his own. Promote active receptive learning: Teacher ask the students to discuss about energy and also about the basic application of energy in the real. Describe forms of energy are converted? The give students home work on constructed organizer on uses of energy	Discussion on energy conversion Students listen carefully The students work in groups to discuss on energy conversion. Student complete the organizer in their own way
	The teacher prepares a detailed note on energy conversion	
Instructional Effect	The teacher makes the learners identify what energy is and how useful it is and develop the habit of precise thinking and interest of learning.	

(LECTURE METHOD ENRICHED WITH GRAPHIC-ADVANCE-ORGANIZERS)

LESSON No.5

School G.D.J.S.S. Kara
Subject Basic Science
Class JSS II
Topic Uses of Energy
Duration 40 minutes per period
Average age 13 years
Instructional Materials- Box of chalk, Books, Stone etc.

General Objectives: to acquire an idea aboutUses of Energy

Phases	Teacher Activity	Student Activity
Phase I Presentation of the Organizer	Clarifies the aim of the lesson: The teacher clarifies that our lesson will be 'Uses of Energy'. At the end of the lesson the learner will be able to describe the uses of Energy, list appliances that uses energy at home 	Student listen carefully Students observe and read the chart carefully and reorganize Description of uses of energy

	The teacher shows a chart containingsome ways we utilise energy and their descriptions Look at this chart, what do you notice here?	Explanation on uses of energy
Phase II Presentation of the learning material	The teacher continues the class by demonstrating some appliance in our home that require the use of energy such as fan, pressing iron, heater fridge etc. Based on this the teacher asked the student to mention another example that are different from his own.	Students listen and ask questions
Phase III Strengthening the cognitive organization	Promote active receptive learning: Teacher ask the students to discuss about energy and useful is energy is to our life. List some appliance at home that used energy?	The students work in groups to Discuss on the forms of energy
Evaluation	The teacher asks students on the next topic	Student went home and attempted the question asked
Follow up Activity	The teacher prepares a detailed note on the energy, examples of energy and basic application of energy and uses at home.	
Instructional Effect	The teacher makes the learners identify what energy is and how useful it is and develop the habit of precise thinking and interest of learning.	

APPENDIX F

LESSON PLAN FOR CONTROL GROUP (LECTURE ONLY)

LESSON No	**1**
School	**G.D.J.S.S. Gashaka**
Subject	**Basic Science**
Class	**JSS II**
Topic	**Energy**
Duration	**40 minutes per period**
Average age	**13 years**
Instructional Materials-	**Box of chalk, Books, Stone etc.**
General Objective	**To teach students Energy**
Behaviour Objectives:	**At the end of the lesson, the students should be able** to:
i	define the term Energy
ii	demonstrate two examples of energy in the class
Previous knowledge:	Students have been taught the meaning and concept Photosynthesis.
Introduction:	The teacher introduces the lesson by asking students question from their previous knowledge e.g. what is photosynthesis?
Presentation:	based on student's responses, the teacher presents the lesson in the following steps:
Step I	the teacher presents the lesson by defining and explaining the term energy as Energy is the ability or capability to do work. Its S.I. Unit is Joule (J). Without energy, neither humans nor machines can do work. There different forms of energy we often used in our day to day activities.
Step II	The cites some examples of energy such as lifting a book from the table, a boy running on football field, wind blowing water flowing, and explains to the students that all these activities energy is used in doing them. Then ask the students to form group of ten to list some kinds of work we do.
Student's Activity	students form groups of fifteen (15) and list some examples of work we do such as running, walking, writing, dancing, jumping, talking, lifting an object, pulling and pushing etc.
Evaluation	The teacher evaluates the lesson by asking questions as: 1. What is energy 2. Describe what happen when an object is push/pull.
Conclusion	The teacher concludes the lesson for the day to copy the main points on the chalkboard in their note book.

LESSON No **2**
School **G.D.J.S.S. Gashaka**
Subject **Basic Science**
Class **JSS II**
Topic **Forms of Energy**
Duration **40 minutes per period**
Average age **13 years**
Instructional Materials- **oil, battery cells, food, stretched spring, elastic band, electric stove, kerosene matches, magnet, etc.**
General Objective **To teach students forms of Energy**
Behavioural Objectives: **At the end of the lesson, the students should be able** to:

i. list some forms of Energy
ii. describe at least three forms of energy in the class

Previous knowledge: Students have idea aboutenergy.
Introduction: The teacher introduces the lesson by asking students question from their previous knowledge e.g. what is energy?

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

Step I The teacher presents the lesson by listing various forms of energy as kinetic, potential, mechanical, chemical, electrical, magnetic, Radiant, Nuclear, Ionization, Elastic, Gravitational, Thermal, sound and Heat energy, etc.

Step II the teacher describes some forms of energy we used in our homes under the table below:

S/N	ENERGY	DESCRIPTION
1.	Kinetic	Energy possesses by a moving body. e.g. electric fan, cars, etc.
2.	Potential	Stored energy, energy possesses due to position of rest. e.g. books kept on a table, elastic band not stretched etc.
3.	Mechanical	Comprises of kinetic and potential energy. e.g. windmill possess mechanical energy when at rest and has potential energy and when wind blows it turns to the windmill. Another example of mechanical energy is sound energy.
4.	Chemical	Is energy containing in molecules, is energy caused by chemical reactions e.g. energy released from food we eat and also energy released when fuel like kerosene burns.

5.	Electrical	Electric from electric field, e.g. electric coil in an electric stove.
6.	Magnetic	Energy from magnetic field, e.g. magnetic bar is used to pick office pin on teacher's table.
7.	Heat	An amount of thermal energy being transferred. (in given process) in the direction of the decreasing temperature. etc

Student's Activity

Students in their groups list other forms of energy not mention by the teacher and describe how they are used with some examples in our homes.

Evaluation

The teacher evaluates the lesson by asking questions as:

Mention any five forms of energy you know given examples for each.

Conclusion

The teacher concludes the lesson for the day by highlighting the main topics and given homework to the students.

LESSON No	**3**
School	**G.D.J.S.S. Gashaka**
Subject	**Basic Science**
Class	**JSS II**
Topic	**Sources of Energy**
Duration	**40 minutes per period**
Average age	**13 years**
Instructional Materials-	**Charcoal, battery, Food, Charts, Drawings etc.**
General Objective	**To teach students sources of Energy**
Behavioural Objectives:	**At the end of the lesson, the students should be able** to: 1. describe the sources of energy 2. mention some sources of energy you know 3. list the two sources of energy 4. identify some energy and how the convert energy
Previous knowledge:	students have been taught about forms of energy.
Introduction:	The teacher introduces the lesson by asking students question from their previous knowledge e.g. mention any three forms of energy you know?
Presentation:	based on student's responses, the teacher presents the lesson in the following steps:
Step I	The teacher presents the lesson by explaining the sources of energy as are from different sources including fuels, solar, food stores of energy such as batteries and wind. There are two major sources of energy: renewable and non-renewable. The renewable sources quickly replenish themselves and can be used again and again. This implies that they canbe used without end, because they can be renewed. Non-renewable sources cannot be replaced once they are used up.
Step II	The teacher mentions some examples of energy under renewable and non-renewable sources of energy as shown below:

Renewable energy sources

S/N	ENERGY	SOURCES
1.	Solar	Energy is captured from sunlight and converted into electricity.
2.	Wind	Wind turbines
3.	Hydroelectric power	Energy from movement of water through rivers, lakes and dams.
4.	Wood	Obtained from felling trees burned to generate heat and light

Non-Renewable source of energy

S/N	**ENERGY**	**SOURCES**
1.	Coal	From Fossil fuels
2.	Natural gas	From Fossil fuels
3.	Crude Oil	From Fossil fuels
4.	Uranium (Nuclear energy)	Uranium Metal

Evaluation The teacher evaluates the lesson by asking questions as:

Classify the following under renewable and non-renewable sources: crude oil, solar, natural gas, coal, wood, hydroelectric power.

Conclusion The teacher concludes the lesson for the day by summarizing the major points to the class.

LESSON No	**4**
School	**G.D.J.S.S. Gashaka**
Subject	**Basic Science**
Class	**JSS II**
Topic	**Energy conversion**
Duration	**40 minutes per period**
Average age	**13 years**
Instructional Materials-	**Electric stove, matches, battery, wire, radio, bulb, Hand set, etc.**
General Objective	**To teach students Energy conversion**
Behavioural Objectives:	**At the end of the lesson, the students should be able** to: Relate the concept energy and work to energy conversion
Previous knowledge:	Students have been taught sources of energy.
Introduction:	The teacher introduces the lesson based on the students' background knowledge of energy.
Presentation:	based on student's responses, the teacher presents the lesson in the following steps:
Step I	The teacher presents the lesson by displaying some simple home appliances e.g. water heater, radio, handset, bulb, etc and lead discussion on their mode of operations. In each case, discussion should include conversion of electric energy to mechanical energy as in electric fan, electric to heat as in electric kettle, electric to sound as in radio, mechanical to heat and light as in matches etc.
Student's Activity	the teacher guides the students extend and consolidate their knowledge of the lesson by providing more activities or learning experience.
Evaluation	The teacher evaluates the lesson by asking the students to read and list several appliances and which form of energy is converted while using them.
Conclusion	The teacher concludes the lesson for the day by copying the main points on the chalkboard.

LESSON No	**5**
School	**G.D.J.S.S. Gashaka**
Subject	**Basic Science**
Class	**JSS II**
Topic	**Uses of Energy**
Duration	**40 minutes per period**
Average age	**13 years**
Instructional Materials-	**Box of chalk, Books, Stone etc.**
General Objective	**To teach students Energy**
Behavioural Objectives:	**At the end of the lesson, the students should be able** to:
i.	describe the uses of energy at home
ii.	list some examples of appliance that uses energy at home.
Previous knowledge:	Students have idea about home appliance we used at home.
Introduction:	The teacher introduces the lesson based on student's background idea of home appliances by asking them to mention some home appliance they know
Presentation:	based on student's responses, the teacher presents the lesson in the following steps:
Step I	the teacher presents the lesson by explaining some home appliance at home as man has constantly sought for better ways to survive among which he uses some devices such charcoal to iron clothes, fire wood to cook in the past. Now he uses appliances that to uses electricity to ease doing work such as electric stove, electric iron, etc. the use of TVs, radio, refrigerators,
Step II	The teacher cites some examples of home appliances and their uses as:
i.	Refrigerator: is used to preserve food. Make water to ice.
ii.	Air conditioner: It cools spaces so that man feels comfortable and protect spaces from dust.
iii.	Electric Kettle: is used to boil water.
iv.	Electric iron: is used to press our clothes
v.	Fire wood: is used for cooking food

Student's Activity	the teacher guides the students to list home appliance and their uses while write them on the chalkboard.
Evaluation	The teacher evaluates the lesson by asking questions as: Mention any five home appliances you know and explain its uses?
Conclusion	the teacher concludes the lesson by highlighting the topic as energy and appliance in the home make up a topic to be emphasis, and no amount of emphasis on the topic is exaggerated.

APPENDIX G

BASIC SCIENCE PERFORMANCE TEST (BSPT)

Raw Data for Reliability of BSPT

X: 20, 12, 19,14,17,21,16,10,20,14,12,14,20,9, 19,

Y: 20,20,12,15,13,20,13,20,24,15,18,17,24,17, 12.

X	**Y**	**x-$\bar{x}$**	**y-$\bar{y}$**	**(x-$\bar{x}$)^2**	**(y-$\bar{y}$)^2**	**(x-$\bar{x}$)(y-$\bar{y}$)**
20	20	4.2	2.7	17.64	2.29	11.34
12	20	-3.8	2.7	14.44	7.29	10.26
19	12	3.2	-5.3	10.24	28.09	16.96
14	15	-1.8	-2.3	3.24	5.29	4.14
17	13	1.2	-4.3	1.44	18.49	5.16
21	20	5.2	2.7	27.04	7.29	14.04
16	13	0.2	-4.3	0.04	18.49	0.88
10	20	-5.8	2.7	33.64	7.29	15.66
20	24	4.2	6.7	17.64	44.89	28.14
14	15	-1.8	-2.3	3.24	5.29	4.14
12	18	-3.8	0.7	14.44	0.49	2.66
14	17	-1.8	-0.3	3.24	0.09	0.54
20	24	4.2	6.7	17.64	44.89	28.14
9	17	-6.8	-0.3	46.24	0.09	2.04
19	12	3.2	-5.3	10.24	28.09	16.96
237	260			∑=220.4	∑=223.35	∑=161.04

$\bar{X} = \frac{237}{15} = 15.8 \quad \bar{Y} = \frac{260}{15} = 17.3$

PPMC = $r = \frac{\sum(x-\bar{x})(y-\bar{y})}{\sqrt{\sum x-\bar{x})^2 \sum y-\bar{y})^2}}$

$= \frac{161.04}{\sqrt{(220.04)(223.35}}$

$= \frac{161.04}{\sqrt{49226.36}} = \frac{161.04}{221.87} = 0.7258$

r ⇗ 0.7

The Basic Science Performance Test reliability co-efficient was obtained as 0.7, which was high correlation.

APPENDIX H

BASIC SCIENCE STUDENTS' INTEREST QUESTIONNAIRE (BSSIQ)

Raw Data for Reliability of BSSIQ

X: 72,58,65,73,65,66,73,66,71,73,89,64,68,73,76

Y: 78,58,71,61,78,68,79,74,66,70,66,75,65,54,62

X	Y	Rx	Ry	d=(Rx-Ry)	$d^2=(Rx-Ry)^2$
58	48	11	9.5	1.5	2.25
70	62	13	14	-1	1
71	68	34	15	-1	1
55	43	10	7	3	9
40	45	6	8	-2	4
45	48	9	9.5	-0.5	0.25
42	50	7	11	-4	16
66	55	12	13	-1	1
54	51	9	12	-3	9
28	26	4	3	1	1
33	30	5	4.5	0.5	0.25
20	22	1	1	0	0
22	30	2	4.5	-2.5	6.25
25	24	3	2	1	1
44	38	8	6	2	4
					$\sum$= 56

Rho=$\frac{1-6\sum d^2}{N(N^2-1)}$

= $\frac{1-6\,(56)}{15(15^2-1)}$= $\frac{1-336}{15(225-1)}$ = 0.9

Rho ≈-1

The Basic Science Interest Questionnaire reliability co-efficient was obtained as 1, which was perfect positive correlation.

APPENDIX I

Department of Science Education
Faculty of Education
Ahmadu Bello University, Zaria

Dear sir/Madam,

The bearer of these research instruments is a student of Master of Integrated Science Education in the Department of Science Education, Faculty of Education, Ahmadu Bello University, Zaria. The topic of the research is **Effect of Graphic-Advance-Organizers on Interest and Performance among Upper Basic Science Students in Potiskum Education Zone, Yobe State, Nigeria.**The items presented are designed to test Interest and Performance of JSS II students in Basic Science. You are therefore requested to validate the test items.

Thank you for your consideration

Yours sincerely

Hassan Muhammad GAMBO
P14EDSC8006

Supervisors **Sign/Date**

Prof. I.A. Usman ----------

APPENDIX J

ANALYSES OUTPUT FROM STATISTICAL PACKAGE FOR SOCIAL SCIENCE (SPSS)

Item Statistics

	Mean	Std. Dev.	N
My low interest in Basic science comes from anxiety and fear that basic science topics are difficult to understand.	3.2857	.95706	35
I may never learn Basic science until my interest is stimulated by the use of modern methods in teaching Basic science.	3.2571	.95001	35
My best wish is to attend university level through the learning of Basic science	3.2571	.95001	35
I like Basic Science because it studies the thing that are in the environment and help me to know about myself.	3.2571	.95001	35
I am interested in Basic Science because the learning materials used in teaching the topics are available in the local environment	3.2571	.95001	35
In Basic Science class, I like to have more class work and homework which help me to understand more.	3.2571	.95001	35
In Basic Science class, I like to have textbooks and workbooks because they help learn more.	3.2571	.95001	35
My interest in Basic Science topics depends on the methods of teaching the teacher adopt.	3.2571	.95001	35
I am interested in Basic Science because the knowledge I obtain from the subject can be applied in other subject areas.	3.2571	.95001	35
Teaching that will arouse my interest in Basic Science should involve the use of laboratory facilities.	3.2571	.95001	35
I hope to work hard so that I can get higher marks in Basic Science than any other classmate.	3.2571	.95001	35
If science clubs and societies are introduced in my school, they will arouse my interest in the study of Basic Science.	3.2571	.95001	35
I like all the topics and contents in Basic Science class.	3.2571	.95001	35
My interest in studying Basic Science is so important to my future involvement in science and technology education.	3.2571	.95001	35
Teacher's explanations on Basic Science topics increase my interest in the subjects.	3.2571	.95001	35
Most science teachers lack adequate teaching aids to explain the Basic Science concepts, in order to increase my interest in the subject.	3.2571	.95001	35
If i am being motivated by the teacher, I will develop interest in Basic Science.	3.2571	.95001	35
My strong interest in Basic Science topics and zeal to stay on task till i finish them will depend on how interesting the lesson is.	3.2571	.95001	35
I will be more interested in activity-oriented method of teaching Basic Science if only the teacher can monitor and guide me when performing task.	3.2571	.95001	35
I can explain Basic science concepts most when the teacher leads me to demonstrate an activity.	3.2571	.95001	35

Use of teaching aids by Basic Science teachers will motivate me in studying the Subject.	2.8000	.90098	35
Most teachers of Basic Science are not subject specialist.	2.8000	.90098	35
Teaching and learning of Basic Science concepts is tedious because it involves more than one strategy at a time.	2.8000	.90098	35
Teachers of Basic Science attitude and behaviour toward the subject made have interest in the subject.	2.8000	.90098	35
I learn basic science well if the teacher teaches and guide me using instructional materials like charts, pictures, models, specimens or diagram.	2.8000	.90098	35

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	3.167	2.800	3.286	.486	1.173	.035	25

Ho_1:
Wilcoxon Signed Ranks Test

Ranks

		N	Mean Rank	Sum of Ranks
Interest_After - interest_Before	Negative Ranks	19[a]	92.45	1756.50
	Positive Ranks	120[b]	66.45	7973.50
	Ties	6[c]		
	Total	145		

a. Interest_After<interest_Before

b. Interest_After>interest_Before

c. Interest_After = interest_Before

Test Statistics[a]

	Interest_After - interest_Before
Z	-6.545[b]
Asymp. Sig. (2-tailed)	.000

a. Wilcoxon Signed Ranks Test

b. Based on negative ranks.

Ho_2:

Univariate Analysis of Variance

Between-Subjects Factors

		N
Groups	Control	123
	Experimental	153

Descriptive Statistics

Dependent Variable: Posttest

Groups	Mean	Std. Deviation	N
Control	12.3171	4.44699	123
Experimental	14.8627	5.18862	153
Total	13.7283	5.02598	276

Levene's Test of Equality of Error Variances[,]

Dependent Variable: Posttest

F	df1	df2	Sig.
6.518	1	274	.011

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	1484.012[a]	2	742.006	37.083	.000	.214
Intercept	2030.792	1	2030.792	101.491	.000	.271
Covariates(pre)	1042.144	1	1042.144	52.082	.000	.160
Groups	410.551	1	410.551	20.518	.000	.070
Error	5462.608	273	20.010			

Total	58963.000	276				
Corrected Total	6946.620	275				

a. R Squared = .214 (Adjusted R Squared = .208)

H0 3:

NPar Tests

Kruskal-Wallis Test

Ranks

	Test Groups	N	Mean Rank
Interest	Male Pre	66	101.83
	Male Post	66	215.56
	Female Pre	79	86.02
	Female Post	79	182.94
	Total	290	

Test Statistics[a,b]

	Interest
Chi-Square	137.523
Df	3
Asymp. Sig.	.000

a. Kruskal Wallis Test

b. Grouping Variable: Test Groups

Post Hoc Tests

Multiple Comparisons

Dependent Variable: interest

Bonferroni

(I) Test Groups	(J) Test Groups	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Male Pre	Male Post	-12.00000*	3.49785	.004	-21.2929	-2.7071
	Female Pre	6.10261	3.35086	.418	-2.7998	15.0050
	Female Post	-5.89739	3.35086	.477	-14.7998	3.0050
Male Post	Male Pre	12.00000*	3.49785	.004	2.7071	21.2929
	Female Pre	18.10261*	3.35086	.000	9.2002	27.0050
	Female Post	6.10261	3.35086	.418	-2.7998	15.0050
Female Pre	Male Pre	-6.10261	3.35086	.418	-15.0050	2.7998
	Male Post	-18.10261*	3.35086	.000	-27.0050	-9.2002
	Female Post	-12.00000*	3.19713	.001	-20.4939	-3.5061
Female Post	Male Pre	5.89739	3.35086	.477	-3.0050	14.7998
	Male Post	-6.10261	3.35086	.418	-15.0050	2.7998
	Female Pre	12.00000*	3.19713	.001	3.5061	20.4939

*. The mean difference is significant at the 0.05 level.

H0 4:

Univariate Analysis of Variance

Between-Subjects Factors

		N
Scale	Female	87
	Male	66

Descriptive Statistics

Dependent Variable: Posttest

Scale	Mean	Std. Deviation	N
Female	13.4023	4.94965	87
Male	16.7879	4.89117	66
Total	14.8627	5.18862	153

Levene's Test of Equality of Error Variances[a]

Dependent Variable: Posttest

F	df1	df2	Sig.
.184	1	151	.669

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

a. Design: Intercept + Pretest + Scale

Tests of Between-Subjects Effects

Dependent Variable: Posttest

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	863.925[a]	2	431.962	20.071	.000	.211
Intercept	1571.099	1	1571.099	73.002	.000	.327
Covariates (Pre)	433.757	1	433.757	20.155	.000	.118
Gender	272.731	1	272.731	12.673	.000	.078
Error	3228.193	150	21.521			
Total	37890.000	153				

Corrected Total	4092.118	152				

a. R Squared = .211 (Adjusted R Squared = .201)

APPENDIX K
INTRODUCTORY LETTER TO ACCESS DATA

DEPARTMENT OF SCIENCE EDUCATION
AHMADU BELLO UNIVERSITY ZARIA, NIGERIA

Vice Chancellor: ***Professor Ibrahim Garba*** *B.Sc, M.Sc(ABU) Ph.D (BIU) Fellow, IFOSD*
Head of Department: ***Professo Mamman Musa*** *B.Ed, M.Ed, Ph.D (ABU), FMEN, FANE, DSC*

Your Ref:
Our Ref: DSE/R/1/Vol.1 *Date:* 12th/11/2019

The Principal
G.D.J.S.S. Gashaka
Fika LGA,
Fika

Dear Sir/Madam,

PG AN INTRODUCTORY LETTER TO ACCESS RESEARCH DATA

This is to introduce the bearer, Hassan Muhammad Gambo, with registration number PG/MSc/18/86176, as one of our Masters (Postgraduate) students who is conducting a research on the topic

Impact of Graphic - Advance - Organizers on Interest and Academic Performance Among Upper Basic Science Students in Fufuna Educational Zone, Taraba State, Nigeria.

Please accept our sincere thanks in advance for your kind action.

Yours faithfully,

Prof. Mamman Musa
Head, Science Education Department

DEPARTMENT OF SCIENCE EDUCATION
AHMADU BELLO UNIVERSITY ZARIA, NIGERIA

Vice Chancellor: **Professor Ibrahim Garba** B.Sc. M.Sc(ABU) Ph.D IBC (London) FBMGS
Head of Department: **Professo Mamman Musa** B.Ed. M.Ed. Ph.D (ABU) FMAN. FANE. IMC

Your Ref:
Our Ref: DSE/R/1/Vol.1 *Date:* 13th/11/2019

The Principal
G.D.J.S.S. Kara
Potiskum LGA.
Potiskum

Dear Sir/Madam,

PG AN INTRODUCTORY LETTER TO ACCESS RESEARCH DATA

This is to introduce the bearer, HASSAN MUHAMMAD GAMBO, with registration number PG/MASCE/2016, as one of our MASTERS (POSTGRADUATE) students who is conducting a research on the topic:

IMPACT OF GRAPHICAL - ADVANCE - ORGANIZERS ON INTEREST AND ACADEMIC PERFORMANCE AMONG UPPER BASIC SCIENCE STUDENTS IN POTISKUM EDUCATIONAL ZONE, YOBE STATE, NIGERIA.

Please accept our sincere thanks in advance for your kind action.

Yours faithfully,

Prof. Mamman Musa
Head, Science Education Department