EFFECTS OF EXPOSITORY METHOD ENRICHED WITH IMPROVISED AND STANDARD MATERIALS ON PERFORMANCE OF LARGE CLASS BASIC SCIENCE STUDENTS, KADUNA , NIGERIA

BY

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DECLARATION

I hereby declare that this dissertation entitled "Effects of Expository Method Enriched With Improvised and Standard Materials on Performance of Large Class of Basic Science Students ", Kaduna ,Nigeria was written 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.

_____ _____

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CERTIFICATION

This dissertation "Effects of Expository Method Enriched with Improvised and Standard Materials on academic Performance of Large class of Basic Science Students ", Kaduna – Nigeria by Ishaya Bartholomew meets the regulations governing the award of Master degree in Science Education of Ahmadu Bello University and is approved for its contribution to knowledge and literary presentation.

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DEDICATION

This dissertation is dedicated to my late father, mother, my wife Mrs. Janet Bartholomew and my children: Simeon, Joy, Joan and Shadrach Abba for their encouragement, prayers and patience during the course of this study.

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ABBREVIATIONS

BSPT – Basic Science Performance Test

STAN – Science Teacher Association of Nigeria

JSS – Junior Secondary School

JSCE – Junior School Certificate Examination

FME – Federal Ministry of Education

NTI – National Teachers Institute

ERC – Educational Resources Centre

PTA – Parents Teachers Association

PPMC – Pearson Product Moment Coefficient

UNESCO – United Nations Educational Scientific and Cultural Organization

OPERATIONAL DEFINITION OF TERMS

i. **Improvised Instructional Materials**: These are the teaching materials a teacher made from available local and cheaper resources that substitute the standard materials or already made ones.

ii. **Standard Instructional Materials:** These are factory made materials/equipments used for teaching and learning of sciences.

iii. **Performance:** This refers to the level of attainment of success recorded by students after undergoing a period of learning with improvised or standard instructional materials.

iv. **Upper Basic Students:** These are students in the Junior Secondary School Level i.e. JSI – JS III.

v. **Large Class**: Is considered as one with a population of 80 and above students to one teacher as used in the study

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ABSTRACT

This study investigated the Effects of Expository Method Enriched with Improvised and Standard Materials on academic Performance of Large Class of Basic Science Students , Kaduna Nigeria.The study intended to improved the academic performance, check and reduce the persistent failure among Basic Science students in large class using enriched expository method with instructional materials.The study involved pre-test, post-test quasi experimental and control group design. The population consisted of all (number of schools in study area) which consist of a total of four thousand eight hundred and ninety-nine (4,899) students. A sample of 392 students was drawn from three schools and divided into two experimental groups and one control group.The experimental group I was taught using improvised instructional materials. The experimental group II was taught using standard instructional materials while control group was taught using lecture method without instructional materials. The instrument used for data collection was Basic Science Performance Test (BSPT) with reliability coefficient of 0.83. Five research questions and hypotheses were formulated and tested. The research questions were answered descriptively using mean and standard deviation while the null hypotheses were tested using t-test at $p < 0.05$ level of significant.Findings from the analysis of the data revealed that there was significant difference in the mean scores of experimental and control groups in favour of experimental groups. There was no significant difference in the mean scores of male and female students exposed to expository method enriched with improvised and standard materials after being taught Basic Science Concept using the expository method enriched with improvised and standard materials. Based on these findings, it was recommended that the expository method enriched with improvised or standard materials should be used by Basic Science Teachers to teach Basic Science Students in large class at the upper basic education level. Therefore, instructional materials that teachers use in teaching Basic Science have significant effects on students performance and the use of either improvised instructional materials in the absence of standard or convential materials can facilitate learning in large class of Basic Science.

CHAPTER ONE

THE PROBLEM

1.1 Introduction

Science is the bedrock upon which the bulk of present day technological breakthrough is built. Today, nation all over the world, including Nigeria, are striving hard to develop scientifically and technologically, since the world is becoming scientific and all proper functioning of lives depends greatly on science. Science education is an important tool for national growth and development. The economic and political strength of a nation is always assessed in terms of her achievement in science and technology (Olarinoye 2001& Otuka 2006)

Basic Science, formerly known as Integrated Science, is a subject taught in Lower, middle and upper Basic Education levels i.e. primary and junior secondary schools. It has occupied a very important position in the school curriculum and is made a core subject .In fact, there is so much emphasis on science, and science related subjects at all levels of education emphasizing the need for scientific thinking and application among the students, in which Basic Science is the foundation. Science education plays a vital role in the lives of individuals and the development of a nation scientifically and technologically (Alebiosu and Ifanuyiwa, 2008). It is widely and generally acknowledged that the gateway to survival of a nation is through science education. It has been a prerequisite subject for offering most science oriented courses in the senior secondary schools and tertiary institutions and this calls for the need in teaching it effectively. In order to make our citizens show interest in science education, Nigerian government came up with a policy that 60% of the students seeking admission into the nations universities, polytechnics and colleges of education should be admitted for science oriented courses, while 40% of the students should be considered for arts and social science courses (Ajibola 2008).

Integrated Science has reflected a new world-wide dimension to the teaching into Nigeria through the Aiyetoro Basic Science Scheme in 1968 and the Nigeria integrated science project of the Science Teachers Association of Nigeria (STAN). The first publication of the Nigerian Integrated Science Project (NISP) was in 1970.The Nigerian integrated science project has been concerned with improving science at the junior secondary level in the country .It presents science as the process of interpretation, manipulation and control of pupils environment. Now called Basic Science, the subject is now taught in primary and junior secondary schools (JSS) in Nigeria following the Universal Basic Education Scheme (UBE) launched in 1999 due to the change in educational system i.e. from 6-3-3-4 to 9-3-4 system. The Nigeria Integrated Science project books have been revised and now cover the three years of junior secondary school (Duyilemi, 1991). Basic Science is one of the core subjects at the junior secondary school in the Universal Basic Education (UBE) Scheme. According to FRN (2013), the basic education which shall be 9 years duration comprising of six years of primary and three years of junior secondary education shall be free and compulsory.

Based on the National Policy on Education (FRN 2013), the teaching of Basic science from the pre- secondary (lower basic) to the junior secondary school (upper basic) levels is intended to achieve the following aims and objectives which are: To Inculcate in the learners the spirit of inquiry and creativity through exploration of nature and local environment by observation; Laying sound basic foundation for scientific innovation and reflective thinking; To develop in the child the ability to adapt to the child changing environment through Basic Science process skills; including observation, manipulating, classifying, communicating, inferring, hypotheses, interpreting data and formulating models; Functional knowledge of science concept and principles to Explain simple and natural phenomena and to provide the child with basic tools for further educational advancement including preparation for trades

and craft of the locality. Develop self confidence and self –reliance through problems solving activities in science. From the above guiding principles, Basic Science course is to be taught beginning with the understanding of the meaning of science and how the scientists work, since it is an activity- oriented programme

Basic Science has been offered to enhance laboratory activity, provide concrete experience, stimulate interactions in school and increase scientific literacy. It also understands the process and product of science, maintaining the changes and showing relationship of science to society. It serves as a base for further scientific study in higher levels of education and consequently transformation of Nigerian society through science and technology. Despite the important position of Basic Science in the educational system and the efforts made by researchers to enhance students performances in Basic Science and sciences in general the performance is still low Adesoji (2008),"Science instruction, especially in Nigeria, has had a limited success in terms of students performance" (Mohammed 2008).Also, the Federal Government of Nigeria has made several efforts at producing, improving and consolidating Basic Science Education in Nigeria (FRN 2013). One of such major effort is the development of Basic Science core curriculum (Osuji 2009). This development is very necessary since earlier training in science will, to a large extent determine student's performance in science at subsequent level of education. Achimugu (2005) posits that, student comprehend and remember better when teaching materials are employed in teaching –learning process. The use of instructional materials if carefully and properly planned enhances teaching and learning of Basic Science. The effect of this is that they make the learning of science enjoyable, interesting, exciting and to see that a firm scientific base is developed in the students.

The poor academic performance of students in Basic Science is attributed to many factors such as the constant use of the lecture teaching methods, poor laboratory facilities,

poor retention ability of students, inadequate number of learning facilities in managing large classes among others (Usman, 2002 , Usman 2007 & Dyel 2011).The use of expository method by science teachers has been criticized by many researchers (Abdullahi, 1982, James 1991 and Usman 2002). Although instructional materials could facilitate meaningful learning in Basic Science, it is rarely used, whereas this method is considered as a method of teaching for improving cognition. A good deal of expected learning outcomes cannot be realized in Basic Science at upper Basic Schools as a result of non – availability of instructional materials as well as lack of effective utilization of appropriate instructional materials (Nwagbo, 2008). There has been poor performance of Basic Science students in Junior Secondary School Certificate Examination (JSCE). The Basic Science chief examiners reports have in recent years indicated a steady decline in candidate performance in Basic Science at JSCE, 2013.

Many students are performing poorly every year in Basic science examination and this situation is worse in junior secondary school qualifying examination (Mock 2013) /Junior Secondary School Certificate Examination (JSCE 2013). This can be seen from the statistical table of Basic Science result of Junior Secondary School Certificate Examination.

Table 1. 1: Junior Secondary School Certificate Examination (JSCE) Performance in Kaduna State. 2009-2013: Basic Science.

Year	Total number of Students that sat for exams	Total number that pass (%)	Total number that fail (%)
2009	19,524	10275.48 (52.63%)	9248.52 (47.37%)
2010	54,853	20953.85 (38.20%)	33899.15 (61.80%)
2011	62,277	27918.63 (40.30%)	41358.37 (59.70%)
2012	72,304	31061.80 (42.96%)	41242.20 (57.04%)
2013	85,904	30188.07 (35.14%)	55719.93 (64.86%)

Source:(Statistics office, ERC Kaduna Nigeria, 2013).

From Table 1.1 the numbers of candidates with fail are higher for most years than

those with pass. In view of this, the problem of inadequate of instructional materials, and lack of the knowledge skills require by science teachers to put some resources within their environment to productive use according to Nwagbo (2008) and Ogunleye (2008).

Instructional materials refer to those equipment, tools and materials that a teacher uses to illustrate, emphasize and explain a lesson, making the lesson clear to the students. Instructional materials according to Abdullahi (2009) are those materials, which a teacher uses or manipulates in the process of his teaching in order to enhance teaching-learning process. Yusuf (2009) described instructional materials as teaching materials used by the teacher to pass information to students in real life situation. These equipment and materials include, object that are familiar to students and can be obtained locally to the sophisticated industrial product which cannot be obtained locally such as microscope, glasswares, tripod stand,herbarium etc. The teaching of Basic Science demands the use of instructional materials or media and this helps to bring effective instructions, which arouses and sustains the interest of the learners (Leghara and Okafor, 2006). This is because when the learners come face to face with teacher through the proper use of instructional materials, lesson is more likely to be effective. Instructional materials are meant to improve and supplement, not to replace the teacher. No matter how good instructional materials are, they should not substitute the teacher.

The use of instructional materials in science teaching will enable the learner to acquire problem solving skills and positive attitude, acquire scientific appreciation and interest and to develop functional knowledge and manipulative skills. In a situation where standard instructional materials are inadequate, the teacher could improvise. Researchers such as Ogunleye (2000) Okonkwo (2005) Mkpanang (2005) and Obioha(2006) reported that there was inadequate resources for the teaching of Basic Science in secondary school in Nigeria. They further stated that where there were little resource or not at all, they are not usually in

good conditions while the few that are in good conditions were not enough to go round those that needed them.

Hence there is need for improvisation. Also, research has revealed that there are materials which could be used to effectively teach Basic Science to enrich the learning experiences of the learners such as (Ayua, 2011). There are resources/materials for students to generate knowledge in their environment through the process of science. Improvisation is the process of making something one has not prepared for, because sudden need has arisen. According to Igwe (2005) is the making or inventing of a piece of science teaching equipment in an emergency. It is an essential part of laboratory management for the purpose of maximizing the use of the available resources. The issue of improvisation of science apparatus in the absence of standard materials present a great challenge to science teachers (Jibrin, 2006).

However, most of the equipment needed for teaching in upper Basic Education Schools can be easily improvised to substitute when equipments are not enough or available. The standard instructional material are not available or inadequate, they can be locally made by using resource in the environment as alternative. These will include used electrical bulb for round bottom flask; beverage tins for convex and concave mirrow; juices of unripe orange as acid, candle or stove as burner, reaspoon for spatula etc, Ogunleye (2000); improvised instructional materials may not be identical with the standard materials, therefore teachers should be skillfull in their handling and use (Omachi 2000). Onasanya etal (2008) Adebimpe (1997) and Aguisiobao (1998) noted that improvisation demands adventure, creativity, interest and perseverance on the part of the teacher. The author added that such skills are only realized through well plan training programme on improvisatrion. Akinyemi and Orukota (1995) noted that improvisation whether they cost less than standard manufactured once or not, the cost money is usually not readily available for the teachers.

Basically, two forms of improvisation can be identified Igwe (2005). The first is described as role substitution in which the original item require little or no modification before it can be used to fuel the new function(s) in an experimental setting. The use of juices of unripe orange as acid, tea spoon for spatula, kerosene stove as a burner, or a glass tumbler as a beaker is a good illustrations. The second type of improvisation is described as role simulation. In this case, actual construction of the apparatus is undertaken as an emergency measure either the needed apparatus is too expensive or not available. An example is the use of the local carpenter to construct test tube racks, tripod stands, balance and test-tube holders.Therefore, the National Policy on Education (FME, 2013) stated that the provision and use of available instructional materials for Basic Science teaching will lay a sound foundation for scientific and reflective thinking among students.

Standard materials are the real materials made or manufactured by the company or a factory for commercial purpose.These equipment are manufactured within the country and others are not.In this case there is need for importation of the ones that are not available and cannot be manufactured for Science teaching. Examples of standard instructional materials are: laboratory reagents, glass-wares, Bunsen burners, tripod stands, microscopes, beakers, test–tubes, apparatus for weighing like spring balance, chemical balance, etc.

The reason for using instructional materials in teaching upper Basic Science is to help in bringing about effective teaching and learning; arousing and holding attention of the learners and help in perception and retention of information or knowledge among our learners. Wallace (2005) was of the opinion that the use of both standard and improvised instructional resources would make discovered facts glue firmly to the memory of the students. Today advances in technology have made it possible to minimize the teacher talking and at the same time, making the message clearer, more interesting and easier for the learner to assimilate (Onasanyaet. al 2008)

Another factor affecting teaching of Upper Basic Education is large classes. A large class is one whose numerical size does not allow the teacher to cope effectively with the need of the individual student," Ahmed (2010). The class room atmosphere, the seating arrangement, the constraints caused especially by the large classes, the teacher's place and role in the classroom and as well as other environmental constraints which hindered the teaching and learning of Basic Science in the Upper Basic Education is as a result of large classes. Wilson (2006), reported that large class can negatively affect two important and interrelated aspects of teacher practice. These are instructional time and classroom management. Findings from Titun (2004) have shown that annual budgets in Nigeria do not accommodate large class size especially with dwinding and inadequate founding of schools in general. According to Anaso (2008), large classes are of significant concern for teachers in schools and for parent whose children attemd such schools. Charleston (1994), describe large class as one teacher to fifty student on average which link to quality of teaching. He believed that high numerical strength of the student does not allow the teacher to handle the class effectively and adequately attention to individuals will certainly be lacking. The effect of large class difference where examine in relation to socio and behavioural adjouncement to school in terms of too dimensions,that is attentiveness and fair relation. It can be seen that with increase in class size their will be more inattentiveness and more sign of difficulties between the childrens in the form of more rejection, a social anxious and aggressive behaviour and less pro social behaviour. Also large class lower the moral and increase the stress of teachers. Okebukola (2005), opine that large classes have led to inadeqauate teaching and learning materials. Therefore, an outstanding problem of the process of effective teaching and learning of Basic Science in most institution particularly at upper Basic is the large classes .Salau(1996),Waitutu (2006), Mahmud (2009).They all attributed student's poor performance in Basic Science to a large classes in our secondary schools. It might be

expected that with larger classes, there will be more distractions and, with more children biding for the teacher's attention, there will be less curiosity, attention and task; and relationship between the teacher and the children may suffer.

Researchers such as Salau (1996), Anaso (2008),Ndirika(2009) have investigated the issue of large class size in science teaching. But the issue of using instructional materials with expository method on the academic performance of large classes is uncovered. Therefore there is the need to find out the effects of expository method enriched with instructional materials on the academic performance of students in large classes of Basic Science to see what will be the result.

On the issue of gender in science education, there is a number of conflicting conclusions about gender-related differences in performance in science (Anaso, 2008). Some view gender as a relevant factor in performance while others feel that no difference exists between the sexes in terms of academic performance. Researchers such as Opyene and Opolot (2005) believe that boys achieve better than girls in Mathematics and Science that there is no comparable difference between the performance of boys and girls. Adegive (2005) attributes the differences in the learning ability levels of males and females due to socialization processes that take place at home and the society around them . Oguazor (2006) believes that boys get better attention and results than girls in Mathematics and Science. In a situation, especially when instructional materials are used in teaching and learning of large class – size, what will be its effects on gender among BasicScience students? In this study the researcher is determined to find out effects of expository method enriched with improvised and standard instructional materials on the academic performance of upper Basic science students of large classes in Rigachikun educational zone Kaduna state. Therefore, the study seeks to find out the effects of expository method enriched with improvised and standard instructional materials on academic performance of large classes of

Basic Science students in Rigachikun Education Zone, Igabi Local Government Area of Kaduna state Nigeria.

1.1.1 Theoretical Framework.

There are many theories that have dealt with the use of instructional materials in teaching and learning among which include constructivism. Learning theories linked with construction are very important in teaching learning with instructional materials, since the theory of learning was based on the idea that knowledge or concept is constructed by the learner based on mental activity (Piaget, 1964). The theory emphasizes on the role of active involvement in learning in relation to the child's environment. The teacher acts as a facilitator who encourages students to discover principles for themselves and to construct knowledge by working to solve realistic problems. This means that the students must take some responsibility for their learning. This is because they have to be actively involved in teaching and learning process. Teaching – learning with materials creates enabling environment for students to learn from themselves.

Therefore, students learn by interacting with one another within the environment using materials as a way of learning and they also interact with the concrete objects. The effects of appropriate instructional materials concretize and elucidate difficult and abstract concepts and this improve students' academic performance and retention of learned concept (Njoku, 2007). This is based on Piaget cognitive development. A concept is the basic unit of all types of learning and sense organs are the gate way of knowledge, since the building of a concept start with the process sensation. Human beings from infancy to old age learn new concept and use old concept in new situation of their daily life. Also, when a concept is taught with the aid of instructional materials, students will understand the concept, similarities, and differences that exist between it and other concepts which will aid student's

performance. The stages of cognitive development in Piaget emphasized the use of concrete materials such as teaching aids for enhancing cognitive development of the learner. The sequence of occurrence of Piaget stages on materials is age dependent, as is between the ages of 11-15 years and above is regarded as the final period of intellectual development. The period is characterized by attainment of the intellectual skills of individual skills of an individual or learner to do abstract thinking. Therefore when abstract concepts are taught with the aid of instructional materials, it will enable students to understand and explain the concepts, processes, structures and relationships. In this study, therefore the effects of expository method enriched with improvised and standard materials on academic performance of large classes of Basic Science students was investigated.

The study of expository method enriched with improvised and standard instructional materials on academic performance of upper Basic Science student in large classes is relatively new. Therefore, an attempt to investigate the effect of expository method enriched with improvised and standard instructional materials on academic performance among Basic Science Student in large classes to see whether or not it can enhance academic performance in Basic Science at Upper Basic Level.

1.2 Statement of the Problem

The importance of instructional materials to teaching and learning of Basic Science in Upper Basic education cannot be over-emphasized. So many efforts have been made to improve the poor performance in Basic Science, yet there is persistent failure in the subject which could be due to lack of use of instructional materials and problem of large classes. The declining rate of the performance of upper Basic Science students is a problem of serious concern to science educators, educationist and examination bodies Usman (2002) and Dyel (2011).Student's performance in Basic Science in junior school certificate examination over

the years showed that as the enrolment increases, the level of passes is not encouraging, therefore something need to be done to improve the performance. The problem of large classes in school is as a result of increase in the number of enrolment which is tied to two interrelated trends, the global initiatives for universal education and rapid population growth (UNESCO, 2006). The problem that comes from enhanced access to education is that of increased number of students and this resulted to inadequate infrastructure, teaching and learning materials, inadequate provision of classrooms, limited range of teaching method and inability to provide for the specific learning needs of the learner Usman (2002) and Dyel (2011) in supporting this view reported the seriousness of the poor performance of upper Basic science students. They observed that persistent use of the lecture method and managing large classes is the major problem affecting learning and higher performance in Basic science.

In the same vein, Okebukola (2005) advanced some problems including lack of practical skills and inadequate knowledge of the subject matter. Many teachers think constructing instructional materials is difficult, time consuming and fund depleting (Omosewo, 2008). Jibrin and Nuru (2007) identify poor method of teaching and improper use of instructional materials as being the cause of poor performance. Gyuse (2009) observed that many students experience difficulty in science concepts and courses. This was as a result of constant use of lecture method without using teaching materials. Anaso (2008) attributed the poor performance in Basic science to large class size of basic science students. According to the chief examination report (2013) of junior school certificate examinations reported lack of qualified and incompetent science teachers, the use of only lecture methods of in.struction, inability to use and improvised instructional materials among others are the causes of declining of the performance in Basic science students. Teachers' neglect of the use of instructional materials has reduced student's motivation as far as learning is concerned. Thus,

without solving the problems of inadequate use of instructional materials the persistent under-performance and retention ability in Basic science will continue.

It is in the light of the above statement this research was set out to investigated effect of expository method enriched with improvised and standard instructional materials on academic performance of large classes of upper Basic Science students in Igabi, Kaduna State Nigeria.

1.3 Objectives of the Study

The study has the following objectives:

1. To determine difference in performance of students in large class exposed to expository method enriched with improvised instructional materials and those exposed to standard instructional materials .
2. To examine difference between performance of students in large class exposed to expository method enriched with improvised instructional materials and those exposed to expository method only
3. To investigate difference between performance of students in large class exposed to expository method enriched with standard instructional materials and those exposed to expository method only.
4. To verify the difference in the mean scores of male and female Students exposed to expository method enriched with improvised instructional materials.
5. To find out difference in the mean scores of male and female Students exposed to expository method enriched with standard instructional materials.

1.4 Research Questions

The following research questions were formulated for answering:

1. What is the difference in performance of students in large class exposed to expository method enriched with improvised instructional materials and those exposed to standard instructional materials? .
2. What is the difference in the performance of students in large class exposed to expository method enriched with improvised instructional materials and those exposed to expository method only? .
3. What is the difference in performance of students in large class exposed to expository method enriched with standard instructional materials and those exposed to expository method only?
4. Do male and female Students exposed to expository method enriched with improvised instructional materials differs in their mean scores?
5. What is the difference in the mean scores of male and female Students exposed to expository method enriched with standard instructional materials?

1.5 Hypotheses

The following null hypotheses were formulated for testing at 0.05 level of significance.

Ho_1: There is no significant difference between performance of students in large class exposed to expository method enriched with improvised instructional materials and those exposed to standard instructional materials .

Ho_2: There is no significant difference between performance of students in large class exposed to expository method enriched with improvised instructional materials and those exposed to expository method only .

Ho_3: There is no significant difference between performance of students in large class exposed to expository method enriched with standard instructional materials and those exposed to expository method only

Ho_4: There is no significant difference in the mean scores of male and female Students exposed to expository method enriched with improvised instructional materials.

Ho_5: There is no significant difference in the mean scores of male and female Students exposed to standard instructional materials.

1.6 Significance of the Study

The findings of the study will uplift the standard of Basic Science Education in the following ways;

Basic Science Teachers: It will help them to understand and develop the positive attitude of using instructional materials in the process of teaching-learning in all subjects in large class size.

Basic Science Students: It will give opportunity and training for students on how to interact positively and encourage individual student's best performance in Basic Science. It is therefore, hoped that when students are successful in learning through enriched improvised and standard instructional materials, they will look at Basic science with a positive attitude. Also it will help in motivating the students to be inquisitive in what to learn using materials.

Policy Makers: The study will educate the policy makers on the significance and relevance of using instructional materials in teaching-learning process, so that they can help in making them available and to reach the teachers and also enforce their use in the classroom.

Curriculum Planners: The study will motivate the curriculum planners to include and enforce the use of instructional materials by teachers as the implementers of the criculum.

Administrators: The study will provide information about the reality of educational practice.

This result can be used as reference point in making further educational practices by Science Education.

Professional Associations: such as the Science Teachers Association of Nigeria (STAN) and Nigerian Educational Research and Development Council (NERDC) can carryout seminars, workshops and research to help implement and communicate the result of the study to teachers to use as part of their instructional materials.

Textbook Authors will be stimulated to incorporate instructional materials for illustration in every topic.

Researchers: It will provide researchers with empirical evidence on the performance of students exposed to improvised and standard materials when compared to lecture and the finding of the study will add new knowledge to the existing literature.

1.7 The Scope of the Study

The study would be undertaken to determine the effects of expository method enriched with improvised instructional materials and expository method enriched with standard instructional materials on the academic performance of upper Basic Science students of large classes. The topics are energy conversion, conduction, convection, radiation, and temperature drawn from Nigeria Basic Science Book II under JSS syllabus STAN (1983). The topics form a good representation of major areas of Basic science, i.e. Biology, Chemistry and physics. These topics contain several activities that involve the use of instructional materials to enhance teaching and learning. A few researches conducted in Basic science revealed that the topics mentioned are among the few in which students usually fail test items. The upper Basic Science students i.e. Jss2 were chosen because they have been sufficiently exposed to Basic Science for the past one year and assumed to be more stable and matured. Therefore; they will understand science concept better. The research covered three

public upper Basic Education (junior secondary schools) in Rigachikun Zone, Igabi local Government Area of Kaduna state Nigeria.

1.8 Basic Assumptions

This study assumes that:

- Basic Science is taught by qualified teachers
- Basic science teachers already have skills on improvisation
- BasicScience students performance in large class size may be better enhanced by using expository method with instructional materials.
- Failure in Basic Science may be due to lack or inadequate instructional materials used during teaching
- Expository method is prevalent in Kaduna state schools.

CHAPTER TWO
REVIEW OF RELATED LITERATURE

2.1 Introduction

The study investigated the effects of expository method enriched with improvised and standard materials on performance of Large Class Basic Science students .In this chapter, an attempt is made to examine the related literature to the study. These are discussed under the following sub headings.

- Curriculum Reforms and Teaching of Upper Basic Science
- Science Teaching Methods
- Expository Method of Instruction
- Instructional Materials needed in Basic Science Teaching
- Concept of Standard Instructional Materials.
- Concept of Improvised Instructional Matserials.
- Instructional Materials and Academic Performance in Basic Science
- Large Classes and Academic performance in Science
- Gender and Academic performance in Science
- Overview of Similar Studies
- Implications of the Literature Reviewed for the Present Study

2.2 Curriculum Reforms and Teaching of Upper Basic Science.

In Nigeria, the zeal to promote Basic Science started as far back as late 1960s. The science curriculum was geared toward the fulfilment of overseas examinations requirement namely, the Cambridge school certificate examination or London general certificate in Education. In recent times, a clear pattern for science project development at the primary and junior secondary schools levels has been the integration of subjects from the field of science and technology. At the secondary, the emphasis has been on inquiry and problem solving activities.

The appreciation of the science as a major drive to technological and industrial development was triggered off in October 1957 when the then Soviet Union launched the sputnik; the first orbiting satellite ever Ogunleye (2008). This led to the awareness of the need to re-examine the school science circular, objectives, content and evaluation. Subsequently, several new science curricular were developed in many countries such as (U.S.A) and Britain to reconsider their Science curriculum (Ogunleye, 2008 and Yoloye,2002). This development yielded several curriculum reform projects such as the Science A Process Approach (SAPA) of the American Association of Science; the Physical Science Study Committee (PSSC); Elementary Science Study (ESS); Chemical Education Materials study (CHEM study), Biological Science Curriculum study (BSCS) all evolved in the U.S.A while in the Britain the Nuffields and schools science projects evolved (Bichi, 1998; Yoloye, 1998).

The focus of the curriculum reforms was to bring about a positive change in pedagogies (Bichi, 1998 & Yoloye 1998) that could express science as a process rather than a mere body of knowledge (Ogunleye, 2008). The reform projects were not limited to the U.S.A and Britain but were also extended to African countries that were then colonies of western Nations. One of such reforms was the African Primary Science Project (APSP) by the African Development Council (ADC) later to be known as Science Education Programme for Africa (SEPA). This project was aimed at enhancing the scientific of understanding citizens through the presentation of science as a process that is capable of arousing and maintaining interest in science in particular through the use of appropriate instructional procedures and materials.s Consequently, a new core curriculum known as the Nigeria Primary School Science and Mathematics Project (NPSSMP) was developed. Recently, in 2007 another new curriculum came up called Basic Science curriculum. This is a restructuring and re-alignment of the revised core curriculum for Primary Science and

Integrated Science of JSS level (Danmole, 2011). This curriculum place more emphasis on practical, exploratory and experimental method of teaching science. This is in line with the statement of Iwuazor (2006) and FME (2013) which states that curriculum contents meant to be activity or process oriented. It is therefore, observed that the use of instructional materials is in line with the manner in which the curriculum is designed (FME, 2013). In another contribution, Oladele and Lasisi (2006) have shown that a critical examination of the Nigerian Basic Science Core Curriculum reveals that science is an activity-oriented subject. It is in view of this that Danmole(2011) observed that there is need to explore and exploit all the available resources for improving science instruction. This shows that materials should be involved in teaching and learning process.

The teaching of Basic Science especially upper basic levels involves three issues which are the learner, the learning environment and the subject matter to be handled by a teacher using a strategy in the art of teaching. Teaching and learning are not the same, for a lesson is not taught until it has been learned. Teaching can be thought of as a process that facilitates learning.A teacher helps to make the society what it is. The influence of the teacher is a long lasting one. Good teaching can make a society better while bad teaching can harm it seriously. Therefore, a teacher must at-least have a good process and should be acquainted with the major variables that influence the success of the teaching learning process.

Although there are considerable variation between countries in terms of curriculum emphasis on content, local and national aims, traditions and priorities, yet in all these countries teachers are the key to realizing curriculum aims and the quality of the science education which the students receive rest ultimately on them; Asoko (2004). Teaching involves helping the student to learn. In teaching, the teacher does not only teach the subject but is dealing with a mind and a personality. Therefore, the teacher should aim at developing

qualities of personality and character that will provide a lasting inspiring example to his student. According to Asoko (2004), Teachers' lack of subject knowledge in science has been documented and frequently identified as barriers to the implementation of curriculum reform and to pupils' progress. Osborne (2003), has some pragmatic solution to the problem of lack of expertise within the existing teaching force. However, sustained improvements in Basic Science will depend on improved teacher capability .This could be viewed from both the initial and in – service education of teachers. So there is the need for the teacher to be knowledgeable and know how best knowledge could be developed and transformed.

The Basic Science curriculum is a general outcome of the topic to be covered by the teacher in the course of the school years. It enables science to be taught sequentially from year 1 – 6 and for each year a main topic is accompanied by performance objectives, content, activities, materials and evaluation (Aina, 2007). It is further observed that the curriculum concepts are arranged in order of difficulty from the lower class to upper class .If the curriculum is strictly followed, Aina (2007), maintained that pupils could develop interest in science education by observing and exploring the environment; develop acquisition of science process skills and develop a positive scientific attitude and objectivity among others. It is based on the content of the Basic Science Curriculum; if effective teaching and learning is to take place, the components of total planning for instruction has to be considered.

In teaching Basic Science Curriculum certain skills are needed, such as teaching skills, questioning skills, listening and attending skills .All is expected to be achieved at the end of the period. The goals and skills are derived from aims. One aim as stated in the National Policy on Education is. The acquisition of appropriate skills and the development of mental, physical and social abilities are for the development of the society. The National Policy on Education stated specifically the goals of secondary education in Nigeria is to provide trained manpower in the applied science, technology and commerce at sub

professional grades (FRN 2013). The philosophy guiding the teaching of Basic Science could be said to have its origin in Rausean's and pragmatic philosophy of nature and experience of Dewey. Others like the empiricists and inductivities also influenced the integrated approach to the teaching of science. Making decisions on the type of method to use for the teaching of Basic Science is dependent on the following :The world of Scientific Knowledge that could be derived from nature environment ,the scientific skills that could be used in deriving such knowledge ,the intellectual capacity of the child in using the skills to generate or falsify scientific knowledge and the systematic study of the universe demands active participation of the learner if he is to acquire the necessary skills that will make him function in scientific and technologically – oriented world. It is for this reason that all Basic Science programmes recommended the use of inquiry/discovery/activity method. Based on this, that for the junior secondary which is now upper Basic Science curriculum, the child – centred approach instruction is emphasized. Specifically, the three strategies that are recommended :The inclusion of problem – solving activities ;the use of discovery teaching modes and the involvement of students in open – ended activities, field trips/excursions .From the above, it is clear that the philosophy guiding the teaching of Basic Science is child – centred Activity.

All these objectives and goals are achieved by the teacher through giving the right types of instructions to the science students, no matter how well – developed and comprehensive a curriculum is, its success is dependent on the quality of the teachers implementing it. Moreover the realization of these goals can be hindered by non – availability of science equipment that can ensure effective teaching and learning. Franzer and Jegede (Oladeji et.,al 2011) stress that; a professionally qualified science teacher no matter how well trained would be unable to put his ideas into practice if the school setting lacks the equipment and materials necessary for him/her to translate his competence into reality. This implied that materials should be involved in the teaching and learning. Therefore, in a situation where the

materials are unavailable or inadequate improvisation should be an alternative way; the regular failure in Basic Science as a result of inadequate instructional materials to improve this by the used of improvised and standard materials.

Ezeliora (2005) showed that locally improvised materials showed superior effect on students performance and interests. The more familiar the students are with the instructional environment of a science class, the more interest and better understanding they are likely to develop and hence more performance in the concept of the Basic Science programme. Inquiry/discovery and activity method of teaching science at the upper Basic schools is recommended from the above, Eyetsinitan, (2002) stated that the teaching and learning of science at upper Basic school is process approach.

2.3 Science Teaching Methods

Instructional methods involve planning, guiding and directing learners, materials and ideas to produce learning. The methods determine to a great extent the objectives of classroom procedures and means that will be employed for the achievement of such objectives set. Method is the procedure for guiding and directing the experience of students towards meaningful learning. Well planned and organised instructional methods are important means by which effective teaching and learning is carried out. Method is defined as a procedure or way of doing something in an orderly manner or way of imparting knowledge and skill, it can also be described as an organizational process that a class or a group will participates so as to define and attack problem that is significant. Teachers of all subjects' especially Basic Science must be aware of the objectives of these subjects' ranges from broad goals for total programme to specific instructional objects. Method "belongs primarily to the teacher whose responsibility is to find an effective way of guiding students to profitable learning and growth". In education the word method means the mode by which the material is

communicated from the teacher to the student ,it is the way teachers impart knowledge and skills while teaching, and students comprehend knowledge and acquire the skills in the process of teaching Rao(2004).

The different science teaching methods that were in existence before 1950's was undertaken to be passive transferred of ideas to the learners. Teaching of science as was done based on textbook oriented. Effective teaching and learning can be ensured only when the truly professional and committed teacher has a reservoir of methods to tap from with respect to the topic he wants to teach, the nature of the students involved and the objectives to be achieved. Today, the methods that science teachers employ in the classroom to present scientific facts, information, principle, skill on concept to the students are many. Some are frequently used than others although non is the best for all the topics. Some of the existing methods currently in used as stated by Abdullahi (1982) and educationist such as Denga(2005), NTI (2007), Getso (2008), Dike (2008), Dangbe et al., (2008).

- Demonstration method
- Inquiry method/Discovery method
- Project method
- Field Trips excursion
- Discussion method
- Individualized learning method
- Expository method
- Team teaching
- Play method

For the implementation of any method in science and technology (Atadoga and Onaolapo(2008) pointed out that the science teachers should put the following into consideration. They are:

- The age of the child
- The child previous or background knowledge
- The teacher must be competent enough to handle a particular method of his/her own choice.
- The science teacher must understand the concepts to be taught in the classroom.
- The teacher should be able to find and use relevant instructional materials for the topic to be taught.

Expository method or talk and chalk method is a teacher – dominated approach to teaching. It involves the teacher telling the students what he knows about a concept while the students listen and some busying writing or coping. According to Okoye (2008). It is reported that "the act of lecturing consists of one person usually the teacher, talking to many students about a define concept". The expository method may or may not be involved the use of resources and questions. It involves one - way communication pattern in which the teacher is the dominant and student participation is low or non-existent. Its teacher centred approach where lesson is delivered to the learners without the use of any instructional materials (Okoye and Ovri, 2008). The method is used in elaborating, simplifying, classifying and discussing new materials (Atadoga and Onaolapo (2008). However the method has some advantages and disadvantages.

The main advantage of expository method that it allows for easy handling of large classes and coverage of syllabus as large information disseminated. However, the disadvantages of expository method are :It does not promote meaningful learning as it appeals to the sense of hearing and not all the senses ;most of the classes in schools consist of different ability groups in the class ;most students learn better through the manipulation of object while others learn easily through hearing, seeing objects and events and it is not a good method for teaching science in the Junior Secondary School as it encourages rote

learning and regurgitation of information without necessarily aiding understanding.

The Basic science is activity oriented. The National Policy on Education (FME, 2013) emphasized activity based or child - centred learning approach. According to Folorunso and Nwosu (2006) the use of improvised materials makes the lesson activity based. The use of improvised materials along with lecture method is an innovative method or another new method of teaching. -The efforts to change teaching method will go a long way in enhancing, improving and facilitating teaching and learning of science. It is in the light of the above that this study intends to use improvised and standard instructional materials to see the effects on student's performance in Basic Science among upper Basic students.

Discussion method is a method that involves the students talking over a subject from various points of view, with the teacher properly directing questions to elicit more information from the students. Discussion method is interactive process involving many communications between teacher and the students from one student to the other. According to Abdullahi (1982) it simply means talking over subjects from various points of view, with the teacher acting as the moderator. The main advantage of discussion method is that it builds up self confidence in students through frequent exchange of ideas between the student and the teacher. Students get a lot of knowledge of their own through active participation and involvement in the lesson. It is also useful in laboratory activities in the discussion of data and improvement of an experimental design .The disadvantage of discussion is, it is a time consuming method. Great time is taken by a continuous of questions and answers; some students may never participate at all; it will not allow for coverage of syllabus and except carefully handled.

Project method is used by teachers mainly to individualize instruction. The method is meant to provide for the needs of the individual students, or sometimes small group so that

those with special abilities have opportunities to fulfil themselves. Denga (2005) state that project method was born of a philosophy which holds that concepts are carefully understood through observable consequences and that learning involves direct contact with things. She added that project method is a combination of assignment and centre of interest; this is because in project work, the centre of interest is regarded as the aim rather the base of learning activities. The learners are encouraged to investigate, collect materials/specimen, analyse and construct things on their own. This is done after the teacher or both the teacher and learners have selected a central theme or problem. The teacher directs and guide in this method. The learners can work individually or in groups. At the end of their finding in their respective works, it will be discussed with the whole class (Dang be et, al 2008 &NTI, 2007). The project gives learners the opportunity to carry out investigation in science on their own. Some of the advantages are: motivation to work is high since it is based on natural interest of the students, it provides opportunity to develop student initiative as a greater understanding on how to learn and it gives room for independent work and to gain depth knowledge of specific area; and affords opportunity for developing leadership and organizing ability.

The disadvantages of project method are it is time consuming, interest of all students is not taken care of since one or more topics cannot interest all the students at once and the method favours the students who like independent work.

Another science teaching method is the laboratory/investigation method. This is an activity carried out by one or more persons through the exercise and experimental approaches or instructional approach within the confines of the laboratory. The exercise involves verification of facts while the experiment is investigative. According to Denga (2005), all laboratory exercises are experiments but not all experiments can be regarded as laboratory work. The main advantages are :Provides students with concrete learning experiences and reinforcing theoretical learning ,it helps students to develop scientific attitudes, promotes

students interest and it gives training in problem solving, therefore, promoting self-reliance .The disadvantages of this method include difficult to organize , time consuming and provision of adequate equipment/apparatus may be expensive.

Individualized learning is a science teaching method employed to meet individual differences. Denga (2005), arguing in favour of this, stated that learning is an individual thing, no matter how many students there are to a teacher considering the type of educational system which we operate, this method is hardly realizable. Denga (2005) reported some finding using individualized system of instruction through use of objective, learning materials, mastering learning, self – spacing, tutors and frequent tests. He found that there was a significant difference in performance between students in individualized system of instruction than those in the conventional laboratory course. Adullahi (1982). also stated that individualized teaching is a situation where the student gets primary control over what he studies for how long, where, when and with whom. According to him, it is a means of helping students in areas of their concern since the education is for the student. The problem today is that individual difference is hardly taken into consideration in our classroom. In Nigeria, the emphasis in the schools is on group learning and interaction. The system is assumed that all the children in a given class should cover the same fixed amount of material in a particular period. Yet we know that the children are not all alike in terms of their needs, interests, motivations and abilities.

Team teaching is another science teaching method. Abdullahi (1982), defined team teaching as a form of organisation in which individual teachers decide to pull resources, interests and expertise in order to device and implement a scheme of work suitable to the needs of their students and facilities of their school. Traditional organisation of the school into classes being taught by one teacher has been taken for granted as the only way of operating in the system. But in team teaching, two or more teachers share the business of

teaching a group of students.

According to Denga (2005), defined team teaching as an arrangement in which two or more teachers and their assistants taking advantage of their special competencies plan to instruct and evaluates one or more subjects areas, a group of elementary or secondary students equivalent in size to two or more conventional classes, using a variety of technical aids to teaching and learning through large group instruction, small group discussion and independent study; these are the vital variables in team teaching. Azua (1998) defined team teaching as "a situation or process whereby sets of teachers work together or co-operate in planning, presenting and evaluating of the teaching and learning process". He goes further to say that team teaching equipped and furnishes teachers on their respective strategies of teaching and subject matters.

The main advantages are it exposed the students to many teachers providing a variety which is needed; it provides opportunity for individual difference in small group and independent study, it breaks the monotony of the conventional classroom .The quality of instruction is better when compared to that of conventional classroom because of the time taken for planning and pooling of resources, building space resources and teachers are more economically managed.

Discovery or inquiry method of teaching in science refers to a way of questioning, seeking knowledge or information, finding out about phenomena. According to Sola and Ojo (2007), discovery activity is an activity designed in such a way that the student, through his own mental processes, discovers concepts and principle in this method, the child left to discover phenomena; through mental processes such as observation classification, measurements, prediction, description and inference.

Discovery method according Nwagbo (2005) is defined as the method which involves an unstructured exploration in the laboratory in which the student, through his mental

processes such as observing, measuring, classifying and so forth, can draw conclusions from the data which he has gathered. It is a method by which human beings seek for information or understanding. Teaching by inquiry may involve discovery in which there is creativity and students participation in a well equipped laboratory. The method assists the students in problem solving. This method is a student or child-centred and activity oriented, there by gives the learners the opportunity to discover facts about a particular problem (Dike, 2008. Getso 2008 .Okoye and Ovri, 2008). In discovery method, it involves investigation, searching, defining a problem, formulating hypothesis (Sola and Ojo, 2007). This method gives learner the opportunities to engage in exploitation and sense making with content (Foley and Maphee, 2008). It also gives students self direction to assimilate and accommodate information (Sola and Ojo, 2007).

Many researchers who have worked on inquiry method of teaching.Nwagbo (2006) shows that student's performance is better than in expository method. Similarly, Ojaside and James (2009), explained that inquiry approach assist learners to understand problem solving as they teach by experimentation. The findings of Ibe (2006) on inquiry method showed highest mean scores compared with demonstration and the least mean score in the lecture method. By implication this method gives learners the opportunity to be more critical in questioning and is able to find out facts from materials, people and other resources. It also gives the students motivation and interest to examine issues that affects them and their community.

Field Trip/Excursion is an excursion taken outside the classroom for the purpose of making relevant observations and for obtaining some specific information. In line with Ibe (2006); he defined field trip as a method of teaching science is a planned activity which take place outside the classroom, for the purpose of making relevant and also for obtaining specific and exact information about the subject matter. Field trip gives the learner direct

experience and concrete evidences. When field trips are well planned, it offers the students opportunities to observing, collecting, classifying, studying relationship and manipulation of objects. It is an interesting, enjoyable and exciting experience of students studying science. Therefore,very effective in teaching science.

Field trip in science teaching makes learning real and permanent to the child but expensive to carry. Therefore ,its creates meaningful learning and allow easier application of learning to real situations. This method is very important in enhancing performance in science. Ado and Inola (2009) in their study on field trip approach for teaching area and volume of shapes for architectural skills yielded better performance than expository method.

Role play and simulation method is also employed in science teaching because it stimulates interest and its naturally traits of children. This is because it gives enjoyment and satisfaction (Dangbe et al (2008). Long John (2005) in Long John (2009) explained that students who are bored and no motivated by school work; motivation is the alternative by playing games or role play. Role play and problem solving can be used effectively in inquiry teaching. According to Dike and Mohammed (2000), role play is an un-rehearsed dramatization where the player tries to clarify a situation by acting out the roles of the participants in the situation. One form of role play is dramatization children are involve in playing parts during their imagination which leads them to act in the capacity of known or of imaginary individuals. This make believe, is very important in the learning process. The role may be used in any of these ways:

- To clarify attitude and concept
- To demonstrate attitude and concepts
- To portray deeper understanding of social situations
- To plan and try out strategies for tacking problems and
- To test hypothetical solutions to problem.

Simulation according to Dike and Mohammed (2000) is defined as the acting of a make believe episode. It bears a resemblance like the real thing as much as possible but with some of dangerous and complicating factors, removed. It is an imitation. Simulation scenario must be assigned definite roles which require their making action in a well defined situation. The students are made to face resemblance of real life situations that require them to take definite actions for solutions. Steps outlined by Denga 2005, in making a simulation are: Introduce the plan to the students, explain the purpose of the assigned roles, brief the students about their roles ,be sure they understand them ,conduct the simulation to the student and follow up with a critic in which student have a chance to discuss what they have done and to draw generalization.

Demonstration method is also a science teaching method. The method is defined as the act of showing, displaying, something. It involves displaying, illustrating a technique or performing an experiment for the student to see. Though demonstration activities are always defined to embrace laboratory experiments, however, there is a distinction between the two practices. In demonstration, the mode of communication is a two – way communication; the emphasis is on the student's involvement in all learning activities. There is a need for the teacher to broaden his concept on demonstration to involve student participation. The demonstration is usually done by the teachers but sometimes it can be performed by the students individually or in small groups.

According to Obeka (2010), this method serves various purposes in teaching. These include setting a problem, illustration a point or to serve as climax – performing on exciting students which is an excellent way to end a lesson. The main advantages of demonstration is, it saves time; it is economical as a teaching technique since materials and equipment are required, its permits students to observe the process in nature; it is an attention inducer and a powerful motivator and allows students to observe scientific activities which otherwise would

have been impossible because its expensive, difficult to handle themselves.

The disadvantages of demonstration are:Time and opportunity may not be available for students to acquire desirable skills e.g. manipulative skills ,visibility is a problem especially in large classes or where extremely small objects are used and lack of student's participation can reduce their understanding and give them a feeling of not being involved .Demonstration as a method in teaching science motivate and adds interest to the lesson as it gives room for students to be involved. However, in a large class it is sometimes discouraged.

Despite the effort made to improve science teaching, Abdullahi, 1982; Achimugu, 2004 and Denga (2005) revealed that the teaching of Basic Science in upper Basic Schools is in effective. Therefore, the National Policy on Education (FME, 2013) emphasised the use of instructional materials at the upper basic school i.e. Junior Secondary Schools.

2.4 Expository Method of Instruction

The expository method of instruction is one of the most popular methods of instruction commonly used for science teaching. This method is known as lecture method or talk and chalk method as it is teacher-centered approach where lesson is delivered to the learners without the used of any instructional materials (Okoye and Ovri, 2008). Expository method of instruction emphasised "Talk and Chalk" in the teaching of science subjects. It encouraged passive learning among students since most of them often sit quietly copying notes from the board or listening passively to a teacher telling, reading or illustrating/demonstrating. Students' minds are seen as empty reservoirs into which knowledge could be stored discriminately. The outcome of this is that students are encouraged memorizes scientific fact, principles and concepts leading to rote learning. Danladi (2003) observes that teachers at this time employ teacher centred method of instruction which disallow students' active participation in the lesson. More than 80% of scientific information is delivered as lectures (Bichi 2002). Teachers embrace this method for easy coverage of the school syllabus. It is

characterised by one way flow of information from the teacher who is always active, while the student are always passive. This method saves time and energy. It allows easy handling of large classes without much stress and is not expensive as only the chalk/maker and board are required. In its true nature the expository method is not effective for science teaching. Bichi 2002, Usman (2000), Gyuse (2009) and Dyel (2011) all argued against it because it does not promote meaningful learning of science. This is how ever detriment to students learning, but the teacher may not have a choice being driven by the pressure to cover the syllabus and thus prepare the students for the external examination which is the only qualifying measure to the next level or employment.

Atadoga & Onaolapo (2008) further noted that the expository method has some basic common problems which are;

i. The teachers disposition: Since the teacher is the authority of the subject matter as well as controllers of student's behaviour, the communication is only one way. Students' have limited opportunities to express their problems and needs.

ii. Communication problem: Inexpository method of instruction delivery is the most personal problem due to individual differences in classrooms. For effective teaching, good communication must be maintained between the teacher and the students. This involved clarity of voice, simple and understandable language style, etc.

iii. The preparation, organisation and presentation: This has to do with clear aims and objectives of the course and the student's previous knowledge will enhance good preparation, lecture materials should be put together ahead of lessons, reporting it as when due. The teacher's presentation should be in a manner that will aid students to develop and maintain interest in the subject. Studies conducted on this method show lecture can promote meaningful learning if properly employed. Okoye and Ovri (2008) suggested that lecture method should not be totally condemned in science

education but should be accompanied along with other means to avoid passive learning. In the light of this, there is possible means of enriching the expository method through combining it by with the use of improvised and standard instructional materials. According to Ezekiel (2004) stated that when verbal instruction is combined with concrete display of learning materials, the rate of assimilation by the learners could be highly enhance at secondary school. This study investigated the effects of enriched expository method with improvised and standard materials on performance of basic science students of large class size.

2.5 Instructional Materials Needed in Basic Science Teaching

The importance of instructional materials for basic science teaching and learning cannot be underestimated in the Nigerian School system today that is experiencing a boost in population giving size to greater demand for classroom facilities and equipment. Learning is permanent when the learner is able to complement classroom teaching with adequately selected materials (Denwigwe, 2008). He explained that instructional materials enhance teaching and learning process in many ways, such as: it assists the teacher to explain concepts easily and logically ,it stimulates creativity and imagination ability in the teacher and learner,it provides a cognitive bridge between abstraction and reality to students, reducing the extent to which the teacher talks i.e. Eliminate boredom, it enhance speed and accuracy in lesson delivery,it makes the learning environment very stimulating and conducive to the learners during Basic Science lesson and it makes the work easier, neater and more accurate, boosting for clarity and well appealing for under-standing. The resources for Basic Science teaching and learning can be obtained for effective use in our local environment. NTI (2007) explained that the basic teaching materials can be acquired through: Collection of materials from the immediate locality of the school ,Donations from well wishers, parents teachers

association (PTA) etc, Education resources centres (ERCs),involve the pupils in the collection and production and distribution by government and non – governmental organisation (NGOS)

The instructional material is very important for teaching in Basic Science. Basic Science is one of the core subjects in curriculum for upper Basic education which if taught properly would help realizing the set objectives. In order to teach Basic science well, instructional materials are very important (Uyoata 2006). Therefore, there is need for awareness of the construction and utilization of improvised materials for Basic Science teaching and learning.

Scientific literacy of people is a very vital condition for fast technological, environmentally sound development in a country. To attain this goal, science education must be available to all. The National Policy on education stated specifically the goals of secondary school education in Nigeria is to provide trained manpower in science, technology and commerce at sub professional grades (FRN, 2013). The prevalent goal of science educators and scientists is that practical use of materials/equipment in science education will increase scientific principles and their application in the real world. Modern science teaching methods in particular emphasize "learning by doing" and "hands on approaches".

The goals are achieved by the teacher through giving the right types of instruction to the science students. No matter how well developed and comprehensive a curriculum is, its success is dependent on the quality of the teachers implementing it. Moreover the realization of these goals can be hindered by non availability of science equipment that can enhance effective teaching and learning. The use of instructional materials is not new in the teaching and learning of science. Early scientists were able to discovered many important things, as well as teach science effectively because of the equipment/materials they are able to make and other needed resources Madumere (2006).Franzer and Jegede (Oladeji et al 2011) stress

that a professionally qualified science teacher no matter how well trained would be unable to put his ideas into practice if the school setting lack the equipment and materials necessary for him or her to translate his competence into reality.

Instructional materials have been defined by many writers, Akinsola (2009), sees instructional materials as those materials that make the work of a teacher easier, better and make learning less strenuous for both the teacher and the learners. Udo (2006), defined instructional materials as all the resources which facilitate the acquisition of skills and knowledge by the learners. According to Abdullahi (2009), instructional materials are those materials which a teacher uses or manipulates in the process of his teaching in order to enhance learning process. Yusuf (2009), also described instructional materials as teaching materials used by the teacher to pass information to students in real life situation. Instructional materials are important in our educational system. It is clear that the main objective of using instructional materials in teaching is to achieve excellence in Basic Science education. Therefore, no lesson is well taught without the use of teaching aids or the use of instructional materials.

Instructional materials are in different form Odey (2007), classified instructional materials into; Audio materials, visual materials, audio-visual materials, Audio –visual includes; television; visual materials examples are real objects, charts, textbooks, Audio materials includes radio or tape recorder etc .The instructional materials make the teaching and learning easier. It is in respect of this that Imuran (2010) viewed the functions of the instructional materials availability on the student's academic performance as

- It makes the students have interest in learning
- It captures the attention of the learners
- It arises and motivates the learner to learn
- It provides the learner with opportunity to manipulate objects in the environment.

- Save time by limiting the use of wordy explanation and
- It offers opportunity for learners to develop their abilities and skills.

From the above, in using instructional materials their selection have to be considered. There are certain criteria for selection of instructional materials for effective teaching. These criteria include, behavioural objectives , structure of the subject matter, learning style, practicability, availability and teachers capability.

2.5.1 Concept of Standard Instructional Materials.

The concept of standard instructional materials refers to those equipment and materials that a teacher uses to illustrate emphasize and explain a lesson, thus making the lesson clear to the students. The equipment and materials include objects that are obtained in the industry or factory either within the country or imported. The standard instructional materials are also classified into three categories; Visual, Audio and Audio-visual materials.

The standard instructional materials are collection of imported or factory made equipment, which the teachers require to make teaching of science clearer for the child to learn science (Ayodele, 2000). Because of the usefulness of science teaching materials, Abdullahi (2009) reported that teaching science will not be successful without equipment and variety of instructional materials.

The importance of standard instructional materials for science teaching and learning of Basic Science cannot be overemphasized since Basic Science is a subject that is activity oriented and the suggested method for teaching it is guided discovery method which is resource base (NTI, 2007).Many researches on standard instructional materials have shown that students learn better with materials, (Akinmade,1992; Akale and Usman 1993); Because it helps in acquisition of scientific skills. Therefore, Olagunju (2000) stated that there are various realm materials that can be readily used to enrich learning among students. These are

candle, heater, wind vane, rain range, herbarium, microscope, simple machine etc. Achimugu (2000) explained that if these equipments are use in teaching, students will learn Basic Science better.

This suggests that the mastery of Basic Science concepts cannot be fully achieved without the use of instructional learning materials. The teaching of Basic Science without instructional learning materials will certainly result to poor achievement in the course. Franzer and Jegede (Oladejo et, al, 2011) stressed that; a professionally qualified science teacher no matter how well trained would be unable to put his ideas into practice if the school setting lacks the equipment and materials necessary for him or her to translate his competence into reality. Achimugu (2000) posits that, students comprehend and remember better when instructional materials are employed in the teaching learning process. The use of Basic Science teaching materials if carefully and properly planned enhances teaching and learning of Basic Science. The effects of this are that they make the learning of science enjoyable, interesting and exciting to the student.

Many researchers have revealed that instructional materials could be used to effectively teach Basic Science to enrich the learning experience of the learners (Ayua, 2011). Also, Usman and Adewumi (2006) stated that the use of instructional materials stimulate students/pupils interest and achievement in science. Abdullahi (2009) stated that greater emphasis should be placed on doing than telling. The students should be immersed in an extended series of enriched experiences that will help to give them opportunity of self discovery instead of read about, tell-about, teacher demonstration oriented course .Though, many researchers have shown the impact of these science teaching equipment on performance, according to Ogunleye (2002) and Obioha (2006) reported that there were inadequate resources for teaching Basic Science at the upper basic level in Nigeria. They further stated that the available ones are not usually in good conditions. Nnaobi (2003) stated

that one main factor contributing to the poor performance of students in science is the lack of teaching materials and equipment. Therefore, substitution and improvisation of the needed standard instructional materials ought to take place.

2.5.2 Concept of Improvised Instructional Materials

The concept of improvisation has been defined by many authors. According to Igwe (2005) improvisation is the making or inventing of a piece of science teaching equipment in emergency .Ayodele (2000) viewed improvisation as the act of making of substitutes in the absence of real materials. Ajayi (2004) define improvisation as the provision of alternative to real things. According to Ihiegbulem (2006); improvisation is the act of substituting for the standard equipment or instructional materials not available, with locally made equipment or instructional materials from readily available natural resources. National Teachers Institute in Omachi (2000) defines improvisation as the act of using alternative materials and resources due to lack or insufficient teaching aids to facilitate instruction. Therefore improvisation means sourcing and production of equipmenst or materials using available local and cheaper resources to meet the need by imitating the real materials to make teaching and learning effective and meaningful.

Improvised materials are materials that are used in the absence of the real, original or delicate objects to bring about effective teaching and learning instead of the real or complicated materials that would have been brought. This materials/equipment can be invented or produce from readily available materials within the environment. In science teaching at the upper basic school, where the standard materials are not available they should improvised . Ezeliora (2005) showed that locally improvised materials show superior effect to students achievement and interest.The more familiar the students are with the instructional environment of a science class, the more interest they are likely to develop and hence more

achievement in the concept; science instructional materials or equipment are essential, therefore they are needed by the teachers for demonstration and investigation. According to Ajayi (2004) highlighted the different ways in which materials could be improvise. These include :Collection of specimens, objects etc from the environment without cost.Pictures can be made by use of combination of bits of papers, cloth or cut out from cardboard, newspapers and magazines; clear visual summary of an important process can be designed from a combination of pictorial, graphical materials. Examples of these are tabular charts, slip charts, strip charts etc. and obtained from community resources such as agricultural farms, industrials establishment, steeling rolling mill, market, zoo, museum etc. the collection of materials is very important as well as their construction.

Abraham (2002), points out that we have two main types of improvisation.These are: improvisation by substitution, where an already existing local materials is used in place of equipment that is not available. The other is improvisation by construction in this case a teacher or the student constructs a new material entirely to teach his lesson, when the required material or equipment is not available. Igwe (2005), described improvisation as the act of using materials or equipment obtained from the local environment or designed by either the science teacher or with the help of local personnel to enhance instruction. From the definition, improvisation consists of two forms; the first is called "Role Substitution". A situation where the original item generally requires little or no modification before it can be used to fulfil the new functions, in the experimental situation e.g. the use of baby's feeding bottle for graduated measuring cylinder, kerosene stove for a Bunsen burner, use of polyester cup as a beaker. The second is called "Role simulation". A situation where there is need for the construction of an item or apparatus to meet a need which for reasons of cost or unavailability could not be met .When the cost is a factor, the intent is to construct an item that would fulfil the same function but at a cheaper rate. In order to save money, locally

available materials and skills are utilized, e.g a local carpenter could construct a pulley using wood, test tube racks, tripod stands etc. Igwe (2005) while supporting improvisation went further to discuss the types of improvisation. In doing this he said that the improvisation of the basic equipment can be two main ways:

- By role substitution and
- By role of simulation.

The needs for improvisation of instructional material is very vital in the teaching of science in an ideal situation, all science students would be taught in small classes held in well-equipped laboratories but in the absence of those well-equipped laboratories, illustration and practical activities cannot be over emphasized. Instructional materials required for teaching of science are very much in short supply as (Omosewa,2008) lamented that these is a total or partial absent, inadequate finances most especially for the purchase of science equipment, galloping inflation high enrol of students, general downward trend in the nation's economy, poor maintenance culture and at times attitudes of some school heads towards science and science equipment call for the efforts at making science teaching and learning inadequate and un interesting. Bassey (2002), opined that science is resource intensive. Furthermore, in a period of economic recession, it will be very difficult to adequately find some of the electronic gadget/ equipment for science classes in schools. A situation that is further compounded by the galloping inflation in the country and often relatedness of some imported sophisticated materials and equipment; hence need to produce materials locally.

Researchers such as Okonkwo (2005), Ogunleye (2002), Mkpanang (2005) and Obioha (2006) reported that there were inadequate resources for the teaching of science subjects in secondary school in Nigeria. They further stated that where there were little resources at all, they were not usually in good conditions, while the few that were in good conditions were not enough to go round those who needed them.

Akinsola (2000) and Omosewo (2008), considered the human factors as the teachers professional commitment, creativity, mechanical skills, initiative and resource - fullness. They found that many of Nigeria science teachers were aware of possibility of improvisation but many exhibited poor attitudes towards improvisation. They also noted that very few teachers practice improvisation while majority depends on imported equipment and claim that improvisation is time – consuming and fund depleting. The writer noted that students too, possess little or no interest in improvisation.

Experience over the years has shown that teachers have been depending on excessive use of words to express, to convey ideas or facts in teaching – learning process. This practice is termed "chalk - talk" method. Today, advancement in technology has made it possible to produce materials and devices that could be used to minimized teachers talking and at the same time, make the message clearer, more interesting and easier to understand (Onasanya et al, 2008). With all these problems, it seems that the best option is the improvisation of science teaching materials in the classroom for teacher and even students.

The basic consideration on any improvisation in the teaching and learning process involve certain criteria which must be put into consideration. The basic consideration necessary according to Maduabum (2003), include: What is to be taught, the objectives of the lesson ,the background of the learners ,the durability of the improvised materials and the cost advantage of the improvised materials .Therefore, the degree of adequacy of the improvised instructional materials will be determined by what is to be taught and the objective of the lesson.

According to Abrahim(2002),the following are some of the advantages of improvisation.The use of local materials reduces cost in term of financial expenditure for purchasing ready – made materials ,it enables the learner and teachers make proper use of their environment because in improvisation we mainly make use of the available materials in

the environment ,the development of resource materials for instruction can lead to discovery of new knowledge ,they provide experience not easily obtained through other means and contribute to efficiency, depth and varieties of learning ,when parent, learner and community members assist in improvising a resource material such a donating material,it will improve school – community relationship ,improvisation helps to bridge the gap between theoretical knowledge and practicability ,When the teacher and learner succeed in improvising an instructional material, there it a high sense of achievement and they are encouraged to higher exploits and talents in the students are discovered.

The major disadvantage of improvisation according to Bassey (2002) explains that there are two militating factors: technical and human . Low degree of accuracy and precision which affect some improvised materials are termed as "technical factors". While the human factors problems are attributed to skill-fullness, creativity and competence. Having known what improvisation is, it is necessary to guides people that would be involved in improvisation of instructional materials. These include appropriateness of teaching aids to the age of the learners for whom they are meant, its clarity in illustration of concepts, its adequacy in size, its relevance to the lesson they are meant to serve, it should be interesting to the learners and durable among others.

Igwe (2005) stated that when the desire is not available then the available should become the alternative if it performs the same or similar function as the desirable. It should be noted that the resource materials do not achieve any of the attributed values on their own .The usefulness depends on what the teacher makes out of them i.e the influence made on the students by the teacher with the materials. Also Abraham (2002) pointed some guides as follows; the materials to be improvised should be relevant to the concept to be taught; the materials could be obtain within the town, village, school, home etc.; students should be assigned to participate in collection of the materials to be used. This will develop their

creativity, motivate them to learn and increase their manipulative skills. The students should be involved in the process of improvisation.

2.6 Instructional Materials and Academic Performance in Basic Science

The use of instructional materials for the teaching and learning of Basic Science cannot be underrated. This is important because instructional materials would help in solving problems in teaching and learning. In using materials in order to solve the problems in teaching/ learning, teachers should be systematic in designing, carrying out, and evaluating the total process of learning and learning in terms of the objectives to be achieved,which are based upon human research in learning and communication to bring about effective instruction in the learning process.

Instructional materials are meant to improve and complement or supplement, not to replace the teacher. Instructional materials create change and progress only when the teacher is knowledgeable and knows how to make use of them ,thus portraying the professional attributes of the teacher and the general knowledge or his creativity in selecting, developing and using instructional materials effectively (Emma and Ajayi, 2004). Okay (2008) stated that instructional materials stimulate the students desire to learn. They arrest and sustain attention of learners ,help in the understanding of abstract concepts ,promote the spirit of inquiry ,help to reduce verbalism or the repetition of words ,help in perception and retention of information provides common frame none of experience to a large number of learners and they inculcates in the individual scientific skills and attitude in this approach to personal and social problems.

Also, in line with the above researchers Ajayi (2004) stated that instructional materials are used to motivated and sustain the interest of students, clarify information, present and illustrate new concepts and ideas, stimulate discussion, challenge independent thinking, influence attitudes summarize what has been learnt and provide experience that

encourages transfer of knowledge and skills to new tasks. Use of instructional materials tend to foster collaboration among students, which in turn may have a positive effect on student's achievement. He maintained that there is the need for teachers to develop the attitude of using instructional material in the teaching and learning process, so that effective learning can take place and to enhance good performance in the learners.

2.7 Large Classes and Academic Performance in Basic Science

The concept of large classes is very important in the teaching – learning situation. Without considering large classes it is doubtful whether meaningful teaching and learning can take place. Large class is necessary in the schools for the sake of the learner's performance and intellectual growth .The academic performance of students in many learning situation depends on many factors such as the socio-economic background ,teachers qualification ,school location ,learning attitude ,teaching method, mode of learning activities ,sex and large classes of the learners. Large class has no exact number of students per teacher (student-teacher ratio).In some countries, 25 – 30 is considered large, while in other countries this is seems to be normal or even quiet small (UNESCO, 2006). In Nigeria the national policy on education (FRN, 2004) regarded large classes are those where the students/ teacher ratio exceed 40:1. From a teacher perspective, a class is "large" whenever it feels large, and while a class of more than 50 students is usually consider a large class to those who normally teach 25 or fewer students, a class of 35 can be large and overwhelming. Other researchers consider a large class as one having a student population of 50 – 70 students to one teacher. (Glass and Smith; 1982, Shaibu, 2003 ; Booser and Maloney, 2004).

In term of numerical strength, the national policy on education (2004) specify 20 in pre-primary, 20 in primary and maximum of 40 in secondary school. These specification, however are unrealistic in some areas as a result of dense population and shortage of class

rooms .According to Anaso 2008 large class is of significant concern for teachers in schools and for parents whose children attend such schools. While Okebukola 2005, opine that large classes have led to inadequate teaching and learning materials. He said that it was predicted that as class size increased there would be more inattentiveness in class and more sign of difficulties between children in the form of more rejection, a social anxious and aggressive behaviour and less pro-social behaviour.

A large class is what the teacher considers as a considerable size of students population beyond the normal capacity in his teaching within a classroom space or subject (Nolasco and Arthur(1988). Abdullahi (1996) identified a large class as a factor that militates against effective curriculum implementation and in practical terms increases the teacher's workload, creates space problem, increase high level of indiscipline and inhibits the teacher's routine operational practices. He explained that this goes further to include difficulties in assessing class work and as well reduces teacher/ student interaction. Charleston (1994) described large class as one teacher to fifty students on average. He believed that teacher high numerical strength of the student does not permit the teacher to handle the class effectively and adequately attend to individual students will certainly be lacking. Omachi (2000) asserted that teachers are disturbed by the fact that large class prevents them from knowing students well. Salawu (1996), Waitutu (2006), Mahmud (2009) all have attributed student poor performance in Basic Science to large classroom in our secondary schools.

Duyilemi (1998) reported that many teachers faced with large class might be tempted to give up, thinking that there is no chance of getting so many students to learn. The problem with such teachers is that they assume that learning occurs in proportion to the class size and that the smaller the class, the more students learn.Large class is of significant concern for teachers in schools. However, several researches conducted and as reported by Nolasco and

Arthur (1988), show that class size does not automatically correlate with student learning. Students in large classes, medium classes can learn just as well as those in small classes. What matters is not the type of class size but the quality and the method of teaching.

Kolawole (2009), observed that the relationship between class size and student achievement is negative, such that the larger the class, the lower the student achievement will be. Ajayi and Emma (2004) in their studies of the relationship between instructional resources and student academic achievement in Ogun State found no significant relationship between class size and student performance. Mullis et al., (1998) indicated that in a small class size, students received more individual attention, received more immediate feedback that both below average and above average students achieve more than since a greater variety of instructional materials were used and instructional atmosphere were less hectic that teacher assigned more homework and were happier and more enthusiastic about their teaching.

Since it is necessary to consider large class for meaningful teaching and learning, there is need for science educators to find out how to expose students to teaching using improvised and standard instructional materials which bring about increase in students participation, recall, creativity and meaningful learning. In this study therefore, an attempt was made in using the expository method enriched with improvised and standard instructional materials to see whether or not they can enhance teaching and learning in large classes.

The rationale for using instructional materials with expository method in large classes is the idea of changing the perspective from teaching that focuses solely on "didactic approach" to a more student-centred and learning that encouraged students to be more actively involved in the teaching/learning process. This is an attempt in reducing one of the major problems of large class size through the provision and utilization of appropriate improvised and standard materials to enhance academic performance of basic science students which made it

necessary for this study based on the related literature reviewed in the in the field of provision and utilization of materials for this study. Many studies cited revealed that subjects exposed to improvised and standard materials recorded higher academic performance when compare with those taught using expository method of teaching. The advantages from the effective of use of improvised and standard materials in related literature so far have been summarized by Okay (2008) are: Helps in bringing about effective instruction in a given environment materials helps in arousing and holding attention of learners; Helps in perception and retention of information or knowledge in our learners; talent in the students are discovered; Helps to bridge the gap between theoretical and donations; it reduces cost in terms of financial expenditure in buying ready-made materials and the development of resource materials for instruction can lead to discovery of new knowledge .However the different ways for teaching large classes which emphasis active involvement of the learner-friendly environment include:

- Plan your lesson ahead and prepare thoroughly to enable you deal with your problems that can be magnified in large class size.
- Do everything possible to know your students. A positive relationship with your students builds willingness on their part to actively participate in class.
- Move around the class when talking. This helps students to be more active and it can reduce the physical and social distance between you and your students.
- Be natural and personal in class and outside of it.
- Tell your students to see you whenever they have problems/questions.
- Be aware of the class and keep track of frequently asked questions to help you develop lessons , students and avoid making mistakes.
- Recognize that the attention span of students is short; 15 minutes of lecture followed s by an illustration using materials and then lecture is needed.

- Develop a formal lesson plan as way to organize your teaching in a large class size and help to identify what topic is to be taught, the learning objectives, teaching method, classroom management, main activities and assessment methods.
- Explain to the class exactly how and why you are teaching the lesson in the manner that you do. For example, why I give assignments and quizzes at the end of class.
- Adequate use of wait-time, for example, count to 10 after you ask a question to give time for the student to answer.
- Make a portfolio system or other ways to keep track of students performance-both success and areas that need improvement and to identify those students who require extra attention.
- Give feedback on assignment, tests and exams immediately always. Involve your students in the grading process to give faster feedback.
- Development an exams that really tell you if your students have truly and can apply what you have taught them, not just what they remember.
- Reflect on your teaching. Discuss with your colleagues and students how your class can be improved. Find time to visit the class of colleagues who are also teaching students, and exchange ideas and materials for teaching a large class size. Therefore, see the challenge of teaching a large class size as an opportunity, not a problem.

2.8 Gender and Academic Performance in Science

In science education, there has been debate on the controversial issue of gender on difference on mathematics science performance (Linver et,al 2004).Gender according to Bichi (2002) refers to the content of masculinity and femininity found in an individual .The social and culturally constructed characteristics and roles which are ascribed to males and females in any society is refer to as gender (Okeke,2008).Eta(2000)reveals that males have a head start

advantage over females in opting for science related career.Erinosho(2005)notes that ,the main concern in the fied of science education is the biases and misconception about women and science i.e science is a male enterprise.

In studied carried out by Ogwuazor(2006)believe that boys get better attendance and results than girls in mathematics science.Opyene and Opolot(2005) showed that in 1973/74 students achievement in London on a level syllabus, more of the items on which were observed, that girls out performed boys in what could be termed problem solving behaviours.Ogwuazor ,(2006) was of the opinion that there are many factors affecting students performance in Mathematics but all these factors hangs on gender and parental back ground. Ormerod (2005) suggested that the differences in the performance of male and female subjects could be related to interest in content area.

Researchers in science education,Bello,(2002); Bichi,(2002); Ukwungwu,(2004); Linver, et, al(2004) etc have shown their concern on gender related issues with view of improving science teaching. The difference in school science is characterized by under representation and under achievement in science by female (Bello, 2002).

It is observed by Oluwatoyin (2007) that when women are exposed to science the better their scores. Several researchers confirmed what, Aweriale (2006) showed in his findings that no significant difference between male and female student's performance when taught with paper / opaque projector in physic. Oluwatoyin (2007) indicates that the scores of males and females students do not differ significantly. While James (2001) has revealed that female students perform better in Biology when exposed to inquiry method than male students.

In the contrary, studies of Aigbomian (2004) and Aguokagbu (2007) revealed that boys performed better than girls. In another separate finding of Aweriale (2006) revealed significant sex difference in achievement in favour of girls.

The issue of gender and achievement in science cannot be underrated; Eta (2000)

observed that female participation both in science and education in general have been observed to decline drastically between primary and secondary levels .Bichi (2002) findings show no significant different between the post test mean score of male and that of the female. Osborne (2003) Opined that the early established difference in the interest and activities of boys and girls result in parallel differences in their science performance. It is in is this regard that this study investigates the effects of expository method enriched with improvised and standard instructional materials on the academic performance of both male and female students of large classes in Basic science .

Academic performance is the measure of students learning or acquisition of certain skills at the end of teaching and learning activities (Usman, 2000). Marshall and (Usman, 2000) define academic performance as the extent to which a person has achieved something, acquired certain information or mastered certain skills, usually as a result of a planned instruction or training. Academic performance in teaching and learning process has to do with attainment of set objectives of instruction (Nnaobi, 2007). In science teaching for instance, if a learner accomplishes a task successfully and attains the specified goals for a particular learning experience, he is said to achieve. The attainment of the goals in science education is a major concern of education policy makers and one of such goals is the inculcation of scientific literacy (FGN, 2004). The use of equipment and materials in science instruction will enable the learner to develop problem solving skills and positive attitude, acquire scientific appreciation and interests and to develop functional knowledge and manipulative skills (Uche and Umoren, 1998). The influence of equipment and materials on students performance and retention cannot be over- emphasized.

It is obvious that for learners to perform well in any class or discipline, a proper perspective of students learning difficulties in terms of their mental readiness conceptual organisation of their external environment and the learning materials available to them is

very Paramount (Ejah, 2012). Therefore, Basic Science teachers should adopt methods and use instructional materials that will enable the students to understand whatever concepts, topics or principles that are being taught. Teaching using the right methods and equipment/materials plays an important role in science education.

2.9 Overview of Similar Studies

Similar studies related to the present research was conducted by some researchers .A study conducted by Usman (2008) on enhancing the Academic achievement of integrated science using improvised materials among JSS students. The study was carried out on 100 subjects from Zaria Local Government Area of Kaduna State .The design of the study was the matched experimental and control design. Integrated Science Achievement Test (ISAT) comprised of 20 multiple choice test items was used for the data collected. The data collected were analysed using t-test. The results showed significant difference between subjects taught with improvised and control groups, but no significant different among gender in experimental group (those taught with improvised materials). The used materials was gender friendly. Therefore, the government and science teachers should make use of resource personnel in the construction and repairs of improvised materials (Usman, 2008).

Ndioho (2005) investigated the related effectiveness of constructivism-based instructional model on senior secondary school student performance in Biology in Obio/Akpor Local Government Area of Rivers state. Ndioho used a sample of 240 SSII Biology students in four secondary schools; two mixed schools, one boys school and one girls school were randomly selected. From each school, 60 students were selected and divided into two groups of 30 students in each group. One group was assigned the experimental group and the other control group. The instrument used was Biology performance Test (BPT).The experimental groups were taught genetic concept using

constructivist based instructional model while the control groups were taught the same genetic concept using conventional lecture method. The two groups were post tested and the test was analysed using mean, percentage, standard deviation and t-test statistics. The result indicated that the experimental groups taught using constructivist based instructional model performed significantly better than the control groups who are taught the same concepts using lecture method.

Makobi and Okoye (2010) on the effects of class size on academic achievement of senior secondary school students in chemistry, Delta state Nigeria. In the study, 681 SSII students were used. The researcher employed an ex-post-factor design and the data collection was carried out using Chemistry Achievement Test (CAT). The chi-square and F-test ANOVA were used. The result showed that chemistry students in small size classes performed better in relation to those in large size class. The results also show that there is no interaction effect of school location and class size on the achievement of the considered students.

Again, another study of Akusoba and Okeke (2006) on the effect of activity centred teaching approach using low cost learning kits in facilitating students achievement and interest in Mathematics. The study was quasi-experimental study with the sample of 162 subjects. The instruments used included Mathematics Achievement Test (MAT) and Mathematics Interest Scale Questionnaire (MIS) for data collection. The data analysis used were mean score and standard deviations to answer the research questions, while Analysis of Covariance (ANCOVA) was used to test the null hypotheses at 0.05 level of significance. The result showed that significant difference exist between the experimental group and the control group.Akusoba and Okeke maintained that adaptation of activity centred approach using low cost learning kits as an alternative to conventional method that would improve higher achievement and interest in mathematics.

Onasanya and Omosewa (2011), on the effects of improvised and standard instructional materials on senior secondary school student's performance in physics in Ilorin have shown a greater impact on performance. The researcher employed quasi-experimental study. The study comprised of 60 students and assigned to 3 groups (improvised standard and control groups). In this study,performance test in Physics (PTP) comprising of 50 multiple choice items were used for data collection .The mean scores ,standard deviation and t –test statistics were used .The result revealed that no significant difference exist in the performance of subjects taught with improvised and those taught with standard materials. Also, there was no significant difference according to gender. This shows that improvised materials has almost the same effect as the standard materials as long as they are relevant to the lesson context.

Folorunso and Nwosu (2006) in their study of students' and teachers' improvised materials on students' achievement in senior secondary school certificate biology. In the study, 107 students were involved (Experiment I, II and control groups).The design was experimental control group design. The instrument used was Ecological Achievement Test (EAT) for data collection. The data were analysed using Analysis of Covariance (ANCOVA) and Scheffe tests to test the hypotheses. The result showed that students taught with their own constructed improvised materials performed better than those taught with teacher improvised instructional materials. Therefore, Folorunso and Nwosu (2006) mentioned that science teachers should encourage students' participation in supplying and improving resource in science classroom.

In another study, Jibrin (2006), on the use of teacher made educational materials in enhancing acquisition of mathematics concept and science experimentation, 60 subjects were randomly selected and grouped into experimental and control groups. Mathematics Performance Test (MPT) was used to generate data for analysis. The scores of two (2) groups

were analysed using t-test statistics. The findings indicated that significant difference exists between the academic achievements of subjects taught with teacher made materials. Based on this, Jibrin (2006) suggested that the state and local government should set up centres for production of instructional materials and scientific equipments/apparatus to complement that of the federal government.

Another study was conducted by Salawu (1996) who studied the effect of class size on the students' achievement of different ability inMathematics. The study wants to know and to establish the effect of class size on the achievement level of students with varying abilities inMathematics. In a work sample of three hundred (300) senior secondary two (SS2) students was used and divided into different classes of 30, 60, 90 and 120 groups of students Based on the result of the pre-test the students within each group of class size produced higher, average and lower achievers. The results indicated that there was a general decrease in the level of students' performance of the different ability groups as there is increasing in the class size.

From the various studies reviewed, such as Salau(1996), Ndioho (2005)Akusoba and Okeke(2006),Folorunsho and Nwosu (2006),Jibrin (2006), Usman (2008),Makobi and Okoye(2010) andOnasanta and Omosewa(2011).The study on the effects of expository method enriched with improvised and standard instructional materials on Academic performance of large classes of Basic Science Students is relatively new. Therefore the study to investigated the effects of expository method enriched with improvised and standard instructional materials on student's academic performanceof Basic Science students in large classes.

2.10 Implication of Literature Reviewed on the Present Study

In the literature review cited, the results obtained from the several research studies

carried out on effect of expository method enriched with improvised and standard instructional materials have the following implication for this study.

Many subjects exposed to the effects of improvised and standard instructional materials recorded higher academic performance. This shows that effective use of improvised and standard instructional materials in teaching and learning can be advantageous to learning in science. Also, related literature about the consistent poor academic performance among science subjects by the constant use of traditional method of instruction have been reported in the numerous research activities cited so far. It is in the light of the above that the researcher considers it necessary to help students learn Basic Science using standard or improvised materials during instruction .It is hoped that using expository method enriched with improvised and standard instructional materials for teaching and learning will enhance the academic performance of Basic Science subject in large class.

Literature reviewed further shows that the manner in which science was presented is a matter of concern to both learners and teachers at the Upper Basic Schools. It is based on this, that Nwoji (2007) opined that students at the upper Basic Schools should be given opportunity to see science as real. This is through the provision and effective use of instructional materials and qualified science teachers. Therefore, it is important and necessary to note that: Basic science foundation forms the core subject of science in Senior School Curriculum ,the curriculum is designed to involve a lot of activities ,these activities require the use of instructional materials ,in a situation of inadequately/lack of these materials, it is necessary for the teacher to improvise and Improvisation can be hindered by time, skills, poor attitude, curiosity, fund etc.

Literature review revealed that using improvised and standard instruction materials in teaching and learning brings about increased retention and makes learning meaningful in the learner. Significantly, increased retention is advantageous to science learning and brings

about higher academic performance. It is in view of these numerous advantages that this study is being conducted .However, from the literature, the effect of expository enriched with improvised and standard instructional materials in large class is relatively new. This study therefore was conceived against this background and hoped that the results obtained from, will motivate the provision and use of instructional materials in large class in Kaduna, Nigeria.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This study investigated the effects of expository enriched with improvised and standard instructional materials on the academic performance of Large Class of upper Basic Science Students in Igabi Local Government Area Kaduna State Nigeria.

- In this chapter, the methodology is presented under the following sub-heading:

- Research Design
- Population of the Study
- Sample and Sampling Technique
- Instrumentation
- Validity of the Instrument
- Pilot Testing
- Reliability of the Instrument
- Administration of the Treatment
- Data Collection Procedure
- Procedure for Data Analysis

3.2 Design of the Study

The study adopted a quasi-experimental design ,the pretest,posttest non randomized control group design. The study comprised of two groups i.e the Experimental Group (EG) which was divided into two groups of I and II and Control Group (CG) of large class-size. Both experimental and control groups were pre-tested (O_1) to determine their equivalence of performance between the two groups, before the treatment.

The Experimental Groups (EG) received treatment (X_1 and X) after the pre-test, while the control group receive no treatment (X_0). Then both groups were subjected to post-test to find out the effects of the treatment i.e use of improvised and standard instructional materials with lecture method for experimental groups and lecture method for the control group .The two experimental groups were taught the same Basic Science concept using improvised and standard instructional materials with lecture .While the control group was exposed to the same Basic Science concept using expository method of teaching .The post test mean scores of experimental and control groups were analyzed statistically to determine if there is a significant difference .The design is illustrated in the Figure 3.1

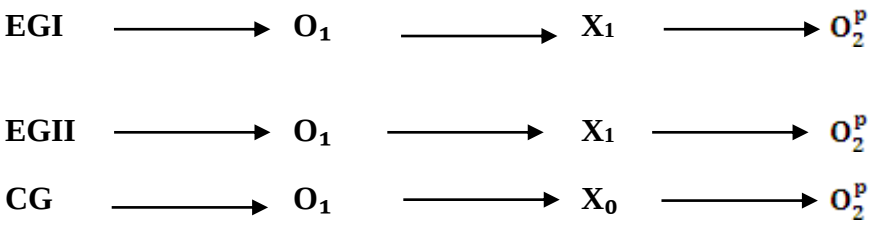


Fig. 3.1:Research Design Illustration

(Source: Sambo, 2008)

KEY:

EGI: Experimental Group I (improvised materials)

EGII: Experimental Group II (standard material)

CG: Control Group

XI: Experimental Treatment (use of improvised materials)

X_0: No Treatment (Lecture method without materials)

O_1: Pretest (to ascertain their equivalent)

O_2: Posttest (to find out the effect of the treatment)

P: Performance

3.3 Population of the Study

The target population for the study comprised of all the Junior Secondary School JSS II Co-education i.e. Upper Basic Schools offering Basic Science in Igabi Local Government Area of Kaduna State. In Rigachikun Education Zone under Igabi Local Government Area, there are Twenty Four (24) Co-education Schools. Junior Secondary School two (JSS II) were used because they are assumed to be more stable, have adapt to environment and have been offering Basic Science, since JSS I to JSS II. Also, they are matured enough and would understand science concepts better. The total number of JSS II students is 4,899 made up of 3,106 males and 1,793 females. The details of the population are presented in the table below.

Table 3. 1: Population of the Study

S/N	Name of School	Location	JSSII		Total
			Male	Female	
1.	GSS Air force Base	Mando	108	75	183
2.	GSS BirninYero	BirninYero	145	73	218
3.	GSS Buruku	Buruku	100	42	142
4.	GSS Dandaura Jnr.	Dandaura	145	68	213
5.	GSS Farakwai	Farakwai	97	12	109
6.	GSS Gadan Gaya	Gadan Gaya	134	23	157
7.	GSS Gamagira	Gamagira	79	04	83
8.	GSS Gurbabiya Jnr.	Gurbabiya	45	17	62
9.	GSS HayinBanki	HayinBanki	270	250	520
10.	GSS Igabi	Igabi	100	20	120
11.	GSS Jaji Jnr.	Jaji	329	119	448
12.	GSS Katabu	Katabu	263	104	367
13.	GSS Labar Jnr.	Labar	35	14	49
14.	GSS Makami	Makami	29	17	46
15.	GSS Nass. R/chikun	Rigachikun	65	57	122
16.	GSS RafinGuza	RafinGuza	140	90	230
17.	GSS Rigachikun Jnr.	Rigachikun	262	161	423
18.	GSS Ruhogi Jnr.	Ruhogi	58	28	86
19.	GSS SabonAfaka	SabonAfaka	220	120	340
20.	GSS SabonBirni Jnr.	SabonBirni	37	15	52
21.	GSS TsohonAfaka	TsohonAfaka	47	17	64
22.	GSS Turunku	Turunku	164	20	184
23.	GSS Wusono Jnr.	Wusono	86	44	130
24.	GSS ZangonAya Jnr.	ZangonAya	148	59	207
Total			3,106	1,793	4,899

Source: Rigachikun Educational Zone (2014).

3.4 Sample and Sampling Technique

The sample size for the study consists of 392 Basic Science Students using intact classes from three schools within Rigachikun zone in Igabi Local Government Area of Kaduna State Nigeria The three schools were randomly sampled from 24 coeducation secondary schools using ballot method involving picking from the hat.Simple random sampling was employed because of its true representation of the population,more so every subject in the population has an equal opportunity of being selected or rejected.The three schools were more or less homogeneous with similar conditions in terms of staff ,provision of equipment ,instructional materials and students enrolment .The conditions were in line with the curriculum and academic calendar within the schools under study as observed during pilot testing.An intact classes of junior secondary 11 (JSS11)from the sampled schools were assigned to three groups(improvised,standard and control).The JSS11 students in each sampled school were made to belong to one group to avoid inter-group contamination. The used of intact classes is in line with Njodi and Bwala (2004) suggestion for adequate sample of 1/2 of the total population of the study. The sample of 392 is viable for the study which is in line with central limit theory that recommended minimum of thirty subject as being viable for experimental study of this nature ,This is supported by the central limit theory of $n \geq 30$ Sambo (2008).The details of the sample size is presented in table 3.2

Table 3. 2: Samping frame of the Study

Group	Name of School	Location	JSSII		Total
			Male	Female	
Exp 1	GSS Buruku	Buruku	100	42	142
Exp 2	GSS Igabi	Igabi	100	20	120
Cont.	GSS Wusono Jnr.	Wusono	86	44	130
	Total		286	106	392

3.5 Instrumentation

The instrument used for this study was Basic Science Performance Test(BSPT) Basic Science Performance Test (BSPT) was developed by the researcher and was made A and B. The Basic Science Performance Test (BSPT) A was a pre-test instrument used to assess the equivalence of the two groups (experimental and control) in the three schools with reference to their performance prior to the commencement of the treatment. The Basic Science Performance Test (BSPT) B was post-test instruments used in measuring the Performance of Basic Science Students. The instrument consist of Thirty (30) multiple choice objective questions covering the subject content in some topics and were selected from past JSSII qualify mock examinations. The test was design for a period of 60 minutes. A multiple choice format was used because it allows for a wide coverage of the content and instructional objectives of the treatment. Also, it could be completed by a large number of students. The multiple choice objectives were used for this study because of its wide application in measuring a range of learning outcomes.

Table 3.3: Table of Specification for BSPT Based on Bloom's Taxonomy CognitiveDomain:

S/N.	content	Weight %	Knowledge 40%	Comprehension 40%	Application 20%	Total 100%
1.	Sources and Forms of energy	15%	2	1	1	4
2.	Energy conversion	20%	3	3	1	7
3.	Sources of heat	15%	1	1	2	4
4.	Heat Transfer	15 %	2	2	-	4
5.	Effects of heat On objects	20%	3	3	2	8
6.	Temperature And its measurement	15%	1	2	-	3
	Total	100%	12	12	6	30

Source: Adapted from Obeka(2011)

3.5.1 Validation of Instrument

The instrument Basic Science Performance Test (BSPT) was subjected to face and content validation by a panel of experts from Science Education who are well experience in test construction in the science education Department, Ahmadu Bello University, Zaria.

- These comprised of three science education lecturers, with PhDs and the rank of senior's lecturers.
- The three Basic Science teachers at upper Basic education level with a minimum qualification of first degree and minimum of 5 years teaching experience. These groups of experts ensure that the test items are within the ability level of the students, whether the language is simple, free from ambiguities and have covered the subject area.

3.5.2 Pilot Testing

A pilot testing was conducted at the Air Force Base Secondary School Mando, Kaduna. The Pilot area was away from the study area to avoid interference among them. The trial school was not part of the study. The subjects used were the Junior Secondary School, JSS II Students studying Basic Science. The Pilot testing was aimed to determine the effectiveness of the research instrument, to identify difficulties that might arise before the final administration and to ascertain reliability co-efficient of the instrument . The pilot testing was carried out with subjects in a large class sized. The groups contained mixed sexes and ability group. Basic Science Performance Test (BSPT) was administered. The Basic Science Performance Test consisted of 30 multiples choice items and lasted for one hour. Instruction on how to answer the questions (test items on BSPT) were carefully read. Also, difficulties arising from the pilot were noted in order to improve upon the final instruments. The test-retest method was used in the study. Based on the result obtained from the pilot testing, corrections were effected on the instruments.

3.5.3 Reliability of the Instrument

The instrument Basic Science Performance Test (BSPT) was pilot tested to determined the reliability.The test re-test method was used. The first test was given to students of different school which was not part of the study. After two weeks interval the second test was administered to the same student which is in line with Sambo (2008) recommendation on the use of two weeks interval for the test re-test method. Pearson product moment correlation co-efficient statistics was used to analyze the reliability of the instrument at $P< 0.05$ significant level.Based on the data obtained from pilot testing of the instrument , reliability coefficient was calculated to be 0.83. This shows that the instrument was reliable and was used for the study.

3.5.4 Items Characteristic of the Instrument

For the purpose of standardization of the instrument (BSPT) facility index and discrimination index was determined as follows;

3.5.4.1 Facility Index

The facility index of an item indicate the percentages of candidates that got an item right Mahmud (2009). To compute the facility index for each item in the test, these steps are followed;

- Rank the scores on the test from highest to lowest
- Identify the high scoring group and low scoring group
- Identify one third of the top scoring group and the third of the bottom scoring group
- Determine the percentage of high scores and low scored of each item
- Compute the item facility index by adding the percentage of those correct in low scoring and high scoring and divide by the number of student involved in the analysis

- The formular is F.I = U+L/N

  F.I = Facility Index

  N = Number of Students involve in the analysis

  L = Number of student who passed the item in lower percent

  U = Number of student who passed the item in the higher percent.

Facility index of 75% or higher is regarded as easy in terms of facility level. Where the index is 25% or less, is regarded as hard in terms of facility level. For this study, the Basic Science Performance Test (BSPT), with facility index which ranges from 0.32- 0.75 was use in line with James (2005) and Usman (2008).

3.5.4.2 Discrimination Index

The discrimination index of a test is a measure of it ability to discriminates between high and low achievers as whole Mahmud (2009). This is use to identify high and low index of test item , its ability to separate or sort out high and low ranking students in a test. Item showing little or no difficulty or items that shows a percentage of success in favour of the poor group should either be eliminated or re-examined for vagueness and ambiguity and such item should be rewarded.

The difficult index for each item is calculated by subtracting the number of students in the lower group who answered the item correctly from the number of students in the upper group who got the item correctly. One figure is divided by half the number of student in both groups by the number of the respondents. Calculation was done using scores of the top twenty seven percent (27%) of the total respondents. This was calculated using the formula given by (first in Olorukooba, 2001).

Thus D = RU-RL/1/2N

Where;

D= Numbers among upper 27% of respondents who score the item

RL= Number among the lower 27% of respondents who score the item

N= Total number of respondents in each of the upper and lower groups.

The discrimination index which ranges between 0.32-0.70 was regarded as moderately positive and was accepted for the present study. This was used in selecting the final items for the BSPT. See Appendix 1.

3.6 Administration of the Treatment

The regular Science teacher research assistant from group I was trained by the researcher on the use of improvised instructional materials for six weeks. The main treatment was teaching using expository method enriched with improvised instructional materials . The group received teaching in some Basic Science concepts; Energy, thermal energy and temperature for six weeks. A close supervision was made on the treatment by the researcher to ensure that the contents of the study are adequately covered within the given time frame .The experimental group I was exposed to expository method enriched with improvised instructional materials on the same concepts. Immediately after the treatment, BSPT was given to experimental group as post-test to test their ability again.

Also, the regular science teacher research assistant from the experimental group II was trained by the researcher on the use of standard instructional materials for six weeks. The main treatment was teaching using expository method enriched with standard instructional material .The experimental group II receive instruction in the same Basic Science concepts; Energy, thermal energy and temperature as in group I.A close supervision was observed on the treatment by the researcher to ensure that the content of the study are adequately covered within the given time frame the experimental group it was exposed to expository method enriched with standard instructional materials to teaching the same concepts.Immediately after the treatment , BSPT was given to experimental group II as post-test to test their ability again.

In the control group, the research assistant was not trained on use of instructional materials as in experimental group 1and11.Also,the instructional materials was not given to him. The main treatment here was expository method of teaching without using instructional material on the same Basic Science concepts; energy, thermal energy and temperature. A close supervision was made on the treatment by the researcher to ensure that the contents of the study are adequately covered with the given time frame. Immediately after the treatment, BSPT was given to the control group as post-test to test their ability.

3.6.1 Basic Science Performance Test (BSPT)

The Basic Science Performance Test (BSPT) is a thirty (30) Items objectives test involving multiple choice of "a-d" developed by the researcher. The BSPT was developed based on the following topics that were identified to be difficult to students. The topics are energy conversion, heat transfer, and temperature.The item are presented in table 3.3. The items were further prepared base on blood taxonomy of cognitive domains to ensure that the test items cover the different cognitive level of the student adapted from blooms taxonomy (1957) and represented in the table 3.3.

3.7 Data Collection Procedure

The researcher and research assistants trained were involved in the data collection. This was done after the administration of the treatment of experimental and control groups respectively. The instrument, BSPT was administered to the group. The data of the post – test of BSPT was marked, scored and recorded based as experimental I ,experimental II,and control group as well as pre-test and post-test .These scores were subjected to statistical analysis.

3.8 Procedure for Data Analysis

The mean scores and standard deviation of the post – test result of the groups were computed. Research questions were answered using descriptive statistics such as mean and standard deviation. The independent t-test Statistic was used to test statistical significance of

the observed difference between the mean scores in the experimental groups and control group. Because the group are three i.e, experimental group I ,experimental group II and control group.

CHAPTER FOUR

DATA ANALYSIS, RESULTS AND DISCUSSION

4.1 Introduction

The study investigated the Effects of Expository method Enriched with Improvised and Standard Materials on the Performance of Large Class of Basic Science Students, Kaduna State.

This chapter deals with analysis of data and discussion of the results in relation to the hypotheses stated in chapter one. The data were analysed using computer software package for social sciences (SPSS).

The hypotheses were either retained or rejected at ≤ 0.05 level of significance. The chapter is represented under the following subheadings:

- Data Analysis and Result Presentation
- Summary of Findings
- Discussion of the Results

4.2 Data Analysis and Result Presentation

The data obtained from the three groups in respect of different learning strategies were used in answering the research questions employing descriptive statistics such as mean and standard deviations, while in testing the hypotheses, independent sampled t-test were used for all the analyses because the hypotheses were formulated on two variables parametric data and results are presented as follows.

4.2.1 Answering the Research Questions

Research Question 1: What is the difference in performance of students in large class exposed to expository method enriched with improvised instructional materials and those exposed to standard instructional materials? .

Table 4. 1: Mean for Post test Scores of Students in Large Class exposed to Improvised Instructional Materials and Standardised Materials.

Variables	N	Mean	Std dev	MD
Standard	120	27.76	0.78	0.25
Improvised	142	27.51	1.60	

The mean score of academic performance of Students in Large Class exposed to Improvised Instructional Materials and standardised Materials was respectively 27.76 and 27.51, while their standard deviation was respectively 0.78 and 1.60. This shows that low difference existed in the post test scores of students in large class exposed to improvised instructional materials and and those exposed to standardised materials. The difference was in favour of the standardised instructional materials with low variance in the students' performance.

Research Question 2: What is the difference in the performance of students in large class exposed to expository method enriched with improvised instructional materials and those exposed expository method only?

Table 4. 2: **Mean for Post test Scores of Students in Large Class exposed to Improvised Instructional Materials and Expository Method only.**

Variables	N	Mean	Std dev	MD
Improvised	142	27.51	1.60	9.75
Control	130	17.76	0.78	

Table 4.2 above shows that differences existed between performance of students in the control group and the experimental group after exposure to enriched expository method using improvised instructional materials. The mean scores of students' academic performance confirmed this position as the posttest mean and standard deviation scores for

the experimental group were 27.51and 1.60 respectively, while the control group showed mean score of 17.51 and standard deviation 0.78. These statistics indicated that the academic scores for the experimental group was higher than the control group with a difference of 9.75marks, however the control group had a low dispersion in their performance.

Research Question 3: What is the difference in performance of students in large class exposed to expository method enriched with standard instructional materials and those exposed to expository method only?

Table 4. 3: Mean for Post test Scores of Students in Large Class exposed to Standard Instructional Materials and Expository Method only.

Variables	N	Mean	Std dev	MD
Standard	120	27.76	0.78	10.00
Control	130	17.76	0.78	

Table 4.3 above shows that differences existed between performance of students in the control group and the experimental group after exposure to enriched expository method using standard instructional materials. The mean scores of students' academic performance confirmed this position as the posttest mean and standard deviation scores for the experimental group were 27.76 and 0.78 respectively, while the control group showed mean score of 17.51 and standard deviation 0.78. These statistics indicated that the academic scores for the experimental group was also higher than the control group with as difference of 10 marks, however the experimental and control group coincidentally had equal low dispersion in their performance.

Research Question 4: Do male and female Students exposed to expository method enriched with improvised instructional materials differs in their mean scores?

Table 4. 4: Mean for Post test Scores of Male and Female Students in Large Class exposed to Improvised Instructional Materials.

Inprovised	N	Mean	Std dev	MD
Male	100	27.26	1.64	0.01
Female	42	27.27	1.54	

Table 4 .4 above showed there existed slight difference in performance between male and female students in the experimental group after exposure to enriched expository method using improvised instructional materials. The mean scores of female students' academic performance confirmed this position as the posttest mean and standard deviation scores for the female experimental group were 27.27 and 1.54 respectively, while the male experimental group showed mean score of 27.26 and standard deviation 1.64. These statistics indicated that the academic scores for the two experimental groups was slightly difference with a difference of 0.01 marks in favour of the female students, however the male experimental and female experimental group coincidentally had almost the same dispersion in their performance.

Research Question 5: What is thedifference in the mean scores of male and female Students exposed to expositoy method enriched with standard instructional materials?

Table 4. 5: Mean for Post-test Scores of Male and Female Students in Large Class exposed to standard Instructional Materials.

Standard	N	Mean	Std dev	MD
Male	100	27.26	1.56	0.04
Female	20	27.22	1.68	

Table 4.5 above showed there was also slight difference in performance of male and female students in the experimental group after exposure to enriched expository method using standard instructional materials. The mean scores of male students' academic performance confirmed this position as the posttest mean and standard deviation scores for the male experimental group were 27.26 and 1.56 respectively, while the female experimental group showed mean score of 27.22 and standard deviation 1.68. These statistics indicated that the

academic scores for the two experimental groups was more slightly different with 0.04 marks in favour of the male students, however the male experimental group here had lower dispersion than the female experimental group in their performance.

Hypotheses Testing

The following null hypotheses were formulated and tested at 0.05 level of significance.

Ho_1: There is no significance difference between performance of students in large class exposed to expository method enriched with improvised instructional materials and those exposed to standard instructional materials .

Table 4. 6: Independent sample t-test for Post test Scores of Students in Large Class exposed to standardised Instructional Materials and Improvised Instructional Materials.

Variables	N	Mean	Std dev	Df	t-cal	p-value	Decision
EG2	120	27.76	0.78	260	1.562	0.062	Ho Retained
EG1	142	27.51	1.60				

Table 4.6 shows there was no significant difference in the performance of students of large class exposed to enriched expository method with improvised instructional materials compared with those taught using standard instructional materials. Reason being that the calculated p value of 0.062 intercept value is higher than the 0.05 alpha level of significance. Hence the null hypothesis which Stated there is no significant difference between students of large class exposed to enriched expository method with improvised instructional materials compared with those taught using standard instructional materials is hereby retained.

Ho_2: There is no significance difference between performance of students in large class exposed to expository method enriched with improvised instructional materials and those exposed expository method only Table 4. 7: Independent sample t-test for Post test Scores of Students in Large Class exposed to Improvised Instructional Materials and

those exposed to expository method only.

Variables	N	Mean	Std dev	Df	t-cal	p-value	Decision
EG1	142	27.51	1.60	270	62.96	0.001	Ho
CG	130	17.76	0.78				Rejected

Table 4.7 shows there was significant difference in the performance of students of large class exposed to enriched expository method with improvised instructional materials compared with those taught using expository method. Reason being that the calculated p value of 0.001 intercept value is lower than the 0.05 alpha level of significance. Hence the null hypothesis which Stated there is no significant difference between students of large class exposed to expository method enriched with improvised instructional materials compared with those taught without instructional materials is hereby rejected.

Ho_3: There is no significance difference between performance of students in large class exposed to standard instructional materials and those exposed to expository method only

Table 4. 8: Independent sample t-test for Post test Scores of Students in Large Class exposed to Standard Instructional Materials and those exposed to expositorymethod only.

Variables	N	Mean	Std dev	Df	t-cal	p-value	Decision
EG2	120	27.76	0.78	248	101.27	0.001	Ho
CG	130	17.76	0.78				Rejected

Ho_4: There is no significant differences in the mean scores of male and female Students exposed to expository method enriched with improvised instructional materials.

Table 4. 9: Independent sample t-test for Post test Scores of Male and Female Students in Large Class exposed to Improvised Instructional Materials.

Variables	N	Mean	Std dev	Df	t-cal	p-value	Decision
Male EG1	100	27.26	1.64	140	0.034	0.973	Ho
Female EG1	42	27.27	1.54				Retained

There is no significant different in the mean scores of male and female Students exposed to expository method enriched with standard instructional materials.

Table 4. 10: Independent sample t-test for Post test Scores of Male Female Students in Large Class exposed to Standard Instructional Materials.

Variables	N	Mean	Std dev	Df	t-cal	p-value	Decision
Male EG2	100	27.26	1.56	118	0.103	0.918	Ho Retained
Female EG2	20	27.22	1.68				

4.3 Summary of Findings:

The findings from the analysis of the data and test of the study hypotheses revealed the following findings.

i. There wasno significant difference in the mean scores ofsubjects exposed to expository method enriched with improvised and standard instructional materials.This shows that improvised instructional materials have almost thesame effects as standard instructional materials. 2 There was significant in the mean scores of the subject taught with improivised instructional materials and those taught without instrutional materials of Basic Science in large classes. Those expose to improvised materials are the most favoured. They achieved significantly higher than those exposed to expository method.

ii. There was significant difference in the mean score of the subject taught with standard instructional materials of Basic science students in large class. Those exposed to standard materials are favoured i.e achieved significantly higher than those exposed to expository method.

iii. There was no significant difference in the mean score of male and female subjects exposed to expository method enriched with improvised and standard instructional materials. This shows that gender-related difference in the subjects academic performance does not exist when taught Basic Science using expository method enriched with improvised and standard instructional materials, so the experiment is gender friendly.

4.4 Discussion of Results

The study investigated the effects of expository method enriched with improvised and standard materials on the performance of Basic Science students of large class. The data collected and analysed were based on the academic performance of subjects in Basic Science performance test (BSPT). The result of the analysis are presented in table 4.6, 4.7, 4.8, 4.9 and 4.10.

The analysis of table 4.6 showed that there is no significant difference in the mean scores of students academic performance in the used of improvised and standard instructional materials in their pre-test score and post-test score respectively revealing the almost same level of performance before and after being taught with expository method enriched with instructional materials. The finding of Osborne (2003), Njoku (2007) and Ndioho (2005), who reported that the use of instructional material improves student academic achievement than those taught without materials. This is supported by the findings of Aweriale 2006, Oluwatoyin 2007 and Usman 2008 who Stated that expository with instructional materials enhance teaching and learning than expository method without materials.

The result from table 4.7 showed that there was a significant difference between the group taught with improvised instructional materials i.e. experimental group I and those taught with lecture method. This finding is supported by (Akusoba and Okeke 2006, Usman 2008) who stated that students taught with improvised instructional materials performed better. They found that expository method enriched with improvised instructional materials are more superior over the expository method in enhancing student academic performance. The use of improvised instructional materials with expository method stimulate students cognitive skills In further ascertaining the effects of this finding,Atadoga and Onaolapo (2008) reported that the lecture method has some problems among which are;the teachers disposition,since the teacher is the authority of the subject matter,control of students

behaviour, comunication is only one way with limited opportunities for students to express their problems and needs.

The result from table 4.8 shows that there was a significant difference in the mean scores of students in the experimental group II and the control group. The result revealed that the experimental group II which was expose to expository method enriched with standard instructional material performed significantly better than those in the control group who were taught without instructional materials . This finding is supported by Burch 2002, Onasanya and Omosewa (2010). However, in comparison with mean scores of students exposed to improvised and those taught using standard instructional material showed no significant difference since the null hypothesis is retained. This finding is in line with the previous work of Rule and Hillgan 2006, Kurumeh and Actor (2008) who maintain that hands-on and minds-on activities have positive effect on improving student academic performance. Also the finding of Folorunso and Nwosu 2006, Usman (2008). The findings revealed non-significant difference in the experimental group I and experimental group II that improvised instructional materials have almost the same effect as standard instructional materials in teaching Basic Science. This is supported by Onasanya and Omosewa (2010) who found that students taught with improvised materials and those taught with standard instructional material in physics showed no significant different. The main reason for the difference in the performance of the experimental group and the control group is that students were more likely to interact with the materials Takawira and Mathias (2010) maintain that practical activities enhance teaching and learning. Therefore, theory alone cannot develop students ability to understand Basic Science concepts.

The result obtained from null hypothesis four comparing the male and female students as shown in table 4.9 and 4.10 showed that there was no significant difference in the mean scores of male and female students when exposed to improvised and standard instructional

materials. This implies that the use of expository method enriched with improvised and standard instructional materials is gender-friendly. Therefore, the use of instructional matrials does not show any significant difference between male and female in either of the groups. This shows that an improvised materials is as effective as standard materials in the performance of both sexes ,meaning that both male and female benefited equally from the effects of expository method enriched with instructional materials. This findings is supported by Ukwungwu 2002, Folorunsho andNwosu, 2006, Oluwatoyin 2007 and Usman 2008 who maintained that improvised instructional materials are having the same effects as standard instructional materials. In another findings of Onasanya and Omosewa 2010 revealed that students taught with improvised instructional materials and those taught with standard instructional materials in physics showed no significant difference in male and female students performance .The finding is supported by Bichi 2002 ,Ndioho (2005) and Usman 2007 and who in their separate studies found that innovative teaching strategy with integrating resource materials enhance students achievement irrespective of gender. On the contrary, Aigbomian 2002 and Njoku 2007 independently reported that boys performance significantly better than the girls in science, technical and mathematics subjects. This might have been attributed to the method of instruction used in teaching such subjects.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATION

5.1 Introduction

In this chapter, the study investigated the effects of Enriched Expository method with Improvised and Standard Materials on Performance of Basic Science Students in large Classes, Rigachikun, Igabi-Kaduna. This Chapter is presented as follows.

- Summary
- Summary of the Major Findings
- Conclusion
- Contribution to knowledge
- Recommendation
- Limitation of the Study
- Suggestion for further studies.

5.2 Summary:

This Study investigated the effects of enriched expository method with improvised and standard materials on performance of Basic science students in large classes Rigachikun, Igabi-Kaduna. The study was carried out to;

1. Determine the effects of using enriched expository method with improvised instructional materials on students academic performance in large classes in Basic Science
2. Examine the effects of using enriched expository method with standard instructional materials on students academic performance in large classes in Basic Science

3. Examine the effects of expository method only on student academic performance in large classes.
4. Investigate the effects of gender on academic performance of students taught with improvised and standard instructional materials with enriched expository method in Basic Science.

In chapter one, the background of the study was highlighted .Research questions raised and hypotheses generated were used to guide the conduct of the study. Significance and scope of the study were stated .Chapter two featured related literatures that were relevant in areas such as curriculum reforms, teaching of upper Basic Science, teaching methodologies ,instructional materials, concepts of improvised materials, concepts of standard instructional materials and large class size and gender in science education as well as finding from similar studies and implication on the present study.

In chapter three, the methodology employed by the study was outlined. The experimental-control group design involving pretest and post test was used. A simple random sampling technique was used to select three co-education public school in Rigachikun Education Zone Igabi Kaduna state. A Sample of three hundred and ninety-two student were selected from a population of four thousand, eight hundred and ninety-nine , one hundred and forty-two student from Government secondary school Buruku were used as experimental group I, one hundred and twenty from Government secondary school Igabi were used as experimental group II and one hundred and thirty from government secondary school wusono were used as control group. The pretest was used to determine the equivalence of the subject before the treatment; reliability of the instruments used and item analysis.

Treatment was administered to two groups, the treatment for experimental group I was the used of expository method enriched with improvised instructional materials and experimental group II was the used of expository method enriched with standard

instructional material to teach students for six weeks while the expository method was used for the control group . The differences in treatment administration was to determined the effects of using expository method enriched with improvised and standard instructional materials over the expository method without instructional materials on student academic performance. A post test was administered after treatment to determine if there was any significant difference in student performance. The research instrument used was:Basic Science Performance Test (BSPT) was used as pretest and posttest. The data generated from the Basic Science Performance Test BSPT was analysed using t-test statistics to test hypotheses at $0 \leq 0.05$ significant level.

5.2.1 Summary of Major Findings:

The following are the summary of the major findings:

1. There is no difference in the performance of students in large clss exposed to expository method enriched with improvised instructional materials compared with those taught using standard instructional materials.The mean score of academic performance of students in large class exposed to improvised instructional materials and standard ised materials were27.76 and 27.51, This shows that low difference existed in the post test scores of students.The difference was in favour of the standardized instructional materials with low variance in the students performance.

   2 Significant difference exist betweed students of large class exposed to expository method enriched with improvised instructional materials. Their mean academic performance confirmed this position as their pretest scores and post test mean scores were 27.51 and 17.76 respectively showing that their academic scores had significantly increased after being exposed to expository method enriched with improvised instructional materials.

3 Significant difference exist betwee students of large class exposed to expository method enriched with standard instructional materials. Their mean academic performance confirmed this position as their pretest scores and post test mean scores were 27.76 and 17.76 respectively showing that their academic scores has significantly increased after being exposed to expository method enriched with standard instructional materials.

4. Results of the t-test analysis revealed that there was no significant difference in the mean score of male and female students exposed to expository method enriched with improvised and standard instructional materials, The computed t-test and descriptive statistics table further confirmed this. Subjects taught with expository method enriched with improvised instructional materials,their mean scores were 27.26 and 27.27 for male and female respectively. On the other hand Subjects taught with expository method enriched with standard instructional material, their mean scores were 27.26 and 27.22 by male and female students respectively. From these outcomes it shows that irrespective of sex and groups their mean scores were not significantly different.

5.3 Conclusion

The findings of this study leads to the following conclusion

i. Instructional materials that teachers use in teaching Basic Science in large class have significant effects on student's performance in Basic Science.

ii. The use of improvised instructional materials in the absence of standard materials can facilitates learning of Basic Science in large class.

iii. The academic performance according to gender reveals that both male and female in the experimental groups and control group showed no significant

difference when exposed to treatment, therefore as government does not provide standard materials needed, the Basic Science teachers should improvise instructional materials for use in the teaching of Basic Science.

5.4 Contributions to Knowledge.

This study investigated ways to reduce poor acacamic performance in Basic Science at the upper BasicEducation Level.Usman 2002,2007,Dyel 2011 and Idris 2011,observed that the indiscriminate use of expository method of teaching by teachers has contributed to students poor performance in Basic Science.This study empirically showed that;

1. Academic performance of Basic Science in upper Basic Education is improved by the use of expository method enriched with instructional materials which is a better alternative to using just expository method in teaching and learning in large class .
2. Improvised and standard instructional materials are very important in enhancing performance of Basic Science concepts in students.
3. An instrument (Basic Science Performance Test) for measuring performance of Basic Science has been developed by the researcher because it was efficacious in enhancing the performance of students in Basic Science

5.5 Recommendation

The following recommendations were made;

Laboratories in every school at upper basic education level should be well-equipped with improvised materials to enhance teaching and learning of Basic Science.

i. The teaching of basic Science should be presented in a way that students will effectively understand and learn the concept taught, it should be made

practical by the use of improvised and standard instructional materials which has played greater role in students' performance.

ii.

iii. Basic Science teachers should be trained by federal/state ministries of education on the construction and utilization of improvised materials through series of workshops, seminars and conferences e.tc.

iv. The school authority in Kaduna state should provide all the necessary instructional materials for the smooth teaching of the enriched expository method with improvised and standard instructional materials

v. Teachers at the upper Basic level should try to improvised instructional material and encourage student to do the same. This will give students enough understanding of Basic Science Concept as the child's local environment will be used to source for the materials.

vi. The Kaduna state government and science teachers at the upper Basic level should make use of local resource personnel in the construction and repaires of improvised materials. This will enable students to appreciate the relationship between science and society.

5.6 Limitation of the Study

The study has the following limitations;

i. The study is only restricted to only three Upper Basic Education in Igabi Kaduna State. This will make the scope of generalization fairly narrow.

ii. The study only used the Concept Energy conversion, Heat transfer and Temperature in Basic Science Curriculum .

iii. The study consist of four thousand, eight hundred and ninety –nine (4,899) students population with a sample of three hundred and ninety two (392).

5.7 Suggestion for Further Studies

The following suggestions are made for further studies.

i. Similar studies should be conducted in senior secondary schools and higher institution of learning to find out the effects of expository method enriched with improvised and standard instructional materials on students performance in large classes and their retention.

ii. The study can be replicated to include attitude, motivation and interest of students towards the use of expository method with instructional materials.

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APPENDIX 1

BASIC SCIENCE PERFORMANCE TEST (BSPT)

Time allowed: 1 hour

Dear respondent,

The purpose of the test is purely for research and not to test you or your school performance. Your honest response will be a contribution to the improvement of science education. Read the questions carefully. Each question is followed by four options (A-D). One option is correct. You are to tick the correct option on your answer sheet.

1. Heat is a form of
   (a) Light (b) energy (c) Hotness (d) coldness
2. Burning of fire wood is an example of energy change from
   (a) Chemical to electrical (b) Chemical to heat energy
   (c) Heat to chemical energy (d) Electrical to chemical
3. The form of energy that food has is
   (a) Heat energy (b) kinetic energy (c) electrical energy
   (d) Chemical energy
4. He uses - - - - to dry his clothes

(a) Heat energy from the sun

(b) Light energy c. rainfall (d) cloud from the atmosphere

5. The instrument for measuring temperature is called
   (a) Metal rod (b) thermometer (c) Beaker (d) test – tube
6. Rubbing of two palms together produces
   (a) Pain (b) cold (c) heat (d) work
7. Heating of solid or liquid make the temperature to
   (a) Rise (b) Fall (c) Be stable (d) decrease
8. What type of energy is in a new battery?
   (a) Electrical energy (b) chemical energy (c) kinetic energy (d) potential energy
9. Frictional force generally result in the production of
   (a) Heat energy (b) chemical energy (c) movement energy (d) electrical energy.
10. A boy heat one end of a rod for 10 minutes on fire and found that the other end is hot to torch. What has happened?
    (a) Rise in temperature (b) heat transfer

(c) movement of solid (d) lost of heat

11. Heat circulates in the water by

(a) convection (b) Radiation

(c) conduction (d) condensation

12. The normal body temperature is

(a) 42. 0 c (b) 37.0 c (c) 30.0 c (d) 20. 0 c

13. The energy from the sun is in form of _____ and _____

(a) Light and chemical (b) heat and Light

(c) heat and potential (d) kinetic and potential

14. Ways of heat transfer are

(a) radiation, temperature, convection (b) Radiation conduction, convection

(c) Radiation, temperature, conduction (d) Radiation, pressure, temperature

15. Which of this energy conversion takes place during a telephone conversation?

(a) electrical sound electrical (b) sound electrical sound

(c) chemical magnetic sound (d) sound magnetic sound

16. The following are appliances used at home except

(a) Mortar and pestle (b) telephone (c) electric fan (d) Radio

17. Water boils at

(a) 100 ^{0}C (b) 109 ^{0}C (c) 37^{0}C (d) 40 ^{0}C

18. The degree of hotness / coldness of a substance is called

(a) temperature (b) thermometer (c) water (d) beaker

19. Energy can be define as the ability or capacity to do _____

(a) walk (b) work (c) dance (d) jump

20. The heat from the sunshine is spread through

(a) conduction (b) convection (c) Radiation (d) Energy

21. The unit of energy is called _____

(a) Joule (b) force (c) capacity (d) work

22. All the following are effects of heat on objects excepts

(a) Rise in temperature (b) cooking, wasting and toasting

(c) Change of shape (d) change of state

23. The following are metals except

(a) iron(b) glass (c) copper (d) rod

24. The following are the uses of heat except

(a) drying objects (b) warming our body (c) ironing clothes (d) rise in temperature

25. The major or ultimate source of energy is _____

(a) sun (b) friction (c) electricity (d) Chemical reaction

26. A simple battery cell converts chemical energy to

(a) heat energy (b) kinetic energy (c) sound energy (d) electrical energy

27. Which form of energy are most commonly used in the traditional home

(a) electricity and mechanical (b) heat and light energy

(c) sound and magnetic energy (d) atomic and chemical energy.

28. A light electric bulb gives out light energy and another kind of energy. Which of these is the one?

(a) Movement energy (b) Chemical energy (c) sound energy (d) electrical energy

29. What energy change takes place when a battery light up a bulb?

(a) electrical → light ⟶ chemical (b) light ⟶ electrical ⟶ potential

(c) heat → Movement → heat and light → (d) Chemical ⟶ electrical ⟶ heat and light

30. Which of the following does not give the correct energy conversion?

(a) Telephone mouth piece: sound → electrical

(b) Striking a match sticks: chemical energy → sound energy

(c) Telephone piece: electrical energy ⟶ sound energy

(d) Electric bell: electrical energy ⟶ sound energy.

APPENDIX 2

MARKING SCHEME FOR BASIC SCIENCE PERFORMANCE TEST (BSPT)

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

APPENDIX 3

BASIC SCIENCE PERFORMANCE TEST (BSPT) ANSWER SHEET

Read each question carefully and the four possible answers provided after each question. Select one from the four options as your answer to the question and enter it on the answer sheet by shading letter A, B, C, or D that correspond to your choice.

Example

Supposing you choose letter B for question 1, then you should cross letter B as shown

I A B C D

School _____

Class_____

Test (BSAT)

1.	"A"	"B"	"C"	"D"
2.	"A"	"B"	"C"	"D"
3.	"A"	"B"	"C"	"D"
4.	"A"	"B"	"C"	"D"
5.	"A"	"B"	"C"	"D"
6.	"A"	"B"	"C"	"D"
7.	"A"	"B"	"C"	"D"
8.	"A"	"B"	"C"	"D"
9.	"A"	"B"	"C"	"D"
10.	"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.	"A"	"B"	"C"	"D"
21.	"A"	"B"	"C"	"D"
22.	"A"	"B"	"C"	"D"
23.	"A"	"B"	"C"	"D"
24.	"A"	"B"	"C"	"D"
25.	"A"	"B"	"C"	"D"
26.	"A"	"B"	"C"	"D"
27.	"A"	"B"	"C"	"D"
28.	"A"	"B"	"C"	"D"
29.	"A"	"B"	"C"	"D"
30.	"A"	"B"	"C"	"D"

APPENDIX 4

LESSON PLAN FOR THE EXPERIMENTAL GROUP ONE

(Improvised Material)

Lesson 1: **week 1**

Method of teaching: Enriched lecture with improvised instructional materials

Date: August, 2014

Class: J SS II

Group: Experimental 1

Subject: Basic science

Unit: Four (4)

Unit Title: you and Energy

No of student in class: 80

Time: 40 minutes

Topic: Forms of Energy and its uses

Instructional materials: Local candle (Achibebel), Battery, local flute, local fan, a match stick, box, torch light; animal horn, firewood and match box.

Behavioural objectives: By the end of the lesson students should be able to:

- Define what energy is?
- List the sources of energy
- Name the various forms of energy
- Explain briefly the importance of energy.

Previous Knowledge: students have learnt about energy

Introduction: The teacher introduces the lesson by asking the following questions.

- What is energy?
- Rub your palm together for a minute what happens.

Presentation: The teacher presents his lesson insteps as follows:

Step I: The teacher define what energy is, energy is the ability to do work. Energy is very important in everything we do.

A boy that has energy can do work.

The moving car uses energy, fan local candle, all these need the use of energy before they can work.

Step II: The teacher lists the sources of energy. He list the materials such candle (local),

battery, fire wood, flute (local), flash light bulb (bush lamptern), fan (local), a match stick, a torch light, sort them according to the form of energy they produce.

Materials – forms of energy

Match stick - chemical, heat, light, etc

Candle (local) – chemical, heat, light

Battery – chemical

Char coal – chemical, light, heat, etc

Flute (local) - sound energy

Torch light - light and heat energy

Fire wood – chemical, heat, light

Step III: The teacher explain the example of energy stated as follows:

Chemical energy: petroleum, food, gas, kerosene etc.

Kinetic energy: energy of motion i.e. moving objects such fan, moving car, an aero plane flying etc potential energy: The energy of position i.e. the body at rest when it is set to carry out certain functions e.g. A falling orange from the orange tree, animal at rest.

Electrical energy: These come from battery in a torch light.

Light energy: The burning of some fuels such as wood, kerosene, candle etc

Heat energy: These could be from the contact between two surface i.e. friction and movement of body in an object.

Sound energy: playing of the musical instrument such as drum, clapping of hands flute (local), horn. Animal sound e.g. man, dog, parrot etc.

Sources of energy apart from the above mention are: sun (solar energy)

Fossil fuels (chemical energy) oil shale (chemical energy)

Step IV: The teacher give the student an activity to do.

Activity I: The teacher asks the students to name other sources of energy apart from the ones listed above and the form of energy they possess.

Step V: The teacher names the various forms of energy. Energy exists in many forms. The various forms of energy are:

Chemical energy, kinetic energy, potential energy, electric energy, light energy, sound energy, solar energy, heat energy etc. The sun is the primary or main source of energy that is ultimate source of energy. The plants use the energy from the sun to make their food by the process of photosynthesis and to animals through feeding from the plant. This form of energy can be changed from one form to another.

Step VI: The teacher explains briefly the importance or uses of energy. Energy is very

important in everything we do.Energy is requiring for any type of work. we make use of energy in the following ways:

- Mechanical energy is required to do work.
- Solar energy is used by plants to make new plant materials
- Wood and coal energy are used to produce heat for cooking food and warn
- Electrical energy is used for cooking, cooling, heating, lighting and so on
- Nuclear energy is used to generate electricity
- Chemical and mechanical energy is used for transportation
- Wind energy is used to sail canoe boat.

Step VII: The teacher group the students for the following activities

activity2: mention any forms of energy you know.

Activity 3: list the use of energy

Activity 4: classifying objects base on their forms/ types of energy.

The materials are match stick, candle (local), battery, flute (local), Animal horn, drum; torch light, fire word etc.

Classify each of these materials provided and state the different types of energy it can produce. Use below to complete your answer.

Improvised

S/N	Materials	form type of energy
1.	Match stick	
2.	Candle	
3.	Battery	
4.	Flute	
5.	Drum	
6.	Torch light	
7.	Fire wood	
8.	Animal horn	

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

- Define energy
- Name three (3) sources of energy
- List any four (4) forms of energy.
- Give (4) example of various forms of energy

- Name any three material and the forms of energy they produce
- Mention four uses of energy.

Conclusion: The teacher concludes his lesson by making corrections on the questions that students failed and explain the lesson briefly.

Assignment: what is energy conversion?

Lesson 2: **Week 2**

Method of teaching: Enriched lecture with improvise instructional materials

Date: August, 2014

Class: JSS II

Group: Experimental 1

Subject: Basic science

Unit: Four (4)

Unit Title: You and Energy

No of student in class: 80

Time: 40 minutes

Topic: Energy

Subtopic: Energy Conversion

Instructional materials: Battery Charcoal pressing iron match stick, candle (Local) drum, flexible wire fire wood flash light bulb, fan, radio animal horn torch light etc.

Behavioural objectives: By the end of the lesson students should be able to:

Explain how energy can be transferred from one from to the other

- Classify the source of energy into the form / type of energy conversion they fall into:
- Give example of home appliance and trace their energy transformation that can take place
- **Prevision knowledge:** Students have learnt about forms of energy, their sources and uses
- **Introduction:** The teacher introduces his lesson by discussion briefly on the previous lessons.

Presentation: The teacher presents the lesson in steps as follows:

Step 1: The teacher asks the students to mention various forms of energy and give example of their sourced by using materials as follows:

Forms of energy	sources of energy
Chemical	match stick, food
Electrical	battery, electricity
Kinetic	fan, motor car
Light	battery, fuel, electricity
Potential	orange fruit, animal rest
Sound	drum, radio, flute, animal horn

Heat	fuel, battery, fire wood

Step II: The teacher explain how energy can be converted from one form to another. The process of changing or transfer of energy from one form to another is called energy conversion or energy transformation.

Solar energy get to the earth as light and heat energy. Plants trap the light energy and converted it to chemical energy. The chemical energy in plants is taken by man and converted to mechanical energy.

Changing potential energy to kinetic energy.

When an object is at rest at a point or in some height above the ground, the object is said to posses' potential energy. This is because the object is capable of doing work if free. Work must have been done on the object in taking in to this position. The work done is stored in the object as potential energy; as the object is free if falls toward the ground because of the gravitation pull on it while falling. During its motion, it has both potential energy decreasing and kinetic energy increasing. This means that the potential is being converted to kinetic energy when moving down ward. E.g. falling of an orange from the orange tree. The teacher explains other forms of energy conversion to the students. Rub your palms together for four minutes; you will find that as the palms are moving together this is kinetic energy and converted it to heat energy and also, when put sand in an empty tin and the tin is shaking, it will produce sound. This is another form of kinetic energy to sound.

A dry cell battery has chemical energy and can be converted into electrical energy as the energy passes through flexible wire; it is converted into light energy and heat when converted with flash light bulbs. The dry cell battery is connected through the flexible wire and the positive part and the negative part of the wire converted with dry cell battery light and heat is produced .i.e. chemical → electrical → light and heat energy.

Heat energy to Light

When we heat solid it becomes red hot, it glow fire wood often when there are light energy e.g. heat energy → light energy

Mechanical (kinetic) → sound → heat → light energy.

Electrical energy → mechanical and sound energy as in the use of electric bell and telephone mechanical (potential) → sound

Step III. The teacher gives example of some appliance and traces their energy transformation that can take place. A charcoal pressing lion which is used to press clothes

is converted from mechanical (potential energy and kinetic energy) watering other forms of energy conversion are:

Radio:- electrical → kinetic ⟶ sound energy

Television- electrical ⟶ Light ⟶ sound ⟶ kinetic and heat energy.

Electric Fan - electrical ⟶ sound ⟶ heat ⟶ Kinetic

Activities 5: can you identify forms of energy required in order to use the charcoal iron to press your uniform?

Activities 6: Observing energy conversion from one form to another

Method / Procedure

- The teacher group the student and provide materials each as rule, table etc
- Hold a ruler on the table so that part of it projects over the edge. Bend the piece that sticks out and then let it go. What happens?……..……..
- What energy change has taken place? …….

Write down the name of any musical instruments you know ……

Evaluation

Teacher evaluates his lesson by asking the students the following questions.

- Define the term energy conversion
- Identity the energy conversion that take place in the following
    i. A moving vehicle e.g. car
    ii. Cooking of food using firewood
    iii. Rubbing of palms to generate heat
- Give 3 examples of home appliances that energy conversion takes place.
- Classify the material provide into the form of energy the can produce e.g. dry cell, radio, charcoal iron, bell, drum, sand in an empty tin

Conclusion: He concludes the lesson by summarize the main point of the lesson to the student.

Assignment: Students to read on sources of heat

Lesson 3	**Week 3**
Method of Teaching:	Enriched lecture with improvised instructional materials
Date:	August, 2014
Class:	JSS II
Group:	Experimental I
Subject:	Basic Science
Unit:	four (4)
Unit Title:	Your and Energy
No. of Students in class:	80
Time:	40 minutes
Topic:	Thermal Energy
Subtopic:	Sources of heat and Conduction

Instructional materials: Pebble, cotton maize stalk, knife, long nail, spoon, candle heater, matches.

Behavioural objectives: By the end of the lesson the students should be able to:

- Define what heat is?
- mention common source of heat
- Define heat transfer
- State that heat moves in solid by conduction

Previous knowledge: Student have learnt energy and how it change from one form to another

Introduction: The teacher introduce his lesson by asking the student to rub their palms together vigorously and place on their checks Teachers ask the students how the feel.

Presentation: The teacher presents his lesson in steps as follows:

Step I: The teacher defines heat for the students, heat can simply mean the quality or process of being hot e.g. He can feel the heat of the sun from his back. Heat is also a form of energy. The solar energy which is the major sources of energy reaches us in the form of light and heat

Step II: The teacher list some common source of heat. The sources of heat are: sun; friction; chemical reaction; electricity; burning of fuels like petrol, conversion

Of other forms of energy e.g. electrical energy can be converted to heat energy.

The sun is the primary source of heat. Heat from the sun can dry up a river. Friction from rubbing of the boys palms produces heat.

Electricity produces heat with which we press our clothes.

Burning of fuel like gas in gas-cooker produces heat for cooking.

Step III: The sources of hest as concept will involve student to carry out activities

Activity VII: sources of heat

Method / procedure

- Group the students and ask each group to carry out the following activities
- Uses the pebble provided and rubs on the floor and then touch your palms
- Teacher will find out how they feel
- Teacher will help students to cut the maize stalk vertically to expose the inner layer so as to have two (2) half.

- Then place one (1) half on the floor with inner layer facing upward; and at a point (half way) cotton wool is place.
- At the inner layer of the maize stalk, directly opposite the cotton wool use another this stalk and spin vigorously using the two hands till it get to the cotton wool.

Step IV: The teacher describes how heat is transfer from one place to another. Transfer of heat refers to the flow of heat or ways of spreading heat. The transfer of heat makes it possible for us to use heat at home, in the farm, in the laboratory. How does heat travel from one place to another? Heat travel from one place to another by different method. The heat from the sun travels by waves through space to us on earth. There are three major ways of transferring heat. They are: conduction, convection and radiation

Step V: The teacher states that heat moves in solid by conduction; if you put one end of an iron spoon or fork into a flame, you will discover that the other end will soon get heated. Heat has been spread by conduction. When heat pass on from one particle to the next until it reaches the far end of the wire. We say that heat has been conducted along the wire, and the process is called conduction. Heat flows from a hot body to a cold body by itself.

Step VI: The teachers group the student and provides materials for them to carry out activities.

Activity 8: Heating one end of a metal rod.

Method / procedure: The teacher asks students to place the metal rod on the stone with one end protruded.

- Light the candle heater and place under free end of the rod and heat let the students hold one end of the rod.
- The students hold the end of the rod as long as they can.

Evaluation: The teacher is evaluates his lesson by asking the following questions:

- What is heat energy
- List any 3 sources of heat energy.
- Describe what you feel over an interval of time
- What happen to the other end of the rod as it gets hot.

Conclusion: The teacher concludes his lesson by briefly explain to the students responses for the activities to be demonstrated; heat has been generated. The rubbing of pebbles on the floor and spinning of maize stalk will generate heat by friction. Also sun serves as a source of heat energy. Heat is define as warmth or hotness. It is a form of energy. Also, he explains that heat is capable of moving in an objects-thus heat transfer is the movement or spread of heat from one end of an object to another. The process of transfer of heat in solid is called conduction e.g. Metal rod.

Assignment: Define convection

Lesson 4 **week 4**

Method of Teaching: Enriched lecture method with improvised instructional materials

Date: August, 2014

Class: JSS II

Group: Experimental I

Subject Basic science

Unit: Four (4)

Unit Title: You and Energy

No. of Students in class: 80

Time: 40 minutes

Topic: Thermal Energy

Subtopic: Heat transfer (Convection and Radiation)

Instructional materials: Cold water, candle, heater place in a tall tin cut to serve as a stand, matches, drinking straw, grains of colour chalk, tin, shining tin, candle, heater, brick, can panted black, water.

Behavioural objectives: By the end of the lesson the student should be able to:

- Explain heat movement in a liquid (water) by convection.
- Define and describe radiation
- State whether some surfaces absorb heat better than others.

Presentation: The teacher presents the lesson in steps :

Previous knowledge: Students have been learnt movement of heat in solid objects.

Introduction : The teacher introduce his lesson by asking question as:

- How does heat circulate or move in liquid (water)?
- He asked student to go outside in a sunny location and stand for some minutes. He will ask them how do they feel? Is it hot or cold? can you feel how your body is absorbing the heat from the sum?

Presentation: The teacher presents the lesson in steps: By grouping student dents to carry out activities in steps.

Step I: The teacher explains the term convection briefly.

- Convection is the transfer of heat by the movement of liquid molecules. The heat flows from the bottom to the top by the actual movement of the liquid molecules.

Step II: The teacher gives example of convection. Convection takes place when you heat liquid, for example kettle of water on an electric heater (hot plate) or beaker of water on a

Bunsen burner. Heat circulates in the liquid through convection

Step III: He guide student to carry out activities

Activity 9: Investigating the process of heat transfer in water

Method / Procedure:

- Group the students and provide materials.
- Ask the student to pour cold water (3/4) full of the tin
- Place on the heat stand with candle heater as source of heat
- stand straw in the water touching the bottom of the tin
- drop 1 or 2 grains of colour chalk in the tube of the drinking straw
- Gently remove the drinking straw
- Heat the tin gently from the bottom
- The students watch as the waters boils

Step IV: The teacher describes that radiated heat travels in the same way as light ray.

This is a method of heat transfer which does not involve any material between the source of the heat and the receiver.

The heat is transferred by means of waves.

The heat from sun shine or lighted lamp is spread through radiation in temperate regions; people have fire places at home to keep them warm. Heat from the fire place circulates through radiation.

Step V: The teacher state whether some surface absorbs heat better than others. Some surface absorb heat better than other as in dark surface or black colour absorb more heat than any other colour; likewise white colour or surface absorb less heat than others.

Step VI: The teacher presents the activity below.

Activity 10: Absorption of heat energy.

Method / procedure: the teacher groups the student and asks each group to carry out the following.

- Get a shining tin can and another one of the same size painted with black paint
- Set the two cans at equal distance from the candle heater which is heating on a piece of brick
- Put equal volume of water into the two can

Use your hand to feel the water from time to time to know which can gets hot first

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

- Describe what happens in boiling water.

- Describe movement of the grains of chalk.
- What could cause any difference that you notice
- Does the water in each can become warm at the same time?

Conclusion: The teacher concludes his lesson by discussing with the students that bubbles are seen moving up and down making the grains of the colored chalk to move round as the water boils. Further, he discussed briefly that the activity carried out show absorption of heat by different surfaces. Water in can painted with black paint get hotter first and fast than shiny tin.

Assignment: Define the term radiation

Lesson 5:	**Week 5**
Method of Teaching:	Enriched lecture with improvised instructional materials
Date:	August, 2014
Class:	JS II
Group:	Experimental I
Subject:	Basic Science
Unit:	four (4)
Unit Title:	you and energy
No of Students in class:	80
Time:	40 minutes
Topic:	Thermal Energy
Sub-topic:	Effects of heat on solid, liquid and gas

Instructional materials: Screw eye, nail whose head will just pass through the screw eye, stick, candle heater, cup; drinking straw, tin of cold water, colour water (using ginger), a candle heater long tin formed a tripod stand, thin wire cut to size that can be use to cross the open end of long tin, both with cap wax, or glue; color water bottle; one whole cork, tall tin as stand, using syringe as dropper, glue

Behavioural objectives: By the end of the lesson the students should be able to:

- State the solid objects when heated increase in size and heat will caused expansion in solid
- Explain that liquid expand on heat
- Explain expansion of air on heating.

Previous knowledge: Students have been taught that heat can flow from one end to another in an object.

Introduction: The teacher introduces his lesson by asking question. Why does solid object become bigger when it is heated?

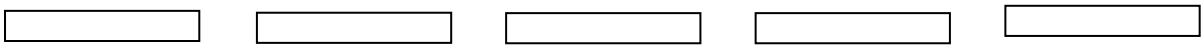
Presentation: The teacher presents his lesson in steps:

Step III: Teacher grouping students and provides material for activities.

Step I: The teacher describes expansion of solid. The application of heat on solid substance causes it to expand.

The expansion of the solid, that is increase in length, area etc also when the substance (solid) gets cool, it contract and become smaller in size (to it original position or length). E.g. Heat on rail line caused expansion during the mid noon and contraction in evening down to morning as you can illustration below.

Before expansion.



During expansion

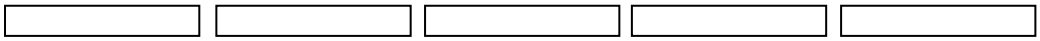


Illustration of expansion and contraction on rail line.

Step II: The teacher state effects of expansion on solid are:

- Rise or increase in temperature
- The solid will increase in length, area,
- It result to change of shape of the substance,
- Change of colour of the substances heated.
- Change of state e.g. Solid to liquid
- Formation of new substance e.g. Burn paper to form ashes.

Step III: Teacher grouping students and provides material for activities.

Activity XI: Heating metal solids

Method / Procedure:

- Student will be asked to screw eye into the end of one stick, fix the nail into the end of the other stick.
- Students will be ask to pass the head of the nail through screw eye
- Heat the head of the screw in the flame for a few minute
- Pass the head of the nail through the screw eye.
- Place the head of the screw in cold water and again try to pass it through the screw eye
- The teacher asks students to observe what will happen

Step IV: The teacher explains briefly expansion of liquid. This means when heat is apply on liquid substances there will be increase or rise in temperature and the volume. Also change of colour and state can result from the substances heated. E.g. From ice to liquid (water).

Step V: The teacher mentions the effects of expansion in liquid. The effects of expansion in liquid are as follows:

- Rise in temperature
- Increase volume
- Change of colour of the substances heated e.g. palm oil changes colour when heated
- Change of state e.g. from ice to liquid.

Step VI: The teacher group the students and materials are provided for activities

Activity: **12** effects of heat on liquid e.g. water.

Method / procedure:

Students will be grouped and material will be provided

- He ask students to fill in the bottle to the brim i.e. neck with the coloured water
- Fit the straw into a hole from bottle cap and fastened with wax and screw the bottle.
- Place bottle in a tin of cold water.
- Heat the tin of water and watch the level of the colour water in the straw
- Mark the level of colour water in the straw.
- Then allow the tin of water to cold again and watch the level of the coloured water.

Step VII: The teacher explains the effects of heat on gas. The application of heat on gas (Air) can result the following:

- Rise in temperature
- Change of state

Step VIII: The teacher involve the students with an activity

Activity13: Effects of heat on gas e.g. air.

Method / procedure;

The teacher groups the students and provides materials

- Fit the straw into the cork carefully.
- Use the syringe to draw the colour water and insert a drop into the straw
- Fit the cork into bottle use wax energy air tight.
- Ensure that the colour water column is clearly visible above the cork.
- Gently heat the bottom of the tin and watch what happen to the drop of colour water in the straw.

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

- Why does the head of the nail return to its size when it cools or does it remain bigger?
- When the head of the nail is heated does it pass through the screw eye?
- Why does the level of the colour water rise as you heat it?
- What is the level of the colour water in the straw when the water in the tin cool?
- What is inside the bottle you heat?
- Why does the drop of colour water rise or increase in the straw tube as soon as you start to heat the bottle
- Do you think that air expand when it is heated?

Conclusion- The teacher concludes his lesson by discussing that when heat is applied on

solid it increases in size this process in called expansion. When solid get cool it contract and become smaller in size. He explain that liquid expand on heat. This will be notice when the liquid level of the colour water increase or rise.

Lesson 6	**Week 6**
Method of Teaching:	Enriched lecture with improvise instructional materials
Date:	August, 2014
Class:	JSSII
Group:	Experimental I
Subject:	Basic Science
Unit:	Four (4)
Unit Little:	You and Energy
No. of Students in class:	80
Time:	40 minutes
Topic:	Heat Energy and Temperature
Sub-topic:	Temperature and its measurements

Instructional materials: chart showing diagram of thermometer, tin, water, candle heater, mercury in liquid thermometer, clinical thermometer.

Behavioural objectives: By the end of the lesson the students should be able to:

- Define what is temperature
- List units and symbols/signs of temperature scale
- Give uses of uses of thermometer
- State the degree at which water boils and normal body temperatures
- Use thermometer to measure temperature of an objects.

Previous knowledge: Students have learnt about effects of heat on objects.

Introduction: The teacher introduces the lesson by asking the students questions on the previous lessons.

- Heat flows in water by …….
- Heat make solid like metal to increase Yes or No. Why?

Presentation: The teacher presents the lesson in steps.

Step I: The teacher define temperature

- Temperature is the degree of hotness or coldness of an object. Thermometer is the instrument used in measuring temperature.

Step II: The teacher gives uses of thermometer the instrument for measuring the temperature is called thermometer.

Activity 14: Temperature Scale

Method/Procedure

The teacher groups the students and provides materials (chart) for them to observe:

- Teacher ask the student to look at the chart and identify it
- Teacher ask student to say what it is
- The student to look at it carefully and look at the scale on the thermometer.
- Having looked at the scale, he require them to identify the lowest number and the highest number.

Step IV: The teacher state the degree at which water boils and normal body temperature.

Step V: He describes the use of thermometer to measure temperature of object.

Activity 15: use of thermometer

Method/Procedure

The teacher group student and provide materials to the various groups

- He ask student to boil the water in the tin and keep it boiling
- Put the bulb of the thermometer in the steam just above the boiling water
- Wait for about five minute
- Watch the temperature shown by the thermometer
- He asked them to shake the clinical thermometer so that the mercury stay in the bulb.
- Put the bulb under your armpit for one minute
- Remove and read your body temperature

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

- What is the lowest number
- What is the highest number
- What scale is marked on the thermometer
- What is the boiling point of water
- What is your body temperature

Conclusion: The teacher concludes his lesson by explaining boiling point of water and thermometer scales. The boiling point of water is 100^oC while the normal human body is 37.0^oC. The thermometer has scales. These scales are:

Celsius scale and the unit is ^oC (ranging from 0^oC – 100c)

- Fahrenheit, the unit is ^oF (ranging from 32^oF – 212^oF)
- Kelvin scale unit is K. (ranges from 273k - 373K).

APPENDIX 5

LESSON PLAN FOR THE EXPERIMENTAL GROUP TWO

(Standard Materials)

Lesson 1:	**Week 1**
Method of teaching:	Enriched lecture with standard instructional materials
Date:	August, 2014
Class:	J SS II
Group:	experimental II
Subject:	basic science
Unit:	Four (4)
Unit Title:	you and Energy
No of student in class	80
Time:	40 minutes
Topic:	Energy
Subtopic:	Forms of Energy and its uses

Instructional materials: Candle, battery, flash light bulb, A Radio, tape recorder, electric motor, lighter, match box.

Behavioural objectives: By the end of the lesson students should be able to:

- Define what is energy?
- List the sources of energy
- Name the various forms of energy
- Explain briefly the importance of energy

Previous knowledge: students have learnt about energy

Introduction: The teacher introduces the lesson by asking the following questions.

- What is energy
- What happen when you rub a pen on your head?

Presentation: The teacher presents his lesson in step as follows:

Step I: The teacher defines what energy is, energy is the ability to do work. Energy is very important in very thing we do.

A boy that has energy can do work. The moving car uses energy. Electric fan, radio, all these need the use of energy before they can work.

Step II: The teacher list the source of energy. He list the materials such as candle, battery,

flash light bulb, radio, telephone, torch light, electric fan , lighter, Bunsen burner, sort them according to the form of energy they produce.

Materials	-	**form of energy**
Telephone	-	sound energy
Candle	-	chemical, heat, light
Battery	-	chemical
Radio	-	Sound, kinetic and light
Torch light	-	light and heat, energy
Electric fan	-	electrical, heat light

Step III: The teacher explain the example of energy stated as follows: chemical energy: petroleum, food, gas, kerosene etc

Kinetic energy: Energy of motion i.e. moving objects such electric fan, moving car, aeroplane flying etc.

Potential energy: The energy of position i.e. the body at rest when it is set to carry out certain functions e.g. a falling orange from the orange tree. An animal at rest.

Electrical energy: these come from battery in a torch light,

Light energy: The burning of some fuels such as kerosene, petroleum, candle etc

Petroleum, candle etc.

Heat energy: These could be from the contact between two surface i.e. friction and movement of body in an object.

Sound energy: playing of the musical instrument such as guitar, piano. Animal sound e.g. Man, dog, parrot etc.

Step IV: The teacher gives the students an activity to do.

Activity I: The teachers ask the students to name other sources of energy apart from the ones listed above and form of energy they possess.

Step V – The teacher name the various forms of energy.

Energy exists in many forms. The various forms of energy are: chemical energy, kinetic energy, potential energy, electric energy, light energy, sound energy solar energy, heat energy etc.

The sun is the primary or main source of energy i.e. ultimate source of energy. The plants use the energy from the sun to make their food by the process of photosynthesis and to animals through feeding from the plants. This form of energy can be changed from one form to another.

Step VI: He explains briefly the importance or uses of energy.

Energy is very important in everything we do. Energy is required for any type of work. We make use of energy in the following ways:

- Mechanical energy is required to do work.
- Solar energy is used by plants to make new plant materials.
- Gas and coal energy are used to produce heat for cooking food and warmth.
- Electrical energy is used for cooking, cooling, heating, lighting and so on
- Nuclear energy is used to generate electricity
- chemical and mechanical energy is used for transportation
- Wind energy is used to sail boat.

Step VII: The teacher group the students for the following activities

Activity 2: mention any forms of energy you know

Activity 3: list the uses of energy

Activity 4: classifying objects base on their forms / types of energy.

The materials are lighter, candle, battery, piano, guitar, torch light, Bunsen burner etc. classify each of these materials provided and state the different forms of energy it can produce. Use below to complete your answers.

Standard

S/N	Materials	Form / types of energy
1.	Candle	
2.	Battery	
3.	Torch light	
4.	Bunsen burner	
5.	Piano	
6.	Lighter	
7.	Guitar	
8.	Kerosene	

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

- Define energy
- Name three sources of energy
- List any four forms of energy.
- Give four (4) examples of the various forms of energy
- Name any three materials and the forms of energy they produce.
- Mention five uses of energy.

Conclusion: The teacher concludes the lesson by making correction and explains the main points to the students.

Assignment: what is energy conversion?

Lesson 2:	**Week 2**
Method of teaching:	Enriched lecture with standard instructional materials
Date:	August, 2014
Class:	J SS II
Group:	Experimental II
Subject:	Basic science
Unit:	Four (4)
Unit Title:	You and Energy
No of student in class	80
Time:	40 minutes
Topic:	Energy
Subtopic:	Energy conversion

Instructional materials: Dry cell battery, lighter, candle, telephone, flash light bulb, radio, tape recorder, torch light, electric fan, etc

Behavioural objectives: By the end of the lesson students should be able to:

- Classify the sources of energy into the form/ type of energy conversion they fall into:
- Explain how energy can be transferred from one form to the other
- Give example of home appliance and trace their energy transformation that can take place

Previous knowledge: Students have learnt about forms of energy, their sources and uses

Introduction: The teacher introduces the lesson by discussing briefly on the previous lesson

Presentation: The teacher presents the lesson in steps as follows:

Step 1: The teacher ask the students to mention various forms of energy and give example of their sources by using materials as follows:

Forms of energy	**sources of energy**
Chemical	food
Electrical	electricity, battery
Kinetic	electric fan, aeroplane
Potential	orange fruit a car at rest
Sound	piano, guitar
Heat	fuel, battery, gas

Step II: The teacher explain how energy can be converted from one form to another. The process of changing or transferring energy from one form to another is called energy conversion or energy transformation.

Solar energy gets to the earth as light and heat energy. Plants trap the light energy and converted it to chemical energy. The chemical energy in plant is taken by man and converted to mechanical energy.

Changing potential energy to kinetic energy. When an object is at rest at a point or in some height above the ground, the object is said to posse's potential energy.

This is because the object is capable of doing work if free work must have been done on the object in taking it to this position. The work done is stored in the object as potential energy; as the object is free if falls toward the ground because of the gravitation pull on it while falling. During its motion, it has both potential energy decreasing and kinetic energy increasing. This means that the potential energy is being converted to kinetic energy when moving down ward. E.g. falling of an orange from the orange tree.

The teacher explains other forms of energy conversion to the students. Rub a pen on your hair on the head for four minutes, you will find that as the pen is moving on the head is kinetic energy and converted it to heat energy. Also when a student for example time - keeper ringing the bell for change of lesson, break period or closing, it will produced sound. This is another form of kinetic energy to sound energy.

A dry cell battery has chemical energy and can be converted into electrical energy as the energy passes through flexible wire; it is converted into light energy and heat when connected with flash light bulbs. The dry cell battery is connected through the flexible wire and the positive part and the negative part of the wire connected with dry cell battery, light and heat is produced i.e..

Chemical → electrical → light and heat energy.

Heat energy→ to light, when we heat solid it becomes red hot, it glow metals when it is light energy e.g. Heat energy → light energy.

Mechanical (kinetic)→ sound → heat → light

Electrical energy→ mechanical and sound energy as in the use of electric bell and telephone.

Mechanical (potential)→ sound

Step III The teacher gives example of home appliance and traces their energy transformation that can take place. An electric pressing iron which is used to press clothes is converted from mechanical (potential energy and kinetic energy) → heat energy.

Other forms of energy conversion are:

Television-electrical → light → sound → kinetic and heat energy

Radio- electrical → kinetic → sound energy.

Electric fan electrical sound heat kinetic energy

Activity 5: can you identify forms of energy required in order to use electric ion to press your uniform? Method/Procedure

Activity 6: observing energy conversion from one form to another method / procedure

- The teacher grouped the students and provides materials such as ruler, table etc.
- Hold a ruler on the table so that part of it projects over the edge. Bend the piece that sticks out and them let it go. What happens?
- What energy change has taken place?
- Write down the name of any musical instrument you know

Evaluation: The teacher evaluates his lesson by asking students the following questions.

- Define the term energy conversion
- Identify the energy conversion that take place in the following

i. a moving vehicle e.g. car
ii. cooking of food using gas cooker
iii. rubbing pen on hair of the head

- Give three (3) examples of home appliances that energy conversion takes place.
- Classify the materials provides into the form of energy they can produce e.g. dry cell, radio, electric pressing iron, piano, guitar, gas cooker, Bunsen burner.

Conclusion: The teacher concludes the lesson by summarizing the main point of the lesson to the students.

Assignment: Students to read on sources of heat.

Lesson 3: **Week: 3**

Method of teaching: Enriched lecture with standard instructional materials

Date: August, 2014

Class: J S II

Group: Experimental II

Subject: Basic Science

Unit: four (4)

Unit titles: you and Energy

No of student in class 80

Time: 40 minutes

Topic: Thermal energy

Subtopic: Sources of heat and Conduction

Instructional materials: matches, convex lens, carbon paper, long rod, retort stand, Bunsen burner.

Behavioural objectives: By the end of the lesson the student should be able to

- Define heat
- List common sources of heat
- Define heat transfer
- State that heat moves in solid by conduction

Previous knowledge: Students have learnt about heat.

Introduction: The teacher introduce the lesson by asking questions

- List two (2) source of heat
- What happen to you when touching a hot object

Presentation: The teacher presents the lesson in steps as follows:

Step I: The teacher defines heat for the students, heat can simply mean the quality or process of being hot e.g. He can feel the heat of the sun from his back. Heat is also a form of energy. The solar energy which is the major source of energy reaches us in the form of light and heat.

Step II: The teacher list some common source of heat. The sources of heat are: sun, friction chemical reaction, electricity, burning of fuels like petrol. Conversion of other forms of energy e.g. electrical energy can be converted to heat energy. The sun is the primary source of heat. Heat from the sun can dry up a river. Friction from rubbing of the boys palms produces heat. Electricity produces with which we press our clothes. Burning of fuel like gas in gas cooker produces heat for cooking.

Step III: The sources of heat as concept will involve students to carry out some activities

Activity 7: sources of heat

Method / Procedure:

- The teacher group the students and direct them to carry out the following activities
- Ask students to pull out one stick of the matches and strike the matches box.
- Ask students what has happened in between the head of the match and the rough edge of the match box
- Go outside and hold the lens and the piece of paper, so that the sun shines through the lens into the paper.
- Move the lens to end from until you ear see a small bright dot of light on the paper
- Hold the lens and paper still and watch what happens to the piece of paper.

Step IV: The teacher describes how heat is transfer from one place to another. Transfer of heat refers to the flow of heat or ways of spreading heat. The transfer of heat makes it possible for us to use heat at home, in the farm, in the laboratory. How does heat travel from one place to another? Heat travel from one place to another by different method. The heat from the sun travels by waves through space to us on earth. There are three major ways of transferring heat. They are: conduction, convection and radiation

Step V: The teacher states that heat moves in solid by conduction; if you put one end of an iron spoon or fork into a flame, you will discover that the other end will soon get heated. Heat has been spread by conduction. When heat pass on from one particle to the next until it reaches the far end of the wire. We say that heat has been conducted along the wire, and the process is called conduction. Heat flows from a hot body to a cold body by itself.

Step VI: The teacher groups the students and provides materials for them to carry out activities.

Activity 8: Heating one end of an iron rod.

Method / procedure:

The teacher groups the students and supply materials.

- Light the Bunsen burner and heat the free end of the rod and ask the students to hold one end of the rod. The students will hold the rod for as long as they can.
- Remove the rod from the flame but cautions to hold it.

Activity 9: Heat of one end copper wire

Method / Procedure:

- He group the students and provides materials.

- Hold a thick piece of copper wire in a Bunsen Flame.
- Remove the copper wire from the Bunsen flame
- Can you continue to hold it for long?

Evaluation: The teacher evaluates his lesson by asking question

- What is heat?
- List any four (4) sources of heat?
- Define heat transfer
- State how heat flow in solid by conduction
- Describe what you feel over interval of time as you heat the rod on the flame.

Conclusion: The teacher concludes this lesson by defining heat as a source of heat or process of being hot. He gives examples of sources of heat as sun, friction, electricity, fuels etc

Lesson: 4 **Week 4**

Method of teaching: Enriched lecture with standard instructional materials

Date: August, 2014

Class: J S II

Group: Experimental II

Subject: Basic Science

Unit: four (4)

Unit titles: you and Energy

No of student in class 80

Time: 40 minutes

Topic: Thermal energy

Subtopic: Heat Transfer (Convection and Radiation)

Instructional materials: Beaker, cold water, glass tube, grains of potassium permanganate, Bunsen burner, tripod stand, an electric lamp, Bunsen burner.

Behavioural objectives: By end of the lesson students should be able to:

- Explain the term convection briefly
- Give examples of convection.
- Describe that radiated heat travels in the same way as light ray.
- State whether some surface absorbs heat better than others.

Previous knowledge: Students have learnt how heat flows in solid object

Introduction: The teacher introduce the lesson by asking questions as follows:

- What is conduction?
- How does heat move in solid objects?
- What is radiation?
- How do you feel when you stand for some times under the sun?

Presentation: The teacher presents the lesson in steps as follows:

Step I: The teacher explains the term convection briefly.

Convection is the transfer of heat by the movement of liquid molecules. The heat flows from the bottom to the top by the actual movement of the liquid molecules.

Step: II The teacher gives example of convection. Convection takes place when you heat liquid, for example kettle of water on an electric heater (hot plate) or beaker of water on a Bunsen burner. Heat circulates in the liquid through convection

Step III: Teacher guides students in carry out activities

Activity 10: finding out the process of heat transfer in water.

Method/procedure:

- Teacher group the students and provides materials.
- Pour water three quarter into a beaker place on the tripod stand
- Stand a glass tube in a beaker of water touching the bottom of the beaker
- Drop I or 2 grain of potassium permanganate crystal in the glass tube so that the grains can go down to the bottom of the beaker.
- Gently remove the glass tube. Heat the beaker gently from the bottom
- The students look carefully as the water boils.

Step IV: The teacher describes that radiated heat travels in the same way as light ray.

This is a method of heat transfer which does not involve any material between the source of the heat and the receiver.

The heat is transferred by means of waves.

The heat from sun shine or lighted lamp is spread through radiation in temperate regions; people have fire places at home to keep them warm. Heat from the fire place circulates through radiation.

Step V: The teacher state whether some surface absorbs heat better than others. Some surface absorb heat better than other as in dark surface or black colour absorb more heat than any other colour; likewise white colour or surface absorb less heat than others.

Step VI: The teacher presents the activity below.

Activity 11: Effects of Heat (solids)

- Ask students to hold their hands under the electric lamp while it is switch off.
- The palm of the hand should face down ward.
- Then switch on the electric lamp
- Also light a Bunsen burner
- Ask pupils to place their palm some few meters away.

Evaluation: The teacher evaluates his lesson by asking questions:

- Describe what happens in the boiling water
- What is convection
- Describe what happens to the grains of potassium permanganate as the water boils.
- Explain briefly radiation?
- What do you feel as soon as the light is turn on?

- How does the heat of the sun reach the earth?
- How do you feel as you moved your hand towards the lighted Burner?

Conclusion: The teacher concludes the lesson by making correction on the evaluation questions answered by the students and summarizes the main point of the lesson.

Assignment: Student to read on effects of heat on solid.

Lesson 5: **Week 5**

Method of teaching: Enriched lecture method with standard instructional materials

Date: August, 2014

Class: J S II

Group: Experimental II

Subject: Basic Science

Unit: four (4)

Unit titles: you and Energy

No of student in class: 80

Time: 40 minutes

Topic: Thermal energy

Subtopic: Effects of heat on solid, liquid and gas

Instructional materials: Ring and ball, Bunsen burner, beaker of cold water, glass tubes, beaker of cold water, cold water, test tube, gauges, tripod stand, one whole cork, glass tube, colour water, flat bottom flask, dropper, wax.

Behavioural objectives By the end of the lesson students should be able to

- Describe expansion of solid
- State the effect of expansion in solid
- Explain briefly expansion of liquid
- State the effects of expansion of liquid.
- Explain effects of heat on gas

Previous knowledge: Students have already learnt that heat can flow from one end to another in objects.

Introduction: The teacher introduces the lesson by discussing briefly on the previous knowledge.

Presentation: The teacher presents his lesson in Steps:

Step I: The teacher describes expansion of solid. The application of heat on solid substance causes it to expand.

The expansion of the solid, that is increase in length, area etc also when the substance (solid) gets cool, it contract and become smaller in size (to it original position or length). E.g. Heat on rail line caused expansion during the mid noon and contraction in evening down to morning as you can illustration below.

Before expansion.

During expansion

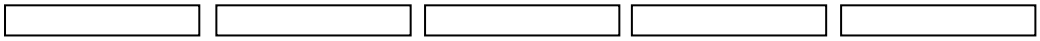


Illustration of expansion and contraction on rail line.

Step II: The teacher state effects of expansion on solid are:

- Rise or increase in temperature
- The solid will increase in length, area,
- It result to change of shape of the substance,
- Change of colour of the substances heated.
- Change of state e.g. Solid to liquid
- Formation of new substance e.g. Burn paper to form ashes.

Step III: Teacher group the student and material provided for activities

Activities 12: Heating of metal (solids)

Method / Procedure:

- Teacher ask students to pass the ball into the ring
- Then heat the head of the ball into the flame for about 3 minutes
- Try to pass the ball through the ring again
- Place the ball in cold water and again try to pass it through the ring
- Teacher asks students to look carefully and answer the questions.

Step IV: The teacher explains briefly expansion of liquid. This means when heat is apply on liquid substances there will be increase or rise in temperature and the volume. Also change of colour and state can result from the substances heated. E.g. From ice to liquid (water).

Step V: The teacher mention the effects of expansion in liquid. The effects of expansion in liquid are as follows:

- Rise in temperature
- Increase volume
- Change of colour of the substances heated e.g. palm oil changes colour when heated
- Change of state e.g. from ice to liquid.

Step VI: The teacher groups the students and materials are provided.

Activity 12: Effect of Heat on Liquid

Method/Procedure

- Fill the test tubes with the colour water

- Fit the glass tube into a cork
- Push the cork into the neck of the test tubes.
- Place the test tube in the beaker of cold water.
- Mark the level of the colour water in the glass tube
- Heat the beaker of the water and watch the level of thecolour water in the glass tube
- Then allow the beaker of water to cold again and watch the level of the colour water in the glass tube,

Step VII: The teacher explains the effects of heat on gas. The application of heat on gar (Air) can result the following:

- Rise in temperature
- Change of state

Step VIII: The teacher involve the students with an activity

Activity 13: Effects of heat on gas (Air)

Method / procedure:

- Fit the glass tube carefully in the flat bottom flask
- Insert a drop of colour water into the glass tube
- Fit the cork into the flask, use wax to ensure flask air tight
- Ensure that the colour water is clearly visible above the cork
- Gently heat the bottom of the flask and watch what happen to the drop of colour water in the glass tube.

Evaluation: The teacher evaluates his lesson by asking questions.

List any two (2) effects of heats on gas (air)

- What is there inside the bottle you heat?
- Does the drop of colour water rise in the tube as soon as you start to heart the flask?
- Do you think that air expand when heated?
- Briefly explain expansion in solid
- Mention any three (3) effects of expansion on solid
- Does the head of the nail return to its size when it cools or does it remain larger?
- Explain briefly expansion of liquid
- List any three (3) effects of heat on liquid.
- Does heat make liquid expand?
- Does the level of the colour water rise in the glass tube as you heat it?

Conclusion: The teacher concludes the lesson by summarizing the main points for the students.

Assignment: The teacher gives students question to answer at home.

- Do you think air expand when heated? Explain
- List any two effects of heat on air.

Lesson 6 **Week 6**

Method of Teaching: Enriched lecture with standard instructional materials

Class: JSII

Group: Basic Science Experimental II

Unit: Four (4)

Unit Little: You and Energy

No. of Students in class: 80

Time: 40 minutes

Topic: Heat Energy and Temperature

Sub-topic: Temperature and its measurements

Instructional materials: Standard thermometer, clinical thermometer, A beaker of water, mercury in liquid thermometer, a burner, tripod stand.

Behavioural objectives: By the end of the lesson the students should be able to:

- Define what is temperature
- Write units and symbols of temperature scale
- Mention the boiling point of water and the body temperature
- Describe the use of thermometer to measure temperature of objects.

Previous knowledge: students have learnt about effects of heat on objects.

Introduction: The teacher introduces the lesson by asking the students questions on the previous lessons.

Heat flows in water by …….

Heat make solid like metal to increase Yes or No. Why?

Presentation: The teacher presents the lesson in steps as follows.

Step I: The teacher define temperature, temperate is the degree of hotness or coldness of an object.

Step II: The teacher writes the units and symbols of temperature.

Step III: He gives the uses of thermometer, the instrument for measuring the temperature is called thermometer.

Activity 14: Temperature scale

Method/Procedure

The teacher groups the students and provides materials (thermometers) for them to observe.

- He asks students look at the thermometers
- The teacher asks students to say what is it

- Asks student to carefully look at the scales on the thermometers
- He also asks students to identify the lowest and highest numbers.

Step IV: The teacher state the degree at which water boils and the normal body temperature.

Step V: He describes the use of thermometer to measure temperature of objects.

Activity 15: use of thermometer

Method/procedure

The teacher group students and provide materials to the various groups

- He asks to pour water into the beaker until it is about two-third (2/3) place the beaker of water on the burner.
- Boil the water in the beaker and keep it boiling
- Put the bulb of the thermometer in the steam just above the boiling water
- Wait for about five minutes
- Watch the temperature shown by the thermometer
- He asked them to shake the clinical thermometer so that the mercury stays in the bulb.
- Put the bulb under your armpit for one minutes.
- Remove and read your body temperature

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

- What is the lowest number?
- What is the highest number?
- What scale is marked on the thermometer?
- What is the boiling point of water?
- What is your body temperature?

Conclusion: The teacher concludes his lesson by explaining boiling point of water and thermometry scales. The boiling point of water is 100^oC while the normal human body temperature is 37.0^oC. Thermometer has scales. These scales are:

- Celsius the unit is ^oC (ranging from 0^oC- 100c).
- Fahrenheit, the unit is ^oF (ranging from $32^oF – 212^oF$)
- Kelvin scales are K (ranging from 273k – 373k).

APPENDIX 6

LESSON PLAN FOR THE CONTROL GROUP

Lesson 1:	**Week 1**
Method of teaching:	Lecture without instructional materials
Date:	August, 2014
Class:	J SS II
Group:	control 1
Subject:	Basic science
Unit:	Four (4)
Unit Title:	you and Energy
No of student in class:	80
Time:	40 minutes
Topic:	Energy
Subtopic:	Forms of Energy and its uses

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

- Define what is energy
- List sources of energy
- Name the various forms of energy
- Explain briefly the importance of energy

Previous knowledge: students have learnt about energy

Introduction: Teacher ask the student to

- Define energy

Presentation: The teacher presents his lesson in steps as follows:

Step I: The teacher define what energy is, energy is the ability to do work. Energy is very important in everything we do.

Step II: The teacher lists the sources of energy. The sources are: The sun, fossil fuels, telephone, Battery, torch light, Radio electric fan, a car packed in one place, candle etc.

Step III: The teacher name the various forms of energy.

Energy exists in many forms. The various forms of energy are: -

Chemical energy, kinetic energy, potential energy, electric energy, light energy, heat energy etc.

The sun is the primary or main sources of energy. The plants use the energy from the sun to make their food by the process of photosynthesis and to animals through feeding from the

plant. This form of energy can be changed from one form to another.

Step IV: The teacher explains briefly the importance or uses of energy.

Energy is very important in everything we do.

Energy is required for any type of work. We make use of energy in the following ways.

- Mechanical energy is require to do work
- Solar energy is used by plants to make new plant materials
- Gas and coal energy are used to produce heat for cooking food and warmth
- Electrical energy is used for cooking, cooling, heating, lighting and so on
- Nuclear energy is used to generate electricity
- Chemical and mechanical energy is used for is transportation
- Wind energy is used to sail boat

Evaluation: The teacher evaluates the lesson by asking the following questions.

- Define energy
- List three source of energy
- Give four (4) examples of the various forms of energy
- List four sources of energy
- Name any three materials and the form of energy the produce
- Mention five uses of energy

Conclusion: The teacher concludes his lesson by making corrections on the questions that students fail and explain the lesson briefly.

Assignment: The teacher gave the students assignment to read on energy conversion.

Lesson 2: **week 2**

Method of teaching: Lecture without instructional materials

Date: August, 2014

Class: J SS II

Group: control 1

Subject: basic science

Unit: Four (4)

Unit Title: You and Energy

No of student in class: 80

Time: 40 minutes

Topic: Energy

Subtopic: Energy conversion

Behavioural objectives: By the end of the lesson students should be able to:

- Classify the sources of energy in to the form of energy
- Explain how energy can be transferred from one form to the other
- Give example of home appliances and trace their energy transformation that can take place.

Previous knowledge: Students have learnt about forms of energy their sources and uses.

Introduction: The teacher introduces the lesson by discussing briefly on the previous lesson.

Presentation: The teacher presents the lesson in steps as follows:

Step I: The teacher ask the student mention various forms of energy and give example of their sources

Forms of energy	sources of energy
Chemical	food, lighter
Electrical	electricity, battery
Kinetic	electric fan, aeroplane,
Potential	orange fruit, a car at rest
Sound	piano, guitar
Heat	fuels, battery, gas

Step II: The teacher explain how energy can be converted from one form to another. The process of changing or transferring energy from one form to another is called energy

conversion or energy transformation.

Solar energy gets to the earth as light and heat energy. Plants trap the light energy. Energy and the chemical energy in plant is taken by man and converted to mechanical energy.

Changing potential energy to kinetic energy: when can objects is at rest at a point or in some light above the ground, the object is said to posse's potential energy. This is because the objects are capable of doing work if free work must have been done on the object in taking it to this position. The work done is stored in the object as potential energy: as the object is free if falls toward the ground because of the gravitational pull on it while falling. During its motion, is has both potential energy decreasing and kinetic energy increasing. This means that the potential energy is being converted to kinetic energy when moving downward work e.g. falling of an orange from the orange trees.

The teacher explains other form of energy conversion to the student for instance, ringing the bell in the school: it will produced sound energy. This is another form of energy, a dry cell battery has chemical energy and can be converted in to electrical energy as the wire; it is converted in to light energy and heat when connected with flash light bulbs the dry cell battery is connected through the flexible wire and the positive part and the negative part of the wire connected with dry cell battery, light and heat is produced i.e. chemical electrical light and → heat energy.

Chemical → electrical → light and heat energy.

Heat energy → to light, when we heat solid it becomes red hot, it glow metals often glow when it is light energy

Heat energy → light energy

Mechanical (kinetic) → sound → heat → light

Electrical energy → mechanical and sound energy as in the use of electric bell and telephone.

Mechanical (potential) → sound

Step III: The teacher give examples of home appliances and trace their energy transformation that can take place. An electric pressing iron is which is used to press clothes is converted from mechanical (potential energy and kinetic energy) heat energy other forms of energy conversion are:

Television- electrical → light → sound → kinetic and heat energy

Radio – electrical → kinetic → sound energy.

Electric fan-electrical → sound → heat → kinetic energy

Evaluation: The teacher evaluates the lesson by asking the students the following questions.

- Define the term energy conversion

- Identify the energy conversion that take place in the following
  i. A moving vehicle e.g. car
  ii. Cooking of food using gas cooker
  iii. Give three (2) examples of home appliance that energy conversion takes place.
- Classify the materials provided into the form of energy the car produce e.g. dry cell, radio, electric pressing iron, piano, guitar, gas cooker, Bunsen burner.

Conclusion: The teacher concludes the lesson by summarizing the main point of the lesson to the students to read on sources of heat.

Lesson 3 **week3:**

Method of teaching: Lecture without instructional materials

Date: August, 2014

Class: JS II

Group: control

Subject: Basic Science

Unit: Four (4)

Unit Title: You and energy

No. of student in class: 80

Time: 40 minutes

Topic: Thermal Energy

Subtopic: Sources of Heat and Conduction

Behavioural objectives: By the end of the lesson students should be able to:

- Define heat
- List common sources of heat
- Explain that heat moves into solid object by conduction
- State substances that are good conductors and bad conductors of heat.

Previous knowledge: Students have learnt what energy is.

I**ntroduction**: The teacher introduce the lesson by asking students to rub their palms together and place on their checks. He also asks the students, how do you feel?

Presentation: The teacher presents the lesson in steps as follows:

Step I: The teacher explain to the students that heat is a form of energy

Step II: The teacher further explains to the students that heat can be from many sources. Some of the sources of heat are: sun, friction, electricity, burning of wood

Step III: The teacher explain that the sum is the primary or major sources of heat, rubbing of palms produce heat.

Friction and electricity produces heat.

Step IV: The teacher State and explain that heat can flow from one end of the object (solid) to the other end.

Step V: The teacher explain that when a metal rod or spoon is heated on fire it get hot. When one end of the iron is put into a Flame it will be discover that the other end will soon get heated and become hot on touching. The process by which heat has move from one end to the other end is called conduction.

Step VI: The teacher state objects that are good conductor and bad conductor of heat.
Objects that are good conductors allow heat to move through them e.g. Most metal while non conductor or bad conductors are objects that do not allow heat to move through them e.g. Rubber, wood etc

Evaluation: The teacher evaluates his lesson by asking questions in the class as class exercise:

- What is heat
- List any three (3) sources of heat
- Name the major source of heat.
- Explain briefly conduction
- The heat moves in solid by
- Give two (2) examples of good conductors and bad conductors.

Conclusion: The teacher concludes the lesson by making correction on the question answered by the students and making summary of the lesson.

Lesson 4	**week 4**
Method of teaching:	Lecture without instructional material
Date:	August, 2014
Class:	JS II
Group:	control
Subject:	Basic Science
Unit:	Four (4)
Unit Title:	You and energy
No. of student in class:	80
Time:	40 minutes
Topic:	Thermal Energy
Subtopic:	Heat Transfer (Convection and Radiation)

Behavioural objectives: By the end of the lesson students should be able to:

- Explain convection
- State that heat from the sun reach the surface of an object by radiation

Previous knowledge: Students have learnt conduction, good conductor bad conductor of heat.

Introduction: The teacher introduces the lesson by asking questions on the previous lesson.

Presentation: The teacher presents the lesson in steps:

Step I: The teacher explains convection. Convection is another way of heat transfer. When water is place on flame and heat, it will make the water to get hotter / warm. Therefore heat circulates in the water and the process is called convection.

Step II: The teacher also explain that when the water starts to boils it will be observes that bubbles will be coming up from bottom to the top of the water.

This action makes the hot molecules of the water to moves up while the cool molecules from the top move toward. This action the water boils 100c i.e circulation has take place through the liquid.

Step III: The teacher state that heat from the sum reach the surface an object by radiation. He defines heat and transfer. Heat means warmth and transfer means movement.

So, heat transfer means movement of heat from one place to another. Heat can spread in many ways, such as heat from the sun, or lighted lamp. Heat from the sun moves through radiation.

Step IV: The teacher explain that in radiation the heat moves in an open space i.e. in air to

reach the surface of the object. When heat travels through nothing it is say that heat travels by radiation

Evaluation: The teacher evaluates his lesson by asking questions.

- Briefly explain convection
- Heat flows in liquid by

.

- Define heat transfer
- Briefly ex[lain radiation
- Heat from the sum reaches our body by ……

Conclusion: The teacher concludes his lesson by making summarizing of the main points.

Lesson 5: **week5**

Method of teaching: Lecture without instructional materials
Date: August, 2014
Class: JS II
Group: control
Subject: Basic Science
Unit: Four (4)
Unit Title: You and energy
No. of student in class: 80
Time: 40 minute
Topic: Thermal Energy
Subtopic: Effects of heat on solid, liquid and gas

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

- State expansion of solid
- State that solid object when heated, increase in size.
- Explain the effects of heat on water
- List the effects of heat on expansion of liquid.
- Explain that air expand on heating

Previous knowledge: Students have learnt heat flow from one end to another in object

Introduction: The teacher introduces his lesson by asking question on the new lesson.

- List any three liquid you know
- Does water increase in volume when heated?

Presentation: The teacher presents his lesson in steps as follows:

Step I: The teacher state expansion of solid during heating.

Heat causes substances to expand when heated and on cooling make the objects to contract i.e. reduction in their sizes. Iron rod expands when heated

Step II: The teacher state that solid objects when heated, increase in size. Heat has effects on objects or substances when heated. The object gets heated when the heat energy moves in. substances when heated, increase in size volume and area. For example objects like ball and ring when heated the ball can not pass through the ring.

This happens as a result of expansion of the ball. Some metal like wire increase in length when heated.

This is because expansion has occurred, so heat can make solid to:

- Increase in length
- Increase in length
- Change their state e.g. solid to liquid as in ice block to water.

Step III: The teacher explain the effects of heat on water(liquid) such as water usually expand on heating. The expansion will result to increase in volume of the water and reverse is the case when there is no heat.

For instance, when a liquid (water) is in a basin and heated. It will be observed that the level of the water in the basin will rise up.

This slows that the water has expand.

Step IV – The teacher list the effects of heat on expansion of liquid. The following are the effects of heat on expansion of liquid.

- Rise in temperature
- Increase in volume or area
- Change of state
- Change of colour

Step V: The teacher explains that air expand when heated. When an empty bottle is heated the air in it can expand. This can be illustrated when a glass tube fitted into the whole cork is fit into an empty flask.

Insert a drop of colour water into the glass tube, then heat gently the bottom of the flask. The level of the colour water in the glass tube will rise up. This shows that the air expand by causing the level of the colour water drops to rise up. Also when it is allowed to cool the level of the drops of colour water will fall.

Evaluation: The teacher evaluates his lesson by asking the following questions.

- Explain briefly expansion of solid when heated?
- List two (2) effects of heat on solid
- Heat can make solid to increase in

a. ……..

b. ……..

c. ……..

- Describe what will happen to water as a liquid when heated?
- List any two (2) effects of heat on water
- Give any example of liquid that can expand when is heated?

- Explain the effect of heat on air
- Does air expand when it is heated?

Conclusion: The teacher concludes the lesson by making correction on the students class work and summarizes the lesson.

Lesson 6	**Week 6**
Method of Teaching:	Lecture without instructional materials
Date:	August, 2014
Class:	JSSII
Group:	Control
Subject:	Basic Science
Unit:	Four (4)
Unit Little:	You and Energy
No. of Students in class:	80
Time:	40 minutes
Topic:	Heat Energy and Temperature

Sub-topic : Temperature and its measurements

Behavioural objectives: By the end of the lesson the students should be able to:

- Define what is temperature
- List units and symbols/signs of temperature scale
- Give uses of thermometer
- State the degree at which water boils and normal body temperatures
- Use thermometer to measure temperature of an objects.

Previous knowledge :Students have learn about effect of heat on objects

Introduction: The teacher introduces the lesson by asking the student questions on the previous lessons.

- Mention the primary source of heat energy
- Heat flows in water by …..
- Heat make solid like metal to increase Yes or No. Why?

Presentation: The teacher presents the lesson in steps.

Step I: The teacher define what is temperature

Temperature is the degree of hotness or coldness of an object. Thermometer is the instrument used in measuring temperature. He describe that the thermometer contains a liquid in a long thin tube at the middle of the long glass-tube.

Step II: The teacher explains that the thermometer is graduated starting from the lowest number to the highest number. The thermometer has temperature scales. These are:

- Celsius scale and the unit is ^{o}C

Fahrenheit scale and the unit is^{o}F and Kelvin scale and the unit is K. These scales have range, Celsius scale and the unit is ^{o}C (ranging from 0^{o}C – 100 c) while Fahrenheit, the unit is ^{o}F (ranging from 32^{o}F – 212^{o}F) and Kelvin scale ranges from 273k - 373K.

Step III: The teacher explained to the students that temperature of objects can be measured. He also explained that when the bulb of a thermometer is inserted into ice water the reading will be 0^{o}C (Zero degree centigrade).

Step IV: The teacher explained to students that boiling point of water is 100^{o}C. This can be observed when the bulb of the thermometer is put in the steam above the boiling water.

Step V: Teacher again explained that the hotness or coldness (temperature) of the human body can be measured using clinical thermometer. Also, he explains that the normal human body temperature is 37^{o}C.

Evaluation: The teacher evaluates his lesson by asking question.

- Define temperature
- Mention any use of a thermometer
- Write the symbol of Celsius scale and Kelvin scale
- What is the boiling point of water
- The normal body temperature is …..

Conclusion: The teacher concludes his lesson by making corrections on the questions asked and gives summaries of what the students have learnt during the lesson.

APENDX 7

List of standard and improvised materials used in the study

Improvised Materials

1. Local candle (Achibelbel)
2. Battery
3. Local flute
4. Local fan
5. A match stick
6. Box
7. Torch Light
8. Animal horn
9. Firewood
10. Match box
11. Charcoal pressing iron
12. Drum
13. flexible wire
14. flash light bulb
15. radio.
16. Pebble
17. Cotton
18. maize stalk
19. knife
20. long nail
21. spoon
22. candle heater
23. matches
24. drinking straw
25. grain of colour chalk
26. tin
27. shining tin
28. heater brick
29. can painted black
30. water
31. Screw eye
32. Cup
33. tin of cold water
34. colour water (ginger)
35. tripod stand
36. cap wax or glue
37. colour water bottle
38. one whole cork
39. tall tin as stand
40. using syringe as dropper
41. Chart diagram of thermo water
42. candle heater
43. mercury in liquid thermometer and clinical thermometer.

Standard Materials

1. Standard materials candle
2. Battery
3. flash light bulb
4. radio
5. tape recorder
6. electric motor
7. lighter
8. electric fan
9. Dry cell battery
10. Telephone
11. torch light
12. Matches
13. convex lens
14. carbon paper
15. long rod
16. rector stand
17. Bunsen burner
18. Beaker
19. cold water
20. glass tube grains of potassium permanganate
21. tripod stand
22. an electric lamp
23. Ring and ball
24. beaker of cold water
25. test tube
26. gauges
27. one whole cork
28. glass tube
29. Colour water
30. flat bottom flask
31. dropper
32. wax
33. Standard thermometer
34. standard clinical thermometer
35. a beaker of water
36. mercury in liquid thermometer.

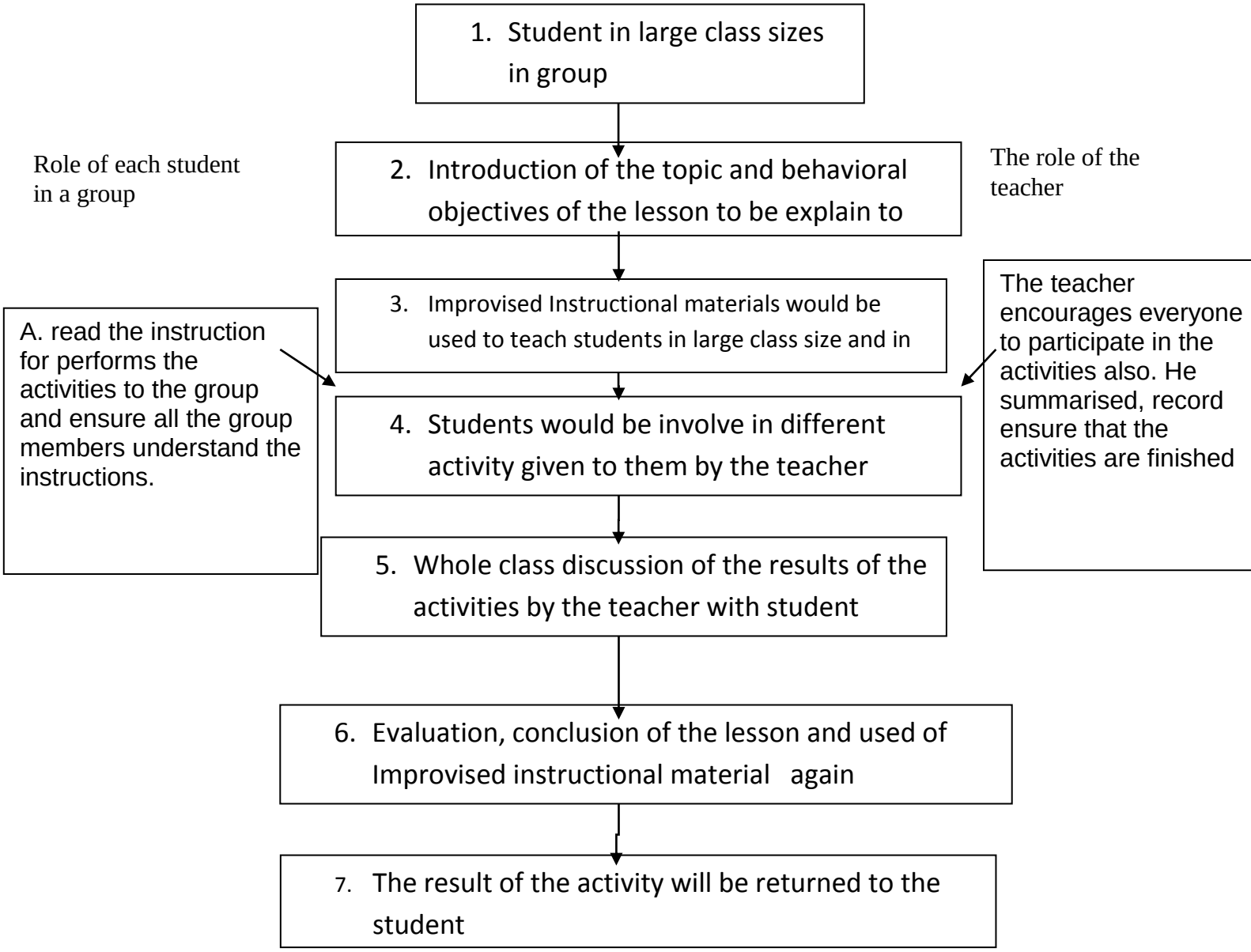


Fig. 3.2:Aflow chart using enriched lecture with improvised instructional materials .

Source: Adapted from Olorukooba (2001)

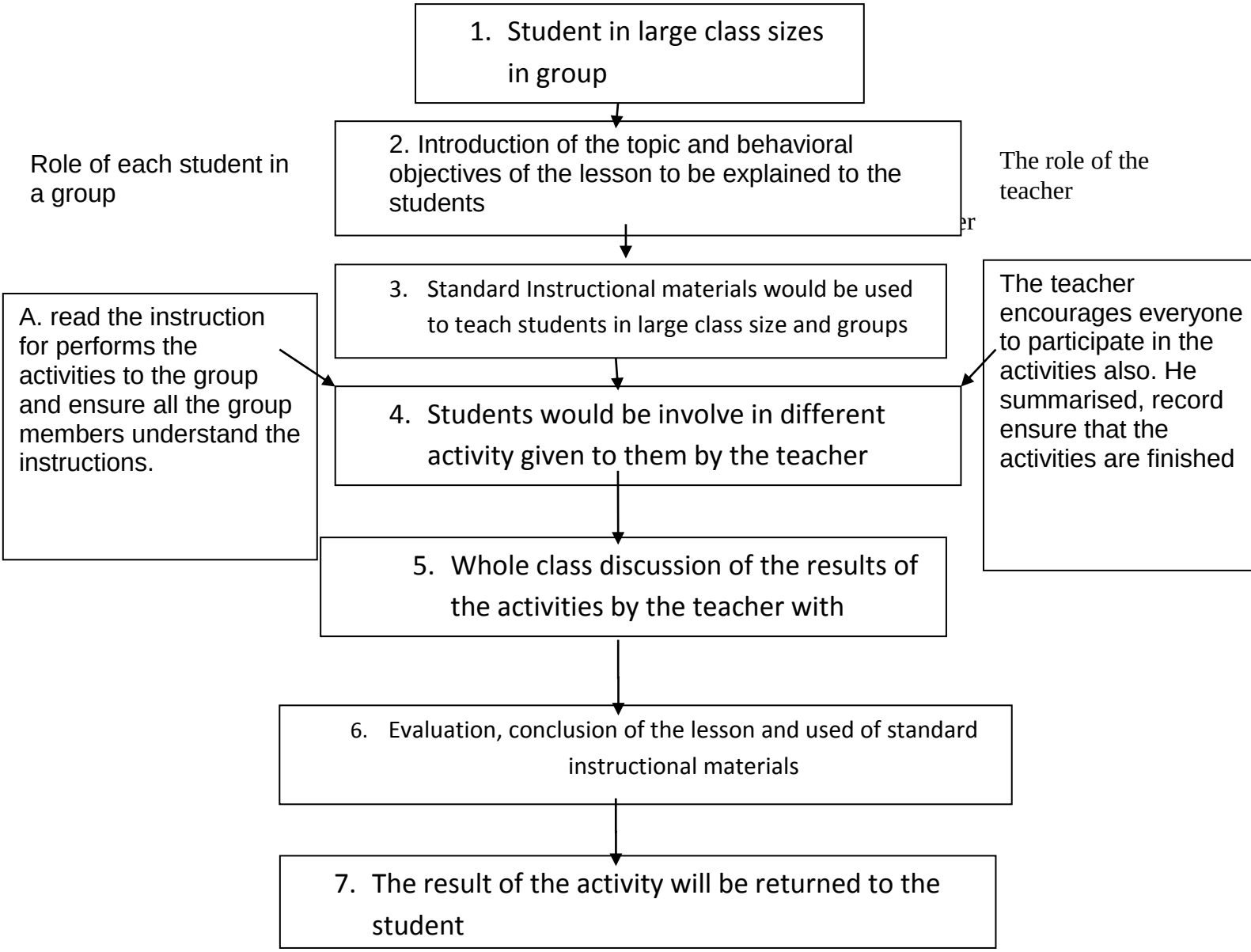


Fig. 3.3:A flow chart of using enriched lecture with standard instructional materials

Source: Adapted from Olorukooba (2001)