IMPACT OF TEAM-TEACHING STRATEGY ON ACADEMIC ACHIEVEMENT AND INTEREST IN BASIC SCIENCE CONCEPTS AMONG JUNIOR SECONDARY SCHOOL STUDENTS IN POTISKUM, YOBE STATE NIGERIA.

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AUGUST, 2014

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A THESIS SUBMITTED TOTHE SCHOOL OFPOSTGRADUATE STUDIES,AHMADU BELLO UNIVERSITY, ZARIA IN PARTIAL FULFILMENT OFTHEREQUIREMENTS FOR THE AWARD OF A MASTERDEGREE IN SCIENCE EDUCATION.

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AUGUST, 2014

DECLARATION

I declare that the work in this thesis entitled "Impact of Team-Teaching Strategy on Academic Achievement and Interest in Basic Science Concepts among Junior Secondary School Students in Potiskum, Yobe State" has been carried out by me in the Department of Science Education. The information derived from the literature has been duly acknowledged in the text and a list of references provided. No part of this thesis was previously presented for another degree or diploma at this or any other Institution.

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CERTIFICATION

This thesis entitled: "IMPACT OF TEAM-TEACHING STRATEGY ON ACADEMIC ACHIEVEMENT AND INTEREST IN BASIC SCIENCE CONCEPTS AMONG JUNIOR SECONDARY SCHOOL STUDENTS IN POTISKUM YOBE STATE", by Banfe Michael YAGA meets the regulations governing the award of the degree of Master Degree in Science Education of the Ahmadu Bello University, and is approved for its contribution to knowledge and literary presentation.

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DEDICATION

This thesis is dedicated to God Almighty, my beloved late mother Mulacha (Zare) Tada Gwajarvare, my entire family and Tasa people.

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OPERATIONAL DEFINITION OF TERMS

1.**Team teaching :** Is referred to as a group of two or more teachers workingtogether to plan, conduct and evaluate the learning activities for the same group of learners.

2. Interest:A feeling of having one's attention, concern, or curiosity particularlyengaged by something, the power to excite such feelings; quality of beinginteresting

3. Academic Achievement: It is an academic work gained or achieved by an effort of the student under the guide from the teacher. An experience gained or accomplished by superior ability under the supervision of the teacher; special effort; great courage; or a great and heroic deed by the student through his supervisors. It is the art of achieving goal; attainment or accomplishment of a target.

ABBREVIATIONS

BSCE Basic Science Certificate Examination

BSAT- Basic Science Achievement Test

BSNSS - Basic Science for Nigerian Secondary Schools

CREDO - Curriculum Renewal and Educational Development Overseas

FMAT - Further Mathematics Achievement Test

IBE- International Bureau of Education

NISP - Nigerian Integrated Science Project

NSSSP - Nigerian Secondary Schools Science Project

NOUN - National Open University of Nigeria

SIQ - Students' Interest Questionnaire

TPHPL - The Project on High Performance Learning

ABSTRACT

This study investigated Impact of team-teaching strategy on academic achievement and Interest in Basic Science Concepts among Junior Secondary School Students in Potiskum, Yobe State Nigeria. The researcher used quasi experimental control Group Design involving pretestand posttest for the study. The study have four objectives, four research questions and four null research hypotheses guided the study. The subjects used in the pilot study comprised a total of 33 students in JSS 2. The population of the study is all government junior secondary two [JS 2] students in Potiskum educational zone, involving 16 junior secondary schools running Basic Science Programme with the population of 3,597 boys, 2,330 girls, and a total of 5,927 students in the study area. Two groups of the subjects were randomly selected as sample for experimental and control groups by using simple random sampling technique with the total of one hundred and fifty-four (154) students. Two instruments; Basic Science Achievement Test (BSAT) and Students' Interest Questionnaire (SIQ) were used for data collection. The instruments were validated by the senior lecturers in the Department of Science Education, Ahmadu Bello University Zaria. The reliability coefficient 0.87 of the test was obtained by using test retest method. The instruments were administered to the subjects before and after the treatment. The data collected was analysed at p 0.05 level of significance. Theindependent t-test simple statistics andpaired sample t-test statistics were used for testing the hypotheses. Students were encouraged to ask questions, made contributions, discussions, class activities and offer personal suggestions during team teaching in the class. Stakeholders, especially commissioners for education, directors of schools, principals and other resource personnel should always emphasise on the use of team teaching for instruction in the class especially the teachers in the service.Students develop high interest in learning of Basic Science Concepts when Team Teaching Strategy is used in learning and teaching. Teachers of Basic science in Potiskum local government Yobe State should be encouraged to adopt constructive team discussion to increase their knowledge on team teaching strategy at JSS two (2) level in secondary schools.

CHAPTER ONE

THE PROBLEM

1.1 Introduction

The system of education which Nigeria inherited from the colonial administration had some defects in terms of its contents and philosophy, with respect to the needs of the country (Obodo, 2004). The defects manifested in the inability of the educational system to meet the manpower needs of the fast growing Nigerian economy. This led to policy changes that brought about the National Policy on Education and its consequent changes in the Nigerian system of education.

The revised edition of National Policy on Education (FME, 2004) gave science, technical and vocational education prominence at all levels of education in Nigeria. Science education should emphasize the teaching and learning of science process and principles such as observation, classification, measurement, experimentation and prediction. National Policy on Education (FME, 2004) opined that such processes and principles will lead to fundamental and applied research in the sciences at all levels of education. Based on this, special provisions and incentives were intended for the study of the sciences at each level of the national education system (FME, 2004). This led to the popularizing the study of sciences and the increased production of science educators and scientists to inspire and support national development. This points to the high level of importance which government places on science education, particularly science teaching that employs the methods of inquiry. The policy emphasizes that the national objectives of teacher education shall include, among others:

- To produce highly motivated, conscientious and efficient classroom teachers for all levels of our education system
- To encourage further the spirit of inquiry and creativity in teachers

To this effect, the admission policy, prescription for Nigerian universities is the ratio 60:40 in favour of sciences in conventional universities and 70:30 in universities of Science and Technology. Furthermore, science education shall emphasize the teaching and learning of science processes and principles. This would lead to fundamental and applied research in the sciences at all levels of education. The specific objectives of the National Science, Technology and Vocational Education programmes therefore include:

- To cultivate inquiry, knowing and rational mind for the conduct of a good life and democracy.
- To produce scientists for national development.
- To service studies in technology and the cause of technological development
- To provide knowledge and understanding of the complexity of the physical world, the forms and the conduct of life.

However, this noble objective (60:40 Science -Arts admission) has not been well achieved because of insufficient qualified science candidates. The inability of the tertiary institutions to admit qualified candidates with science and science related subjects may be responsible for the poor performance of science students in the Senior Secondary Certificate Examination (SSCE) which arose from the poor foundational base of sciences from the Junior Secondary School. The poor performance of students in Sciences and Mathematics has resulted in great shortage of technical manpower needs for scientists, mathematicians and engineers (Harbor-Peters, 2005).

In response to the perceived problem, there arose the need for science curriculum reforms at all levels of education. At Junior Secondary level the reform was based on Basic Science. As a step towards presenting science to the child, reflecting the culture and tradition of Nigerians, the

idea of the Nigerian Integrated Science Project (NISP) was born in 1968 and was first published in 1971 (STAN, 1968) which was an attempt to teach science as a unified whole. According to the Science Teachers Association of Nigeria (1970) cited in Ogunniyi (1986), Nigerian Integrated Science Project should enable students to be able to:

- observe carefully and thoroughly;
- report completely and accurately;
- organise information acquired;
- generalize on the basis of acquired information;
- predict as a result of the generalisations; design experiments (including controls, where necessary, to check the predictions);
- use models to explain phenomena, where appropriate; and
- continue the process of inquiry when new data do not conform to predictions.

To achieve these noble objectives, there should be well trained teachers, available learning materials and equipment under ideal environment so that gender boundary should not be regarded as others argued. In a modern world where women make up over half the workforce (Adya & Kaiser, 2005), it seems only fair that women should have an equal opportunity to pursue whichever career they choose.

The great concern in the field of science education is the biases and misconceptions about women and science, that is, science is a male enterprise (Erinosho, 2005). According to Arigbabu and Mji (2004) in Nigeria and even Africa, gender bias is still very prevalent. Onyeizugbo (2003) observed that "sex roles are somewhat rigid in Africa; particularly in Nigeria… gender differences are emphasized". It is common place to see gender stereotypes manifested in the day-to-day life of an average Nigerian. Certain vocations and professions such as medicine, engineering and

architecture courses have traditionally been reserved for men and others like nursing, catering, and typing for women.

Moses and Daniel (2008) opined that parents call boys to wash cars, taking care of animals, cut grass, fix bulbs, or climb ladders to fix or remove things. On the other hand, chores such as sweeping, mopping, washing dishes, cooking, cleaning and so on, are reserved for the girls. In a nutshell, what are regarded as complex and difficult tasks are allocated to boys, whereas girls are expected to handle the relatively easy and less demanding tasks. As a result of this way of thinking, the larger society has tended to see girls as the "weaker sex".

Traditionally masculine jobs such as those in science, mathematics and technology should now be available for women to take up. These listed objectives, the teaching of Basic Science should involve the use of methods that could allow teachers' sharing of ideas and expertise in teaching – learning process and thereby achieve mastery of subject matter among other methods such that the gender barrier should be eliminated (Nzewi, Okpara, & Okudolu 1995).

Wenzlaff (2002) defined team-teaching as two or more individuals coming together in a collaborative relationship to share work in order to achieve the stated objectives. Team teaching is known as an effective instruction technique capitalizing on the knowledge and expertise of two or more teachers in the same classroom (Darling-Hammond & McLaughlin, 1995; Lieberman, 1995; Roth, 2002). Roth (2002) opined that at the university level, it is often discussed and recommended in teacher preparation programs as a way both to utilize the professional understandings of two teachers as well as to meet the needs of diverse students in a classroom.

Team teaching involves two or more teachers teaching the same group of students. The group of students will benefit from the expert knowledge of different teachers, unlike the single-teacher teaching technique where the students are left at the limited resources of an individual teacher. Single-teacher teaching is an instructional procedure whereby a teacher is responsible for

teaching, directing and evaluating the learning of a group of students all through while team teaching is equally an instructional procedure whereby two or more teachers jointly share the responsibility of directing, teaching and evaluating the learning of a common group of students (Offorma & Ofoefuna, 1998; Heather, 2008).

Team teaching also involves a group of instructors working purposefully, regularly and cooperatively to help a group of students of any age to learn. Teachers together set goals for a course, design a scheme of work, teach students, and evaluate the results. They share insights, argue with one another, and perhaps even challenge students to decide which approach is better. Teams can be single-discipline, interdisciplinary, or school-within-a-school teams that meet with a common set of students over an extended period of time. New teachers may be paired with veteran teachers. Innovations are encouraged, and modifications in class size, location, and time are permitted. Different personalities, voices, values, and approaches spark interest, keep attention, and prevent boredom. These may improve students' learning of science.

Teaching periods can be scheduled side by side or consecutively. For example, teachers of two similar classes may team up during the same or adjacent periods so that each teacher may focus on that phase of the course that he or she can best handle. Students can sometimes meet all together, sometimes in small groups supervised by individual teachers or teaching assistants, or they can work singularly or together on projects in the library, laboratory, or fieldwork. Teachers can be at different sites, linked by video-conferencing, satellites, or the Internet. In team teaching a group of teachers, working together, plan, conduct, and evaluate the learning activities for the same group of students. In practice, team teaching has different forms but in general it is a means of organising staff into groups to enhance teaching. Teams generally comprise staff members who may represent different areas of subject expertise but who share

the same group of students and a common planning period to prepare for the teaching. To facilitate this process, a common teaching space is desirable.

Results from previous researches on the teaching of Basic Science revealed that teachers predominantly use lecture method in Science lessons ((IBE, 2005). This may suggest that teachers do not vary their teaching methods from time to time. It may also be suggested that activities carried out are not stimulating enough. The key concepts in the process of science, i.e. observing things, reporting activities, measuring things were not adequately carried out. This may not help in laying a good foundation for scientific knowledge and advancement (Aworanti, 2009). These have serious implications for academic achievement in Basic Science. Findings also indicated that team teaching has a positive impact on students' academic achievement. Such studies include Nzewi (1995) who observed that team teaching has a positive effect on students' performance in Social Studies as they interact in the process of solving the problem together. Doebler and Cheri (1996) showed a positive effect of team teaching on Mathematics achievement. Also, Ubah (2005) found out that students taught using team teaching performed better than those taught using individual instruction in Further Mathematics. Hence, the researcher wants to find out if team teaching will have a significant impact in the achievement and interest of students in Basic Science.

1.1.1 Theoretical Framework

Team teaching is a learning strategy in which a group of two or more teachers working together to plan, conduct and evaluate the learning activities for the students. Alexander (1963) proposed the middle school concept, where a team of two to five teachers would be assigned to pupils organized either on a single-grade or multi-grade basis. This recommendation of junior high school reform is where the idea of team teaching was developed. Theoretical Framework Collaboration has long been established as a cornerstone for professional growth and educational reform (Darling-Hammond & McLaughlin, 1995; Lieberman, 1995; Roth, 2002). The act of team-teaching, its history as well as its progression, dates back to the 1960s when "progressive education" was required (Villa, Thousand, Nevin & Liston, 2005). According to Wilson & Ferguson (2007) during the 1970s, legislated school reforms were a catalyst in advancing the need for team-teaching as teachers found themselves modifying their instruction in order to teach a "more diverse student population" (Walther-Thomas, 1997; Villa, 2005).

Team teaching acts as the social context for greater interaction, increased feedback, and more resources that Vygotsky (1978) proclaimed as paramount for learning experiences. It is expected that as teachers engage in such collaborative techniques, they continue to refine their craft with the aid of another professional's feedback and encouragement (Darling-Hammond & McLaughlin, 1995). Such aids can both scaffold understanding of classroom practice and reflection as well as discovery of new and innovative ways to think about problems and teaching in context. This type of teaching allows educators to build their own knowledge base through collaboration, while increasing the students' measure of success (Wenzlaff, 2002; Jang, 2006). Bacharach (2008), opined that Co-teaching opens the window for collaboration and reflection on identical contextual experiences and student needs. Pre-service teachers can benefit from firsthand experience with co-teaching, both personally in the growth of their content knowledge, as well as

professionally as a model for instruction that focuses on students' learning and utilization of dual sets of knowledge and experiences (Lindenfeld, 1992; Boreen & Niday, 2000; Jamal & Baba, 2001).

Vygotsky (2007) opined that teaching in team can be grouped into two main groups: namely, socio-behavioral perspective and socio-cognitive perspective. In socio-behavioral perspective, the experience of being in a team impels the individual towards greater performance than would occur if the individual were teaching alone. Scholars of socio-cognitive perspective argued that working in teams express team members of different ways of thinking about subject matter which, in turn, improves teaching and learning.

According to Vygotskyian theory (2007), greater effort results from the team itself rather than from the goal. Teachers come to identify with teams in which they are members, and to form social bonds with other members of their team. The cohesion built around the team identity leads team teachers to combine their knowledge and skills for the team's benefit. Greater achievement results from team identity and pooled effort.

According to Piagetian cognitive-elaboration theory (2010) learning arises from interaction amongst team members. Verbal interaction in teams discussion of the subject matter at hand by team members leads to active processing of information that arises during that interaction. The psychological developmental theories of Vygotsky and Piaget are included in cognitive-developmental explanation of the outcomes of team teaching. The Vygotskyian approach argued that learning occurs from mediation and modeling during interaction with one another, given that the help provided by another person is appropriate in terms of relevance, timing, and level of difficulty. The Piagetian approach argues that learning occurs when interaction in a team leads to cognitive conflict in the individual.

1.2 Statement of the Problem

There has been growing concern throughout the country over the years about the discouraging state of the teaching and learning of Basic Science (Oludipe & Oludipe, 2009). It has been argued that Junior Secondary students must be well grounded in Basic Science at this level for them to be able to study the core science subjects (biology, chemistry & physics.) at the Senior Secondary School level (Olarewaju, 1994). Studies such as the Status and Quality of Secondary Science Teaching and Learning in Lagos State by Ogunmade (2005) was carried out on how to improve the teaching and learning of Integrated Science at the JSS level. Despite this, there is a consistent under-achievement of students in this subject area (Lawan, 2011). For example, the results of JS final examination of Basic Education Certificate Examination (BECE) 2013 Yobe State in the study area indicated in appendix **M** that one hundred and ninety-nine (199) students sat for Basic Science, only thirteen (13) representing 6.5% passed with A, Eleven (11) passed with B representing 5.5%, thirteen (13) passed with C representing 6.5%, twenty-one (21) passed with D representing 10.6%, forty-two (42) passed with E representing 21.1% and ninety-nine (99) failed representing 49.8%. This might be due to the type of instructional strategy used in imparting knowledge to the students in the class, teachers might have little knowledge about the philosophy and objectives of Basic Science, it might be inadequate training of teachers in Basic Science or insufficient learning materials and class congestion that led to failure to improve students' interest in science among others. Without the use of appropriate teaching method where students share ideas, in the class activities and learn from different teachers such as the use of team teaching, may result into low academic achievement in Basic Science by students which will lead to low academic achievement in their core science subjects at SS level. This study therefore used team teaching strategy to see whether it would improve Basic Science student's academic achievement and interest or not.

1.3 Objectives of the Study

The general objective of this study is to compare the impact of team-teaching strategy and single teacher-teaching strategy on JS students' academic achievement in Basic Science Concepts. Specifically, the objectives of the study are to:

i. determine the impact of team-teaching strategy on academic achievement of JSS students and those exposed to single teacher-teaching strategy,

ii. investigate impact of team-teaching on male and female students in Basic Science at JSS level,

iii. find out which of the two teaching strategies promotes interest in the learning of Basic Science among Junior Secondary School students,

iv. find the difference in the interest of male and female students.

1.4 Research Questions:

The following research questions guided the study:

i. What is the difference in academic achievement between students who are exposed to team-teaching and those that are exposed to single-teacher teaching in Basic Science?

ii. What is the difference between the mean score of male and female students who are exposed to team-teaching strategy at JSS level in Basic Science?

iii. What is the impact of the two teaching strategies on interest of JSS Basic Science students?

iv. What is the difference in the interest of male and female students in Basic Science?

1.5 Null Hypotheses

The following research hypotheses guided the study:

H_{O1}: There is no significant difference between the mean achievement scores of students taught Basic Science using team-teaching strategy and those taught with single-teacher teaching strategy.

Ho_2: There is no significant difference between the mean scores of male and female students taught Basic Science using team-teaching strategy.

Ho_3: There is no significant difference in the interest of Basic Science students before and after exposure to the two teaching strategies.

Ho_4: There is no significant difference in the interest of male and female students in Basic Science.

1.6 Significance of the Study

The findings of this research will hopefully be helpful to the students, as it makes them have a better understanding of the Basic Science concepts. The opportunity of having two or more teachers teaching them will help in sustaining their interest in the subject and also deepen their understanding of the subject. The findings of the study will also be of benefit to the teachers. Apart from tapping the knowledge from the more experienced teachers, it can make the teaching of Basic Science more interesting and thus improve teachers' effectiveness.

The findings can provide information with which educational administrators can organize seminars, conferences and workshops for teachers. Such in-service training programme will acquaint teachers with alternative instructional strategy for teaching Basic Science.

The study will also hopefully be of immense benefit to text book publishers, teacher-training institutes such as colleges of education and as well faculties of education in Nigerian universities. The Basic Science courses may be enriched by the team teaching strategy as it encourages the

work of two or more teachers together. This is in line with an adage that two heads are better than one.

Finally, for the fellow researchers, the findings of the research can provide empirical evidence of the efficacy of the team teaching strategy in Basic Science. This can form a basis for further research in Basic Science.

1.7 Basic Assumptions

1. Team teaching ensures learner's participation and hence enhances academic achievement and interest in Basic Science class.
2. Team teaching encourages students' interaction in Basic Science course class activities.
3. Team teaching encourages unity and sharing of ideas among teachers and students.

1.8 Scope of the Study

This study covers only the two selected schools out of sixteen (16) public schools running co-education Junior Secondary Schools [JSS] 2 in Potiskum Educational Zone Yobe State, because it was not easy to cover the whole population in the study area. It also covers only the topic "energy" with the following concepts: forms of energy, sources of energy, energy conversion, uses of energy, energy classification, and energy sort cards that the researcher has identified through oral interview and students' questionnaire as difficult areas in Basic Science. Topic was selected because it cuts across all the Science subject areas, Biology, Chemistry, Physics, and Earth Sciences. Team Teaching was also used for teaching the concepts whether it has the impact on the students Academic Achievement because teachers have been using the lecture method (conventional) for teaching the concepts. The researcher also used JSS two (2) students because JSS three (3) are preparing for their Basic Education Certificate Examination (Junior WAEC) and JSS one (1) are also not suitable for the research because they are just new into the system.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter reviewed the literature that relates to the history and growth of Basic Science in Nigeria. The related literature of this study therefore was reviewed under the following sub-headings:

- History of Basic Science
- Nature of Basic Science
- Problems of Teaching Basic Science
- Science Teaching Strategy
- Single Teacher Teaching Strategy
- Traditional Method of Teaching
- Concept of Team Teaching
- Impact of Team-teaching on Academic Achievement
- Students' Interest and Academic Achievement in Basic Science
- Gender Issues in Academic Achievement
- Overview of Similar Studies
- Implication of Literature Reviewed on the Present Study

2.2 History of Basic Science

According to Ogunleye (1999) the history of Basic Science in Nigeria could be traced from the missionary school in Lagos. He said that the first known primary school in Nigeria is the Methodists' Missionary in Badagry which was established in 1843. Only rudiments of science were introduced by missionary doctors attached to the theological and medical centres. Between 1861 and 1897 rudiments of science were also taught in the secondary and teacher training college

levels. The education ordinance of 1908 which stipulated grants to schools encouraged the acquisition of scientific educational equipment.

In 1909, King's School, Lagos was established as the first secondary school and it had a chemistry laboratory with a European teaching staff to teach science. In 1927, the government established the Queen's School in Lagos for girls, one government college each in Ibadan and Umuahia with provisions for the teaching of science. In 1934 a major development at the tertiary level was the establishment of Yaba Higher College, a science tertiary institution to provide intermediate manpower development in medicine, engineering, survey and teaching of basic sciences at the secondary school level (Ogunleye, 1999).

At the international level, according to National Open University of Nigeria (NOUN, 2008:34),

> no nation is an island. The growth and development of science in one nation pose a challenge to others. A case in point is the launching of the sputnik by the Soviet Union in 1957. This advancement saw a great revolution in the field of science, especially in U.S.A. It so challenged the United States that there was a total transformation in US science education in all ramifications. Nigeria too is not left out in the struggle to meet up with the challenges of world science and technology. This is marked by a drastic change from the liberal arts to much concentration on science and technology.

Ogunleye (1999) opined that the first organized science curriculum project for Nigerian secondary schools is the Basic Science for Nigerian Secondary Schools (BSNSS) project in 1962 through the collaborative efforts of the staff of the science department of Comprehensive High School, Aiyetoro, Ogun State and specialists in science education of the Harvard University, USA. However, the first nationwide secondary school science curriculum in Nigeria occurred through the formation of the Science Development Committees in 1968, nurtured by a cooperative effort between the Science Teachers Association of Nigeria (STAN) and the Comparative Education Study and Adaptation Centre (CESAC). The products of these committees led eventually to two science curriculum projects: The STAN Nigerian Integrated Science Project (NISP) and the

CESAC's Nigerian Secondary Schools Science Project (NSSSP) in Biology, Chemistry and Physics. While STAN syllabuses in Biology, Chemistry and Physics were well-used and had textbooks written on them between 1970 however, the more popular was the NSSSP Ivowi (1990) in Urevbu & Omoifo (2005).

In August 1969, CESAC organized a science curriculum development conference at the University of Ibadan with the aim of preparing some Nigerians with the skills necessary for designing and producing instructional materials in secondary school biology, chemistry and physics. Following this conference was a writing workshop held at the Comprehensive High School, Aiyetoro in 1970. The NSSSP had an examination syllabus in each of biology, chemistry and physics together with students' texts and teacher's guides. The project followed the curriculum development processes of syllabus preparation, writing of instructional materials, assessment at a critique conference, organization of teacher training courses, trial testing and feedback leading to a revision of texts and final production of materials for public use (Ivowi, 1990) in Urevbu & Omoifo (2005). The NSSSP materials, in Biology, Physics and Chemistry, were used in selected trial secondary schools that had the facilities required to implement them throughout Nigeria in 1970s at senior school level (from Forms III to V) which is equivalent to SS 1-3 in the current educational system. Other non-trial schools used the standard science curriculum produced by the WAEC. The NSSSP materials shared quite similar rationale found in most of the post-sputnik science curricula then characteristic of science curricular reform particularly in developing countries.

With the introduction of the *National Policy on Education* (FRN, 1984), the Nigerian government discarded the WAEC curriculum now considered obsolete to contemporary developmental needs, and introduced a new science curriculum at Senior Secondary Schools across the nation in 1985 which so closely resembled the old NSSSP materials. These latter

materials were actually adopted for use throughout the Senior Secondary Schools of Nigeria as a new science curriculum. The adoption saves the trouble of developing a whole new curriculum; especially as the NSSSP materials had been on trial for over a decade at the time they were adopted on a national basis (Ivowi, 1990) in Urevbu & Omoifo (2005).

However, the history of Basic Science teaching in Nigeria is not quite long. When Western education was introduced to Nigeria in 1843, Integrated Science was not part of the school curriculum. Integrated Science in Nigeria started from the primary school unlike what obtained in most western countries such as United Kingdom (U.K) and United States (U.S) where science teaching grew from the universities to other institutions of learning. The foundations for modern Integrated Science education in Nigeria were laid between 1861 and 1897 when rudiments of science were developing into a full science course Aliyu (1984) in National Open University (NOUN, 2008).

By 1926, Nature Study had become a popular subject in some primary schools and teacher training colleges. Elementary Science was taught at the first Government Teachers' College in the North. Later a teacher training college which specialized in teaching Rural Science was established in Minna. The depth and coverage of the subject were shallow because of scarcity of teachers and resources (Ogunleye, 1999).

Post-secondary institutions were opened for the study of science due to pressure by some nationalists who studied abroad. The first of its kind was Yaba Higher College established in 1934. It was aimed at providing intermediate manpower in medicine, agriculture, survey, engineering and teachers to teach basic science subjects in secondary schools. In early 1950s, most Nigerian secondary schools started offering General Science as a single subject to meet the demands of the society. It started losing its popularity when students who successfully completed the course could not be accepted into high school to study Chemistry, Physics or Biology. By the mid-1950s most

Nigerian secondary schools were operating the two-tier approach where every student was taught General Science for two years in a five-year education programme. Students were allowed to specialize in the last three years in two or three subjects of their choice. The Nigerian Integrated Science Project (NISP) was the first in the series of science curriculum projects to be developed by the Science Teachers Association of Nigeria (STAN) in 1970. It was written in conformity with the guidelines as specified in STAN's curriculum development (Newsletter No.1) which contained the philosophy, methodology, content and evaluation of Basic Science. Furthermore, the newsletter listed some of the skills students would acquire after having been exposed to a course in integrated science. These skills were observing, measuring, classifying, reporting, organizing, generalizing, predicting and experimenting. STAN commissioned its members to write Pupils' Textbook and Teachers' Guide for the Nigerian Integrated Science Project (Ogunyele,1999).

The first edition of the Nigerian Integrated Science Project (NISP) was published in 1972. The project became very popular with both classroom teachers and pupils. The popularity of the project was largely due to the relevance of its content to the pupil's experience as well as the presentation of the materials to the pupils. Several important developments such as the emphasis on activity based method of teaching and improvisation of materials which affect science and science teaching have taken place since the first edition was published. The body of the knowledge called science has been expanded very rapidly. The application of scientific ideas to practical situations (in the areas of technology) has grown proportionally as it affects human life.

Above all, the National Policy on Education (FME, 2004) has been approved by the Federal Government of Nigeria, involving a six-year, two-tier secondary educational programme. These developments have brought about the need for a review of the Nigerian Integrated Science Project, to fit into the new three-year junior secondary school system. The Federal Ministry of Education

'core curriculum for Integrated Science for Junior Secondary Schools' and the old edition of the Nigerian Integrated Science Project is the pivot of the new three-book edition (Dorayi, 1982).

2.3 Nature of Basic Science

The nature of Basic Science is organized into columns of content, topics, performance objectives, activities, suggested equipment, a summary at the end of each topic and assessment questions. This was influenced by the launching of the first satellite (Sputnik) into space by the Soviet Union in 1957 that had a dramatic influence in the growth and development of science globally, especially in U.S.A. It triggered off a world-wide movement for a broad based and more functional science. This wave of science reforms worldwide led to the changing needs of the Nigerian pupils. The Science Teachers Association of Nigeria (STAN) was invited by the West African Examinations Council to spearhead the movement for change in school science. Subject panels were set up which developed curricula in Biology, Chemistry and Physics for the senior forms (SS1-3). The content was selected and organized in these individual subjects; Biology, Chemistry and Physics. Although this approach to the organization of science content is still in vogue, much criticism has been levelled against the system (Ogunleye, 1999). Such criticisms include its lack of philosophical base, coherence among subjects, and its irrelevance to solving everyday society's problems Nigerian Educational Research Council (NERC) Publication of October 1981 in (Ogunleye, 1999). Some of the stated limitations gave room for the introduction of the integrated science (STAN, 1972), an approach that brought these subjects into one umbrella subject. Under the Integrated Science, the contents of the subjects are organized to show relationships of concepts and how they could be used to solve real life's problems. This makes science more meaningful. However, Integrated Science is still limited to the Primary school and

later to the Junior Secondary School levels. The effort of the association was supported by grants from the Comparative Education study and Adaptation Centre (CESAC) and of course the British Council/Curriculum Renewal and Educational Development Overseas (CREDO) in the United Kingdom. These efforts led to the production by Science Teachers Association of Nigeria (STAN) in 1972 of pupils' text and workbooks and teacher's guide for forms 1 and 2 (JSS1 & 2) under the Nigerian Integrated Science Project (NISP). The intention of NISP materials was that science should be taught as "what is science and how a scientist works" (Ajeyalemi, 1983:98). In a similar development, Integrated Science should: lay a sound basis for scientific and reflective thinking; develop in the child the ability to adapt to his environment; give the child opportunities for developing manipulative skills that will enable him to function effectively in the society within the limits of his capacity… (FRN, 2008). The separate science curricula developed by the Science Teachers' Association of Nigeria were taken over by the CESAC from which curriculum materials were developed for the Nigerian Senior Secondary Science Project (NSSSP). These materials adopted for the conceptual centre and scientific inquiry methods.

For the philosophy of Basic Science, science educators like Bajah, Jegede and some STAN members have often stated their interest in urging teachers and students to pay more attention to the philosophy and history of science. This is often regarded as a source of information which will help improve science teachers understanding of the nature of Integrated Science and how scientists do their work. The philosophy and history of Integrated Science should enable students to gain an insight into both the principles of science and an appreciation of the values of the scientific enterprise, which has characterized the great scientific advance of the past (Clark 1969; Stimson, 1969). While these basic propositions have been widely accepted by scholars, there are some fundamental issues in dealing with the philosophy and history of science. For example, what do teachers need to know about the philosophy and history of science? How should the philosophy

and history of science be taught to students in schools? Baddeley (1980) in Baddeley (2008) had argued persuasively that the philosophy and history of science should be taught to students not by separate studies in the philosophy and history of science, but through "normal" day-to-day science teaching or as he aptly puts it "through the normal syllabus work by using carefully selected experimental situations".

However, Mathew (1994) has pointed out that whenever science is taught, some philosophy of science is transmitted. This line of reasoning was recently developed by Kichawen, Swain and Monk (2004) who argued that a philosophy of science is conveyed to the students through the choice of activities and the points of emphasis on what is rendered problematic by the science teacher (e.g. science content, concepts, laws and theories, some practical activities and applications).

Much has been written about the philosophy of science and how ideas-about-science should be taught in school science. (Bybee, 1993; Driver, 1996; Miller, 1996 & Collins, 2001) in Monk (2004). While these analyses use a range of terminologies (e.g methods or processes of science, products of science, nature of science, status of science, socio-scientific issues) a common feature is the identification of knowledge about the development and use of scientific knowledge, or what Ryder (2002) called *"knowledge about science"*. Such knowledge can be distinguished from the concepts laws and theories that constitute *"Knowledge in Science"*. (Ryder, 2002:35) argued that a weakness of existing school science curricula is the presentation of the concepts, laws and theories and relations of science (knowledge in science) without any reference to the ways in which these ideas were developed (knowledge about science).

According to Bajah (1983), the philosophy of Basic Science was designed to help the child to:

- gain the concept of the fundamental unit of science

- gain the commonality of approach to problems of a scientific nature.
- gain an understanding of the role and function of science in everyday life and the world in which he lives.
- prepare the child to become useful to himself and his society at large.
- prepare the child for higher education.

In line with the National Policy on Education (FRN, 2008) and the 6 - 3- 3- 4 education system, there has evolved a core curriculum for primary school science produced by the Federal Ministry of Education. According to the National Policy on Education (FRN, 2008) the unifying general objectives as contained in the core curriculum for primary science are to:

- observe and explore the environment
- develop basic science processes including observing, manipulating, classifying, communicating, inferring, hypothesizing, interpreting data formulating models.
- develop functional knowledge of science concepts and principles
- explain simple natural phenomena.
- develop scientific attitude including curiosity, critical reflection and objectivity
- apply the skills and knowledge gained through science to solving everyday problem in his environment
- develop self confidence and self reliance through problem solving activities in science
- develop a functional awareness of science and sensitivity to the orderliness and beauty in nature (Gilbert, 1993).

Basic science was recommended for Junior Secondary School level by STAN (1970). The essence of which is to introduce scientific concepts to students at early level of their secondary education. Hence, according to Nigerian Integrated Science Project 1970 in Duyilemi (1991), and

Federal Ministry of Education (1981) in Omoifo (2001), the integrating principles are intended to produce a course which:

- is relevant to student needs and experience;
- stresses the fundamental unity of science;
- lays adequate foundation for subsequent specialist study, and
- adds a cultural dimension to science education

To achieve these objectives, (Aworanti, 1998) opined that the teaching of Basic Science should involve the use of discovery teaching tactics, problem-solving activities, open-ended field or laboratory exercises and team teaching. He further said that the results from previous researches for example IBE (2005), teachings of Basic Science revealed that teachers lectured and gave notes in Basic Science lessons. These have serious implications for cognitive achievement in Basic Science. Findings also indicated that a laboratory based method, where processes of science are used, could be effective in improving the achievement of students in science. For example, Comber and Reeves 1973 in Aworanti (1998) observed that where students engaged in the processes of science in their schools, the level of achievement in science was higher. The processes of science provide students with unique opportunities to study abstract concepts and generalizations through the medium of 'real' materials. As students interact with learning materials, teachers and classmates and practise what scientists do; they gradually develop skill needed for future work in sciences.

However, the Nigerian Integrated Science Project emphasized the learning of the processes of science rather than mere acquisition of scientific knowledge. Therefore, one would expect a substantial part of the lesson to be devoted to investigative activities.

There have been debates over time to establish whether teaching is a skill or an art (Omatseye, 2007). Some students believe in their teacher's performance as quite brilliant, others

get motivated and excited with the presentation and teaching. For some others, their teachers bore them making the lesson dry, hard and leaving them more confused. All of these enthusiasms and opinions are eventually translated into students' academic achievement. However, what is pertinent in teaching and learning is the ability to apply skills to the art of teaching with an aim to motivate the learners (Melissa, 2010). A blend of skills and art in teaching is also manifested in clear and well-structured lessons and manner of presentation. A teacher who can effectively do this is an active constructor of learning, who can, and should transmit knowledge, but should allow students voices to be heard as contributing members of the class.

Basically, Basic Science is actually an advanced integration of science. The integrated science initially integrated Physics, Chemistry, Biology and Earth science. Basic Science integrates the courses in integrated science with technological skills or applied sciences. The Basic Science is actually a further integration of science with applied science – technology. Basic Science therefore integrates Physics, Chemistry, Biology, Earth Science and technology or applied science to form a holistic science. Accordingly the Basic Science is an infusion into integrated science of the following themes; environmental education, drug abuse education, population family life education (POPFLE), sexually transmitted infections (STIs) including HIV/AIDS and technology related themes. The similarities are the contributions of Integrated Science to the integration, while the differences are the integrated products of science and applied science and the contributions of technology to the integration.

However, there have been problems of teaching Basic Science especially at JSS II level in schools as pointed out below.

2.4 Problems of Teaching Basic Science

Teaching Basic Science in schools has been a problem as a result of some factors as pointed out by March (2009) among which:

1. Lack of training in Basic Science.
2. Inadequate time and effort devoted to it since most teachers always rush to cover the syllabus.
3. Shortage/scarcity of experienced teachers.
4. Inadequate facilities for teaching
5. How to keep students on task in the science classroom. Coming up with activities that will spark imagination and fit the curriculum.
6. How to tailor class plans, activities, and scientific language for students of different ages and different skills.

Grouping as a technique of instruction is a process of assigning learners into teaching/learning groups. The practice of grouping is due to some reasons. First, no school can afford to provide a teacher for every child in the school. Second, no two children are exactly alike. That is, children differ from one another in many respects such as interests, abilities, achievement, ages, among others (Nzewi, 1995). Basically, learners could be grouped into large groups or small groups for purposes of instruction. In large group instruction the class is taught the same thing at the same time, space and speed while in small group instruction learners are organized in small groups for purposes of instructions as opposed to the large grouping. However, the number of students in small group depends on the total number of students in the class. According to Nzewi (1995) the technique has a number of advantages among which include:

- Gifted and bright learners are sufficiently challenged and rewarded.
- It is easy to provide them with enriched programme.
- Teachers and students move at a fast rate.
- On the other hand some members of the class may monopolize discussions. It takes the teacher time in planning and his instructional delivery laborious.

2.5 Science Teaching Strategy

There are number of Science Teaching Strategy used at JS level for teaching Basic Science:

Abdullahi (1982) opined that lecture method involves verbal presentation of ideas, concepts, generalisation and facts. Lecture teaching method is used when an instructor is the central focus of information transfer (Melissa, 2010). Typically, an instructor will stand before a class and presents information for the students to learn. Usually, very little exchange occurs between the instructor and the students during a lecture. This is because the teacher does much of the activities in form of talking while the pupils are either passive or slightly involved. According to Abdullahi (1982), two teaching skills that make lecture method effective are: clear and good command of language, and ability to write clearly and boldly on the chalkboard.

To Abdullahi (1982) and Atadoga (2008), lecture method has the following advantages:

- The method offers few challenges to the teacher and not much fund is required, as more often than not, the only aid required is the chalkboard.
- Lecture method leads to an easy coverage of syllabus and saves time.
- The method allows for easy handling of large classes because a large amount of scientific information can be delivered.
- Lectures are straightforward way to impart knowledge to students quickly.
- Instructors also have a greater control over what is being taught in the classroom because they are the sole source of information.
- Students who are auditory learners find that lectures appeal to their learning style.
- Logistically, a lecture is often easier to create than other methods of instruction.
- Lecture is a method familiar to most teachers because it was typically the way they were taught.

- Because most college courses are lecture-based, students gain experience in this predominant instructiona l delivery method.

According to Abdullahi (1982) and Atadoga (2008), lecture method of teaching has also the following disadvantages:

- It does not promote meaningful learning of science as it appeals to only the sense of hearing.
- Lecture method encourages rote learning and regurgitation of information without necessarily aiding understanding.
- Students strong in learning styles other than auditory learning will have a harder time being engaged by lectures.
- Students who are weak in note-taking skills will have trouble understanding what they should remember from lectures.
- Students can find lectures boring causing them to lose interest.
- Students may not feel that they are able to ask questions as they arise during lectures.
- Teachers may not get a real feel for how much students understand because there is not much opportunity for exchanges during lectures.

However, lectures are one tool in a teacher's arsenal of teaching methods. They are appealing when used with all the other tools, and should only be used when most appropriate. Instruction should be varied from day to day to help reach the most students possible. Teachers should be cautioned that before using the lecture method; they need to provide their students with note-taking skills. Only by helping students understand verbal clues and learn methods of organizing and taking notes will they truly become successful and get the most out of lectures.

Discussion method is a modified form of classroom lecture where the focus is shared between the instructor and the students for information transfer. Typically, an instructor will stand

before a class and present information for the students to learn but the students will also participate by answering questions and providing examples. The discussion teaching method is a design that provides an opportunity for discussion between teacher and students, and students to students (Omatseye, 2007). Omatseye noted that it is a method that centres on shared conversations, discussions, and exchange of ideas in class. It gives an opportunity for all to sit and listen, as well as talk and think, thus emphasizing the process of "coming to know" as valuable as "knowing the right answer".

In other words, students in a discussion class are not passive listeners neither is the teacher a sole performer. Students are allowed to develop critical thinking ability, learn to evaluate ideas, concepts and principles, procedures and even programmes and policies on the basis of clearly set criteria. For instance, a student who participates in a discussion lesson learns to support his views rationally, based on facts, too. He appreciates the need to argue logically, define clearly--concepts and terms, and examine critically--rules, principles and constructs. Such a student learns to develop value processing skills in relation to changes that occur in his society.

Essentially too, the discussion strategy encourages cooperative team work between teacher and students and amongst students. It emphasizes the need for all to work cooperatively while developing societal relationships. Students see themselves as contributory members of the group, instead of separate and odd. According to Bennett (1995) in Omatseye (2007), such cooperative learning improves both academic achievement and students' interpersonal relationship. He went on to argue that in most cases, all students (including high, average and low achievers) tend to benefit from cooperative learning and team work. In the same vein, Johnson, Johnson and Holube (1988) in Omatseye, (2007) have affirmed that such cooperative spirit in learning helps students work together to complete a task successfully. This is also important in promoting students' independence.

Abdullahi (1982), Atadoga and Onaolapo (2008) and Melissa (2010), opined that discussion method of teaching have the following advantages:

- It improves communication skills in the learners.
- It encourages healthy competition among learners.
- It brings out potentials among students.
- It serves as a motivator when properly used especially at the beginning of the lesson.
- It builds confidence in the learners as they express their views.
- Whole group discussions provide for greater interaction between teacher and students.
- Instructors maintain a greater control over what is being taught because they are able to steer the discussion.
- Auditory learners find them appealing to their learning style.
- Teachers can check on what students are retaining through questions posed.
- Whole group discussion is comfortable for many teachers because it is a modified form of lecture.
- Students have a tendency to stay focused on the lesson because they might be called on to answer questions.
- Students may feel more comfortable asking questions during whole group discussions.

And according to them, discussion method of teaching consumes time as all members of the classroom have the right to make their contributions.

- ❖ Whole group discussions require setting up and enforcing ground rules for students. If these rules are not enforced then there is a possibility that the discussion could quickly go off-topic.
- ❖ Not all topics in Integrated Science can be taught by adopting this method.

- Discussion method cannot be used too often as it does not allow for easy coverage of syllabus.
- Learners who don't have background on the topic being discussed become bored and lose interest in the lesson because they are not involved.
- Students who are weak in note-taking skills will have trouble understanding what they should remember from group discussions. This is even more so than in lectures in many cases because not only the teacher but students are talking about the lesson.
- Some students may not feel comfortable being put on the spot during a whole group discussion.

In fact, discussion method is an excellent teaching method when used in conjunction with other methods. Instruction should be varied from day to day to help reach the most students possible (Melissa, 2010). He (Melissa) argued that teachers need to provide their students with note-taking skills before starting discussions. It is important that teachers be good at managing and facilitating discussions. Questioning techniques are effective for this. To Melissa, two questioning techniques that teachers employ is to increase their wait time after questions are asked instead of only ask one question at a time.

Inquiry teaching method is a student-centred method of education focused on asking questions (Kahle, Meece & Scantlebury, 2000). Students are encouraged to ask questions which are meaningful to them, and which do not necessarily have easy answers. Teachers are encouraged to avoid giving answers when this is possible, and in any case to avoid giving direct answers in favour of asking more questions. Suchman (1992) developed an approach called inquiry training. Teachers present students with puzzling situations or discrepant events which spark curiosity and motivate inquiry.

The inquiry method is motivated by Postman and Weingartner's (1969) and Abbey's (2003) recognition that good learners and sound reasoners centre their attention and activity on the dynamic process of inquiry itself, not merely on the end product of static knowledge. They wrote that certain characteristics are common to all good learners (Postman & Weingartner, 1969), saying that all good learners have:

- self-confidence in their learning ability
- pleasure in problem solving
-
- a keen sense of relevance
- reliance on their own judgment over other people's or society's
- no fear of being wrong
- no haste in answering
- flexibility in point of view
- respect for facts, and the ability to distinguish between fact and opinion
- no need for final answers to all questions, and comfort in not knowing an answer to difficult questions rather than settling for a simplistic answer.

Inquiry method also involves engaging students in the research process with instructor support and coaching at a level appropriate to their starting skills. Students learn discipline specific content but in doing so, engage and refine their inquiry skills.

Postman and Weingarten (1969) opined that an inquiry lesson:

- is question driven, rather than topic or thesis driven
- begins with a general theme to act as a starting point or trigger for learning
- emphasizes asking good researchable questions on the theme, and coaches students in doing this

- builds library, interview, and web search skills, along with the critical thinking skills necessary for thoughtful review of the information.
- coaches students on how to best report their learning in oral or written form.
- provides some mechanism (interviews, drafts, minutes of group meetings, bench mark activities) to help students monitor their progress within the course.
- draws on the expertise and knowledge of the instructor to model effective inquiry and to promote reflection.

In an attempt to instil students with these qualities and behaviours, a teacher adhering to the inquiry method in pedagogy must behave very differently from a traditional teacher. Postman and Weingarten (1969) and Rakow (2011) suggested that inquiry teachers have the following characteristics:

- They avoid telling students what they "ought to know".
- They model scientific attitudes.
- They talk to students mostly by questioning, and especially by asking divergent questions.
- They are creative and flexible.
- They do not accept short, simple answers to questions.
- They use effective questioning strategies.
- They encourage students to interact directly with one another, and avoid judging what is said in student interactions.
- They are concerned both with thinking skills and with science content.
- They do not summarize students' discussion.
- They do not plan the exact direction of their lessons in advance, and allow it to develop in response to students' interests.

- Their lessons pose problems to students.
- They gauge their success by change in students' inquiry behaviours (with the above characteristics of "good learners" as a goal).

The National Science Education Standards mandate that science teachers "plan an inquiry-based program", "focus and support inquiries", and "encourage and model the skills of scientific inquiry" (Cartier & Stewart, 2000). According to Cartier & Stewart (2000), inquiry is an approach to teaching that involves a process of exploring the natural world that leads to asking questions and making discoveries in the search of new understanding. Inquiry is a method of approaching problems that are used by professional scientists but are helpful to anyone who scientifically addresses matters encountered in everyday life. Inquiry is based on the formation of hypotheses and theories and on the collection of relevant evidence. There is no set order to the steps involved in inquiry, but children need to use logic to devise their research questions, analyze their data, and make predictions. When using the inquiry methods of investigation, children learn that authorities can be wrong and that any question is reasonable.

The most abstract component of inquiry is imagination (Furtak, 2006). Both students and professional scientists have to be able to look at scientific information and data in a creative way. This unconventional vision allows them to see patterns that might not otherwise be obvious.

Teachers can incorporate inquiry approaches to learning, for example, by allowing small groups of students to explore a particular natural phenomenon that might exhibit certain trends or patterns. The children can then reconvene as a class, discuss their observations, and compile a list of several different hypotheses from this discussion. Each group can choose a hypothesis to investigate. Several groups might choose to replicate the same study to reduce the bias effects of any one group's techniques. Depending on their age, children might design their own experimental

apparatus, use probes attached to computers, or employ sophisticated software to analyse data or create charts and graphs. Data based predictions can be the foundation for further investigation.

Inquiry-based learning need not always be a hands-on experience (Furtak, 2006). He (Furtak) further argued that doing hands-on science with step-by-step procedures can stifle students' own inquiry, distort what science is all about, and may impede students' learning. Reading, discussion, and research can allow students to inquire into scientific questions. According to Pine, Aschbacher, Roth, Jones, McPhee, Martin, Phelps & Kyle (2006), the teacher can facilitate inquiry in the classroom by:

- acting as facilitators rather than directors of students' learning
- providing a variety of materials and resources to facilitate students' investigations
- modelling inquiry behaviours and skills
- posing thoughtful, open-ended questions and helping students do the same
- encouraging dialogue among students and with the teacher
- keeping children's natural curiosity alive and as a teacher, remaining a curious, life-long learner

The problem-solving teaching method is one of the approaches that are student-centred and activity oriented. This is in line with Ausubel (1968) in Gil and Mtnez-Torregrosa (1983) consideration. Ausubel viewed problem-solving method as a form of discovery learning in which the gap between the learners existing knowledge and the solution to the problem is bridged. Similarly, Bello (1981) defined the problem-solving method as an application of the unit idea. According to Bello, it embraces a continuous, meaningful and well-integrated set of activities beginning with a problematic situation. In other words, Bello considered the problem-solving teaching method as a teaching-learning process in which the learner works on solving a problem. However, Obodo (1997) in Nfon (2013) contended that problem-solving teaching method

comprises identifying and choosing of social problems which grow out of the experiences of the individual learner, placing these problems before the learner and guiding them in their solutions. The major aim of this method is to inculcate in the learner the habit of seeking logical answers or finding adequate patterns to solve problems.

Field Trip Method of Teaching: This method provides the teacher with the opportunities to take the learners away from the classroom so that they can see things, perceive and obtain first-hand information about any particular problem Lawal and Mohammed (1991) in Obodo (1997). The use of the outdoor for social studies teaching offers teachers the opportunity of adding relevance, variety and interest to Social Studies lessons. Field trips involve excursion taken outside the classroom for the purpose of making observations and also for obtaining some specific information (Gbamanja, 1991). Field trip is meant to broaden students' general knowledge. The method has the following advantages:

- It provides experience to the learner and this is a crucial factor to Social studies teaching and learning
- It helps to crystallise learning experiences in the learner and thus facilitate retention and transfer of learning.
- Teacher-student relationships are developed and promoted more intimately as a result of the interaction and communication processes that are bound to occur during trips. In other words, it enhances social interaction between the teacher and the students.
- Field trips interpret classroom learning into reality as the learner observes physical environment in its natural state and also have access to have contact with some cultural situations that could have been difficult in the classroom.

However, the method has the following disadvantages:

- Field trips consume a great deal of time
- They are expensive.
- Dangers of accident are involved
- Supervision may prove difficult if not well organized and if students are allowed to be carried away on such trips (Gbamanja, 1991).

Project method is a form of group/individualised instruction whereby the learner(s) perform(s) a unit of work in a natural manner and in a spirit of purpose to accomplish a definite goal (Gbamanja, 1991). The project is a learning unit that requires creativity and originality of experiences by students. Ali (1990) viewed project method as a method in which students are engaged in a long-term assignment to complement the regularly scheduled work. He further emphasized that activities constituted in project work are meant to serve as a means of motivating and sustaining learners' interest in their school work.

The advantage of Project Method are as follows:

- It encourages creativity, originality and freedom of expression and initiatives.
- It makes the learner more pragmatic and thus develop his problem-solving skills
- It promotes individualised learning thus ensuring self confidence in the learner. Although Social Studies emphasizes co-operation yet there is need for individual mastering of the subject matter.
- It motivates the learner particularly where he is able to perform a task and arrive at a worthwhile answer to the problem.
- It exposes the learners to primary experiences which enable concrete and crystallised learning.
- Projects may sometimes be expensive in terms of material and time especially if they are not well planned in relation with the available resources.

- Choosing project topics could be agonizing and difficult (Gbamanja, 1991).

The laboratory method is frequently employed as an instructional approach in which an individual or a group is involved in an activity within the confines of a laboratory (Maduabum, 1989). According to Maduabum, the activity may take either of two forms – an exercise or an experiment. The former involves verification of known information while the later entails an investigation, the results of which are not generally known.

According to Gbamanja (1991), the laboratory method involves observation, experimentation, or application by individuals or a small group dealing with actual materials. Gbamanja opined that laboratory activities are not restricted to a classroom called laboratory. An environment outside the classroom that provides practical work to give first-hand experiences to the learner could be regarded as a laboratory. The method has the following advantages:

- It takes the nature of scientific problem-solving
- It ensures student participation thereby enhancing performance and retention.
- It increases students' ability to critical thinking.
- It increases students' interest in the subject matter.

Disadvantages of Laboratory method

- It could be time consuming and expensive.
- It requires a lot of planning.

Activity Method: Bello (1981) in National Open University of Nigeria (2006), opined that children learn through what they do and not what the teacher does. Learning activities are the things we expect the children to do in the lesson. The learning activity is a planned programme whereby children are kept busy all the time on one assignment or another. According to Adeyemo (1972), children learn a little by listening, a little more by watching but they as a rule learn most by actually doing the piece of work. He maintains that by doing things, children learn both to do and

to know better. This method is the way that enables children to learn with the same vigour that marks their natural activity. Regina (1981) in National Open University of Nigeria (2006), viewed that the purpose of using activity in teaching is to give the child an opportunity to grow and learn in their own way and to provide each child with suitable experience at the precise moment of his need. Since a child learns best by doing and finds interest and enjoyment in activity, a child must be given every opportunity to discover, to explore, to find out for himself by feeling, handling variety of objects. Ndagi, (1985) in National Open University of Nigeria (2006), stated that a good teacher includes pupils' activities as an important step in every lesson he prepares.

Learning through doing is a golden rule in teaching. The more senses a child uses in learning, the better he will understand and remember. Pupil activity adds interest and enjoyment to a lesson and does away with passivity and boredom. Pupil's activity ensures that the lesson is child-centred with the children actively involved in their own learning. Pupil's activity reinforces and revises what is being taught. Good teacher/pupil relationship is fostered. Very often, it encourages initiative, creativity, discovery of new knowledge and curiosity. Pupil's activity develops or improves skill. Very often, pupils apply the knowledge learned to new ends. He suggested that this method should be well planned and supervised by the teacher. Furthermore, time should be created for teacher-directed activities, group activities and individual activities. This method can be used in teaching so many subjects like Basic Science. Some mathematical operations can be taught using this method such as addition, division, multiplication and subtraction in mathematics.

According to Regina (1981) and Ndagi (1985) in National Open University of Nigeria (2006), Activity Method has the following advantages:

- Using Activity method could be a means of gaining practical experience

- Lessons learnt through it are real, practical, interesting and meaningful.
- It develops social living or awareness in a child.
- Self-education is encouraged. Healthy rivalry is stimulated.
- It frees the teacher from being termed a “talking teacher”.
- It develops learning spirit and co-operation, leading to a sense of responsibility.
- It develops self discipline and respects the individuality of a child which makes provision for him to progress according to his rate.
- More than any other method, it develops the aesthetic interest in a child.
- It discourages learning in isolation and it turns the classroom into a learning environment.

Disadvantages of Activity Method

- It is expensive to use.
- It is not the method for a lazy teacher
- It requires plenty of space.
- It encroaches upon the leisure of the teacher.

Activity Method of teaching could be used in Team-Teaching as the advantages outweigh the disadvantages.

2.6 Single Teacher Teaching Strategy

Single-teacher teaching is an instructional procedure whereby a teacher is responsible for planning, organizing, teaching, facilitating, directing and evaluating the learning of a group of students all through. Single-Teacher Teaching or Traditional teaching is concerned with the teacher being the controller of the learning environment. Power and responsibility are held by the teacher and he plays the role of instructor (in the form of lectures) and decision-maker (with regard to curriculum content and specific outcomes). He regards students as having 'knowledge holes' that need to be

filled with information. In short, the traditional teacher views that it is the teacher that causes learning to occur (Novak, 1998)

Learning is chiefly associated within the classroom and is often competitive. The lesson's content and delivery are considered to be most important and students master knowledge through drill and practice (such as rote learning). Content need not be learned in context (Theroux, 2002, Johnson & Johnson, 1991). The most common seating arrangement used by the traditionalists is row.

In the traditional teaching (conventional method) model, a teacher will lecture their students and assign homework according to a specific syllabus and then it is the students' responsibility to complete their homework, memorize their lessons and perform well on their tests. The traditional model is sometimes referred to as "teacher-centered" and does account for differing needs of students or the active learning process.

Team teaching is equally an instructional procedure where by two or more teachers jointly share the responsibilities of a single teacher teaching a group of students. The group of students benefit from the expert knowledge of different teachers, unlike the single-teacher teaching strategy where the students are left at the limited resources of an individual teacher who directs, teaches and evaluates the learning of a common group of students alone (Offorma & Ofoefuna, 1998; Heather, 2008).

2.7 Traditional Method of Teaching

Traditional method of teaching is a conventional method where the teacher transmits information (subject matter content) verbally to his students, sometimes writing on the chalkboard or using instructional materials. The students listen and take notes of facts and ideas that are considered important and also sometimes asking the teacher questions for clarification (Uwameiye and Ojikutu, 2008).

Teaching methods therefore can be defined as the method in which a teacher delivers his subject matter to students, based on pre-determined instructional objectives, in order to promote learning in the students. There have been vigorous searches for strategies to improve the quality of instruction in schools and subsequent student learning in place of the traditional one (conventional method).

Traditional teaching method is concerned with the teacher being the controller of the learning environment. Power and responsibility are held by the teacher and they play the role of instructor (in the form of lectures) and decision maker (in regards to curriculum content and specific outcomes). They regard students as having 'knowledge holes' that need to be filled with information. In short, the traditional teacher views that it is the teacher that causes learning to occur (Novak, 1998)

Dewey (1938) opined that traditional method of teaching focuses on rote learning and memorization. It does not support student-centred and task-based approaches to learning. The chief business of traditional education is to transmit to a next generation those skills, facts, and standards of moral and social conduct that adults deem to be necessary for the next generation's material and social success. Teachers are the instruments by which this knowledge is communicated and these standards of behaviour are enforced.

According to Robert (2009), the primary educational technique of traditional method of teaching was simple oral recitation. In a typical approach, students sat quietly at their places and listened to one student after another recite his or her lesson, until each had been called upon. The teacher's primary activity was assigning and listening to these recitations; students studied and memorized the assignments at home. A test or oral examination might be given at the end of a unit, and the process, which was called "assignment-study-recitation-test", was repeated. In addition to its overemphasis on verbal answers, reliance on rote memorization (memorization with no effort at

understanding the meaning), and disconnected, unrelated assignments, it was also an extremely inefficient use of students' and teachers' time.

The traditional methods of teaching are those methods that only teach you the basics of what you really need to know. In other words, these teachings are dealing with fixed answers. Traditional education, also known as back-to-basics, conventional or customary education, refers to long-established customs found in schools that society has traditionally deemed appropriate, promotes the adoption of progressive education practices, a holistic approach which focuses on individual students' needs and self-expression (Gates, 2011).

This traditional approach also insisted that all students be taught the same materials at the same point; students that did not learn quickly enough failed, rather than being allowed to succeed at their natural speeds. Learning is chiefly associated within the classroom and is often competitive. The lesson's content and delivery are considered to be most important and students master knowledge through drill and practice (such as rote learning). Content need not be learned in context (Theroux, 2002). The most common seating arrangement used by the traditionalists is rows. This approach, which had been imported from Europe, dominated American education until the end of the 19th century, when the education reform movement imported progressive education techniques from Europe.

In Team teaching (modern teaching) there is no one teaching method that is best because students are very different from one another and so are teachers. Different students like to learn in different ways. Some respond well to doing things, others respond better to being told things. Different teachers have different strengths and different likes. It is very hard to teach using a method that does not suit what you, as a teacher, are good at. Therefore, it is better for different teachers to teach in the ways that are compatible with their skills and their style. When you have something as individual as learning and teaching, it is impossible to have one method that is better than all the others

(Ndagana & Onifade (2000). Just like the nature of the road which determines the gear of the car to be used. Some methods will work for some students and teachers, but not for others. It is true that there is no one teaching method that is best. Teachers need to be trained in a variety of methods. Teaching is a complex art, and the more methods a teacher has the better he will be able to use the right one at the right time. There are times when a certain method will work better because of the students involved or the topic. In the nutshell, modern method of teaching places emphasis on the problem solving,, decision making, analytical thinking or transfer of learning.

2.8 Concept of Team Teaching

The practice of team teaching in instruction can enhance pupils learning given appropriate materials, organization and social relationship (Alkin, 1992). This is due to the fact that team teaching offers the learners the opportunity of tapping the resources of the individual teachers who are members of the team. Team teaching can open a student's eye to accepting more than one opinion and to acting more cooperatively with others. It may even provide educational benefits such as increasing the students' level of understanding and retention, in addition to enabling the students to obtain higher achievement. Moreover, diverse perspectives (exposure to the views of more than one teacher) encourage students to consider the validity of numerous views (Brandenburg, 1997). Robinson and Schaible (1995) observed that the cooperation that the students observe between team teachers serves as a model for teaching students positive teamwork skills and attitudes.

Frequently, when teachers are asked to develop team teaching partnerships, questions arise regarding the basics for team teaching: the 'whats', the 'hows', the 'whys' and the what for. These questions will be answered by introducing two major categories of team teaching. The grouping helps to generate the many possibilities available when educators work together. Team teaching

according to Robinson and Schaible (1995), Goetz and Egallery (2000) will be categorized into two major groups, namely:

1. Category A: Two or more instructors teaching the same group of students at the same time within the same classroom.

2. Category B: The instructors work together but do not necessary teach the same neither group of students nor necessarily teach at the same time. When instructors team-teach the same group of students at the same time (category A) there is a number of different roles that the team teachers might exhibit in the course of instruction. For monetary and spatial reasons, this type of team teaching usually involves two partners. Robinson and Schaible (1995) and Maroney (1999) identified six different models or types of team teaching. Category A group of team teaching usually involves one or a combination of these models according to the personalities and strengths of team teachers and the learners. The models are discussed as follows:

1. Traditional Team teaching is the first type of team teaching in which both teachers actively share the instruction of content and skills to all students. A frequent application of this approach is when the teacher presents the new information to the class while the other teachers take notes or completes the Integrated Science problem on the chalkboard. In traditional team teaching both teachers accept equal responsibility.

2. Second type of team teaching referred to as Complementary or Supportive Instruction occurs when one teacher assumes the responsibility for teaching the content while the other teacher provides follow-up.

3. Collaborative Teaching: signing of course is done collectively and the teaching is not by the usual monologue but rather by exchanging and discussing ideas in front of the learners. The course itself uses group-learning techniques for the learners, such as small group work, student led discussion and joint test taking.

4. Parallel instruction: In this setting, the class is divided into two groups and each teacher is responsible for teaching the same material to his class group. This model is usually used in conjunction with other forms of team teaching. It is ideally suited to the situation when students are involved in projects or problem-solving activities, as the instructor can roam or give students individualized support.

5. Differentiated split class: This type of teaching involves dividing the class into smaller groups according to learners' needs. Each educator provides the respective groups with the instruction required to meet their learning needs. For example a class may be divided into those learners who grasped the content more quickly, while the second teacher would likely review or re-teach those students who require further instruction.

6. Monitoring teacher: In this approach, as one teacher assumes the responsibility for instructing the entire class, the other teacher circulates the room and monitor students' achievement and behaviour. This approach can be applied when one teacher delivers the instruction on steps of a laboratory experiment, the other teacher moves around the room to observe and assist individual students at work.

According to Robinson and Schaible (1995), Maroney (1999) and Goetz (2000) category B, team teaching consists of a variety of team teaching models. In this case the instructors work together but do not necessarily teach the same groups of students. But if they do they do not teach these students at the same time. These categories of team teaching could be in many forms, namely:

Team members meet to share ideas and resources but function independently. An example arose during the Master of Teaching (MT) lecture series in November 9th, 1999 when recent MT graduates shared their experience after 50 days on the job. Although those teachers were not teaching in the same class, they participated in daily meetings, discussions and planned their

curriculum together. A recent article of mathematics teacher (Rumsey, 1999) described it as a collaborative teaching in which instructors share teaching ideas and resources but teach independently. Team of teachers share a common resource centre in this form; teachers instruct classes independently, but share resource materials such as lesson plans, supplementary textbooks and exercise or solution to problems. In the team, members share a common group of students; the teams equally share the planning for instruction but teach different sub-groups without involving the whole group. One individual plans the instructional activities for the entire team. This model does not take full advantage of the team concept as only one individual's idea is in cooperated. Sometimes, due to the time or financial constraints, there may be no alternative to one person designing the entire programme.

The team members share planning but each instructor teaches his own specialized skills or area to the whole group of students. An example would be seven instructors teaching seven different topics in mathematics to seven different classes. The teachers teaching these topics and classes can rotate throughout the duration of the course.

The issues surrounding team teaching are numerous and complex. Goetz and Egallery (2000) opined that the key elements that appear to be necessary for a successful team teaching programme are: (1) Compatibility of team members, (2) Shared commitment to team teaching; (3) a keen interest in connecting the content or curriculum to real life and (4) a strong desire to ignite students for knowledge. Also the programme, goals and philosophies, as well as the roles of the teachers and administrators need to be well-defined. The efficacies of using teams to help individual members of the teams learn subject matter has been proven across individual studies and compilation of the studies. While there is near consensus among researchers that teams can help individuals learn, there are fewer consensuses regarding exactly why teams help learning. A

number of perspectives on teaching in teams have been offered, each describing a different social or cognitive factor as responsible for the educational effects of team teaching. To realize the objectives of Integrated Science, there is a need for total coverage of the content as well as thorough teaching of the content. Team teaching may be one of the approaches to teaching that may bring about total coverage and thorough teaching. However, for the purposes of this study, the researcher will assume the following: two instructors are to be involved in the same course for convenience sake. The study will be based on category A group of team teaching. This is because category A satisfies the social theory of team teaching (see theoretical perspective of team teaching). Moreover, out of six models in category A, emphasis will be laid only on traditional team teaching. The choice of this model is because the model emphasizes on equal responsibility and also involves two teachers teaching a group of students at the same time, thus satisfy the condition of category A group of team teaching.

To realize the objective of Basic Science, there is need for total content coverage as well as effective teaching of the subject. Team teaching may be one of the approaches to instruction that may bring about total content coverage and effective teaching of the subject.

Team teaching according to the Longman Dictionary of Contemporary English is referred to a group of teachers who have been chosen to work together to teach a particular group of students. Team teaching is an innovation in the teaching learning process in the classroom, and the procedure involves two or more teachers teaching the same group of students. Team teaching according to Offorma (1994) is defined as an instructional situation where two or more teachers possessing complementary teaching skills co-operatively plan and implement the instruction for a single group of students to the particular instruction. According to Goetz (2002), team teaching is referred to as a group of two or more teachers working together to plan conduct

and evaluate the learning activities for the same group of learners. To Jang (2006), team teaching involves two or more teachers whose primary concern is the sharing of teaching experiences in the classroom, and co-generative dialoguing with each other. They take collective responsibility for maximizing learning to teach, or becoming better at teaching, while providing enhanced opportunities for their students to learn. .Nzewi (1995) defined team teaching as an arrangement in which two or more teachers and their respective competencies plan, instruct and evaluate in one or more subject areas. Murata (2004) defined team teaching as an educational strategy where multiple teachers develop and present course materials to a class.

Quinn and Kanter (1984) reported that team teaching is simple team work between two or more qualified instructors who together make presentations to an audience. Welch, Brownell and Seridan (1999) described team teaching as a restructuring of teaching procedures in which two or more educators who possess distinct sets of skills, work in a co-active and co-ordinate fashion to jointly teach academically and behaviorally heterogeneous groups of students in an educationally integrated classroom setting.

However, team teaching according to the researcher is an instructional procedure whereby two or more teachers jointly share the responsibility of directing, planning teaching and evaluating the learning of a common group of students. Team teaching is a way of adding diversity in the classroom, which ultimately enhances the academic achievement of students. Team teaching involves a group of instructors working purposefully, regularly, and cooperatively to help a group of students of any age learn. Teachers together set goals for a course, design a scheme of work, prepare individual lesson plans, teach students, and evaluate the results. They share insights, argue with one another, and perhaps even challenge students to decide which approach is better.

Team-teaching can also be said to mean two or more people sharing responsibility for teaching some or all of the students assigned to a classroom. It involves the distribution of responsibility among people for planning, instruction, and evaluation for a classroom of students. Team-teaching is a way for students to learn from two or more people who may have different ways of thinking or teaching. For instance, the way a chemistry bias teacher look at an atom may not be the same with the physics bias teacher. Some educators such as Rob (2012) said that team-teaching is a creative way to connect with and support others to help all children learn. Others such as Perkins (2008) said that team-teaching is a way to make schools more effective as it encourages participants to conduct meetings, plan and organize activities. Team-teaching can be likened to a marriage. Partners must establish trust, develop and work on communication, share the chores, celebrate, work together creatively to overcome the inevitable challenges and problems, and anticipate conflict and handle it in a constructive way (Villa & Thousand, 2004).

Teams can be single-discipline, interdisciplinary, or school-within-a-school teams that meet with a common set of students over an extended period of time. New teachers may be paired with veteran teachers. Innovations are encouraged, and modifications in class size, location, and time are permitted. Different personalities, voices, values, and approaches spark interest, keep attention, and prevent boredom.

The team-teaching approach allows for more interaction between teachers and students. Faculty evaluates students on their achievement of the learning goals; students evaluate faculty members on their teaching proficiency. Emphasis is on student and faculty growth, balancing initiative and shared responsibility, specialization and broadening horizons, the clear and interesting presentation of content and student development, democratic participation and common expectations, and cognitive, affective, and behavioural outcomes. Combinations of analysis,

synthesis, critical thinking, and practical applications can be done on all levels of education, from kindergarten through graduate school.

Working as a team, teachers model respect for differences, interdependence, and conflict-resolution skills. Team members together set the course goals and content, select common materials such as texts and films, and develop tests and final examinations for all students. They set the sequence of topics and supplemental materials. They also give their own interpretations of the materials and use their own teaching styles. The greater the agreement on common objectives and interests, the more likely that teaching will be interdependent and coordinated.

Teaching periods can be scheduled side by side or consecutively. For example, teachers of two similar classes may team up during the same or adjacent periods so that each teacher may focus on that phase of the course that he or she can best handle. Students can sometimes meet all together, sometimes in small groups supervised by individual teachers or teaching assistants, or they can work singly or together on projects in the library, laboratory, or fieldwork. Teachers can be at different sites, linked by video-conferencing, satellites, or the Internet.

Breaking out of the taken-for-granted single-subject, single-course, single-teacher pattern encourages other innovations and experiments. For example, students can be split along or across lines of sex, age, culture, or other interests, then recombined to stimulate reflection. Remedial programs and honours sections provide other attractive opportunities to make available appropriate and effective curricula for students with special needs or interests. They can address different study skills and learning techniques. Team teaching can also offset the danger of imposing ideas, values, and mindsets on minorities or less powerful ethnic groups. Teachers of different backgrounds can culturally enrich one another and students.

According to Buckley and Francis (1998), team-teaching has the following advantages:

1. Students do not all learn at the same rate in the class. Periods of equal length are not appropriate for all learning situations.

2. Educators are no longer dealing primarily with top-down transmission of the tried and true by the mature and experienced teacher to the young, immature, and inexperienced pupil in the single-subject classroom.

3. Schools are moving towards the inclusion of another whole dimension of learning: The lateral transmission to every sentient member of society of what has just been discovered, invented, created, manufactured, or marketed. For this, team members with different areas of expertise are invaluable.

4. Of course, team teaching is not the only answer to all problems plaguing teachers, students, and administrators. It requires planning, skilled management, willingness to risk change and even failure, humility, open-mindedness, imagination, and creativity. But the results are worth it.

5. Teamwork improves the quality of teaching as various experts approach the same topic from different angles: theory and practice, past and present, different genders or ethnic backgrounds. Teacher strengths are combined and weaknesses are remedied.

6. Poor teachers can be observed, critiqued, and improved by the other team members in a nonthreatening, supportive context.

7. The evaluation done by a team of teachers will be more insightful and balanced than the introspection and self-evaluation of an individual teacher.

Working in teams spreads responsibility, encourages creativity, deepens friendships, and builds community among teachers. Teachers complement one another. They share insights, propose new approaches, and challenge assumptions. They learn new perspectives and insights, techniques and values from watching one another. Students enter into conversations between them as they debate, disagree with premises or conclusions, raise new questions, and point out

consequences. Contrasting viewpoints encourage more active class participation and independent thinking from students, especially if there is team balance for gender, race, culture, and age. Team teaching is particularly effective with older and underprepared students when it moves beyond communicating facts to tap into their life experience.

The team cuts teaching burdens and boosts morale. The presence of another teacher reduces student-teacher personality problems. In an emergency one team member can attend to the problem while the class goes on. Sharing in decision-making bolsters self-confidence. As teachers see the quality of teaching and learning improve, their self-esteem and happiness grow. This aids in recruiting and keeping faculty.

Despite the fact that Team Teaching Method has numerous advantages, it has also some disadvantages. To Buckley (1998), team teaching is not always successful. Some teachers are rigid personality types or may be wedded to a single method. Some simply dislike the other teachers on the team. Some do not want to risk humiliation and discouragement at possible failures. Some fear they will be expected to do more work for the same salary. Others are unwilling to share the spotlight or their pet ideas or to lose total control.

Team teaching makes more demands on time and energy. Members must arrange mutually agreeable times for planning and evaluation. Discussions can be draining and group decisions take longer time. Rethinking the courses to accommodate the team-teaching method is often inconvenient. Opposition may also come from students, parents, and administrators who may resist change of any sort. Some students flourish in a highly structured environment that favours repetition. Some are confused by conflicting opinions. Too much variety may hinder habit formation.

One of the purposes of curriculum implementation is to provide opportunities for the learner or group of learners to maximally benefit from planned curriculum (Nzewi, Okpara, &

Okudolu, 1995). In assisting teachers to acquire competence in teaching and learning effectively, the following instructional modes: individualized teaching, team teaching, co-operative planning, and grouping among others will guide the teacher.

Individualized instruction involves clearly specifying what students must learn and then organizing the available resources so that this can be done in ways and time most suitable for a particular individual. Obi-Okoye, (1997) defined individualized instruction as a process of designing and implementing of courses in formats suitable for individuals. According to Ohuchi (1995) in Obi-Okoye, (1997), learning is an individual involvement of the learners. The basic principle guiding individualization of instruction is that of reinforcement. The learning material is specially designed to the individual learning technique.

The advantages of individualised-teaching as indicated by Offorma and Ofoefuna (1998), include the following:

- It is self spaced and so allows the learner to move at his own rate.
- It brings the teacher and the learner so close that the needs and problems of the learner are better addressed.
- Individualized instruction provides the learner with immediate knowledge of result in most cases.
- It makes the students to be actively involved in the learning process.
- It lays emphasis on development of individuality.
- The teacher is freed from the mere routine work of more professional duties.

Obi-Okafor (1997) in Obi-Okoye (1997) observed that experienced teachers attest to the fact that individualized instruction does motivate students and equally promote learning. Nevertheless, Offorma and Ofoefuna (1998) stated that the handicaps to effective application of individualized instruction in Nigerian schools are because of unwieldy student population,

outmoded method of teacher preparation, lack of equipment and infrastructure facilities, and problem of time scheduling.

The origin of team teaching is difficult to trace. To Hillson and Hyman (1971) the origin of team teaching can be traced to the Andrew Bell arrival in Madras in the late 17th century to become a chaplain in the English garrison and also superintendent of the newly established school. The school was for the Orphans of British Soldiers, he faced what became a perennial problem; lack of qualified teachers. He resorted to the expediency of running his school by means of the pupils themselves. He assigned John Friskin then eight years old, to the monitor of A, B and C classes. John's success induced Dr Bell, that he extended his experiment. Soon monitors operated his whole school. When he got back to London, he wrote a report about his superintendence in Madras. This monitorial system or approach to learning was introduced in London by John Lancaster.

The origin of team teaching can also be traced to the Gary Plan or Platoons of early 1900s in United States that provided for two platoons to which pupils were assigned. This might be the origin of the differentiated grouping schemes presently being used in the large group instruction found in the team teaching plan. Team teaching was first tried in England in the early 1960s in the secondary schools. With reference to Nigeria, the idea of team teaching was as a result of finding solution to the increasing population in our institutions of learning. The importance of team teaching cannot be over emphasized. This type of teaching mode ensures that resources, interest and expertise are pooled together in order to device and implement an instruction suitable to the needs of the learners (Murata, 2004). This implies that team teaching is learners' need orientated, as the procedures involve two or more teachers teaching the same group of students. According to Afforma (1994), the main curriculum implementations are:

1. To utilize better talents and interest of teachers.

2. To increase the quality of instruction

3. To increase grouping and scheduling flexibility

Accordingly, team teaching provides students with a meaningful and unique way to improve their knowledge on a subject. It offers teachers opportunities for a professional exchange (Linalec, 1999) in Murata (2004).

According to Afforma (1994) the merits of Team teaching are as follows:

1. It is economical in terms of energy used in teaching.

2. Students are exposed to specialists thus improving their knowledge.

3. It makes more flexible use of staff equipment and infrastructure.

4. Students and teachers have opportunities for free discussions.

5. Teachers learn from members of the team, thus developing their professional status.

6. Improved quality of instruction. Team teaching encourages various teaching and learning styles. Team members equally have opportunities to pool resources together.

The disadvantages of team teaching according to Goetz and Egallery (2000) can be identified as follows:

1. Limited time for the implementation of Team teaching, since most teachers always rush to cover the syllabus.

2. Feeling of frustration discontentment about having more than one teacher.

3. The team members may disagree on matters of presentation, time-table, form of evaluation and even standards to be attained by students.

4. It may restrict an individual teacher freedom of teaching procedure.

Co-operative planning can be seen as an instructional mode that involves both the teacher and the learner in planning learning activities. It can also be regarded as the incorporation of a

group of teachers in planning teaching mode (Afforma, 1994). Co-operative is important at all stages of curriculum planning starting with the selection of objectives and ending with curriculum evaluation. Involvement of the learners in the planning of their own learning helps to make their learning meaningful and interesting.

The advantages of co-operative planning include the followings:

1. It enhances student's retention of the materials since they can make their own associations with the minimum help from the teacher.
2. It provides an opportunity for inexperienced teachers to learn how to construct evaluation instruments from the experienced teachers.

Nevertheless, some problems rear up their heads in Basic Science.

2-9 Impact of Team-teaching on Academic Achievement

Team-teaching has the effect on Student's Academic Achievement as seen in the findings of Uwameiye, and Ojikutu (2008) who carried out the research on sixty-two (62) J.S.S. two (2) students in Introductory Technology. There were thirty (30) students in experimental group and thirty-two (32) in the control group. The experimental and control group were treated using team-teaching and conventional strategy respectively. The mean score of the experimental group was 70.29 and the mean score of control group was 59.68 after the treatment. The finding indicates that experimental group have mean score of 10.61 higher than control group. Their calculated t-value of 171.23 after posttest mean achievement scores as against 1.96 criterion value is greater than 138.71 of control group as against 1.96 criterion t-value at .05 significant level, to reject the hypothesis of, there is no significant difference in posttest mean achievement scores of students taught with team teaching and conventional method. The difference in posttest performance scores

shows that the result was not due to chance, but due to the treatment given (Uwameiye and Ojikutu, 2008).

Ubah (2005) worked on the effect of team teaching on students' achievement in Further Mathematics. A sample of 160 Junior Secondary School students selected from four co-education schools in Onitsha and Nnewi educational zones in Anambra state was used. Three research questions and three hypotheses guided the study. The data collected were analysed based on each research question and hypotheses by computing the mean score, standard deviation and analyses of covariance (ANCOVA) with the pre-test scores as covariance at $p \leq .05$ probability level. The result showed that students taught through Team Teaching Strategy had a better achievement than students taught through conventional Strategy. It was recommended that mathematics teachers should teach further mathematics using Team Teaching Technique.

The findings revealed that team teaching instructional method is more effective than the conventional method as regards the academic achievement. One of the possible reasons for this is that team teaching is a co-operative system of instruction where two or more teachers team together to share the same subject matter. The findings are in line with Karin (2000), who stated that team teaching is used in increasing the students' level of understanding and retention, in addition to enabling the students to obtain higher achievement. He further reported that as a result of the team teaching, the students received more individualized attention from more experienced teachers. The cooperation students observed between the team teachers serves as a model for teaching students positive teamwork skills and attitudes. Unlike the conventional method of teaching which does not permit active participation of learners.

2.10 Students Interest and Academic Achievement in Basic Science

Bimbola and Daniel (2010) said that Basic Science plays vital role in Nigerian science education programme because it prepares pupils at the Junior Secondary School level for the study of core science subjects at the Senior Secondary School level which in turn brings about students' interest in science oriented courses at the tertiary institutions. To them,

> "despite government's efforts to encourage science teaching and learning among Nigerian students right from the Junior Secondary School level, the enrolment of students in core science subjects and science oriented courses at the Senior Secondary School level and tertiary institutions level respectively, is not encouraging. This is as a result of Junior Secondary School students' negative attitude towards Basic science" p 347.

Research reports by **Thomas and Kobella (1989)** indicate that this negative attitude was caused, majorly, by teachers' conventional (lecture) method of teaching Basic science.

An important facet of effective instructional design is the consideration of the effects of learning activities on students' motivation. These motivational beliefs are significantly related to students' achievement in science. Several types of instructional programs and activities have been developed to foster students' interest in science (Kanowith-Klein, Stave, Stevens, & Casillas, 2001). In the same vein providing students with culturally sensitive learning materials and activities can facilitate students' interest in science (Bouillion & Gomez, 2001). This means that Basic Science teachers should incorporate constructivist-based teaching strategy in their methods of teaching so that there would be an improvement in academic achievement of Junior Secondary School Students in Basic science.

The empirical literature reviewed the studies in gender and achievement and studies in team teaching. Most studies reviewed, confirmed that male students have a higher advantage over girls in Basic Science. Awodeyi (1997) and Harber-Peter (1999) favoured the hypothesis that Integrated Science had been male-stereo typed since it was regarded as abstract, difficult and has

attributes to which boys were attracted to. Awodeyi and Harber-Peter further said that boys participate more in Basic Science and as a result achieve more than girls. The reason they gave are as follows:

1. Boys are praised for participation in academic activities more than girls.

2. Teachers academic fields are sex stereotyped, they have more academic contacts with girls in reading and with boys in Basic Science. They concluded that from these entire observations one would expect males to participate more effectively in academic activities, particularly in Basic Science than females.

Maccoby and Jacklin (1974) in Ukwuagwu (2002) concluded that girls have greater verbal ability than boys, and boys have better visual spatial ability than girls. Maccoby and Jacklin further noted that girls on the average are reported to do well on words problems than on test of computation and algebra where content bias is not a possibility. Shaibu and Mari (1997) noted that girls are particularly deficient in mathematics reasoning ability. This is in line with Ukwuagwu (2002) who opined that girls perform worse in Basic science than boys. The various biological differences in human make-up particularly between male and female human beings in most cases have led to the suspicion that one sex may have a "learning edge" over the other sex. Some people believe (without of course any empirical support) that because men are regarded as the dominant and even superior sex, they intrinsically have better brains and learn much better than women Mkpughe (1998) in Alio and Harbor Peters (2000). Still on gender difference in Basic Science achievement, Alio and Harbor Peters (2000) suggested some other factors, one of which is the social role of the sexes in the society. Supporting this idea, Alio and Harbor Peters (2000) observed that maturation and interaction through class activities appear to sharpen the distinction between sex ability in Basic Science as students' progress through the school levels. Masculinity and feminity are attached more value and there is an indication that teenagers in general associate

Integrated Science with masculinity. They also hold a view that a material for instruction is a factor contributing to gender difference in Basic Science achievement.

Sex difference in Basic Science achievement has been attributed to another factor "attitude". Jahun and Momoh (2001) carried out a study aimed at finding out whether there existed sex-related differences in cognitive and attitudinal variables in Basic Science achievement or not at the terminal point of junior secondary education at which both sexes would have interacted so well to a level that they would see each as equal in academic pursuit, particularly, these days when the changing role of women in the society is taking a new dimension. On this basis, one of the hypotheses he stated was there will be no significant difference between the achievements of the sexes with respect to interest in Basic Science JS3 students (511 boys; 289 girls) selected from 22 schools in Kwara state of Nigeria, using a three-staged random sampling design. Integrated Science attitude questionnaire which consisted of two sections: background information on Integrated Science and self confidence. The Basic Science and self confidence section consist of six composite scales of which interest in Basic Science in one. The results showed that girls found Basic Science more difficult, shared greater anxiety and hated the subject than boys. They further observed that boys showed greater interest in Integrated Science and have more self confidence in their ability to study Basic Science than girls. Wesis and Levenson (2000) conducted a study to find out gender-related differences in selecting or choosing to study Basic Science during senior secondary school level. The students were asked whether or not they intended to enrol in Basic Science for the next school year. Standardized questionnaire were administered to the students. Their responses gave an indication that some of the sexes planned to continue the study of scientific related courses at the senior secondary level.

Aiyedun (2000) has a contrary view that girls are born with less Basic Science ability than boys. The result of his study on influence of sex differences in Basic Science achievement using

500 students randomly selected from 15 secondary schools in Kwara state revealed that Integrated Science achievement does not depend on sex. It was therefore, recommended that equal opportunity and privilege should be given to both male and female Basic Science students. Instead of arguing whether gender differences in Basic Science is due to social role of sexes in the society, attitude, heredity and the like, the researcher is interested in finding out what happens to both sexes under transformation of mode of instruction. If male and female students are taught Basic Science using team teaching mode of instruction, will the suggested sex difference achievement show?

2.11 Gender Issues in Academic Achievement

The age-old stereotype that girls are naturally good at reading comprehension and that boys are naturally good at science, mathematics and technology has long been a focus of feminist critics of science. The consequences of this stereotype, however, have been hotly debated. Some researchers believe that girls' performance in mathematics and science suffer considerably as a result of the influences and expectations of society (Heather, 2007). Others argue that these differences no longer apply, and only slight differences in attitude and self-confidence in these subjects continue to linger. Whatever differences truly still remain, any difference is too much. In a modern world where women make up over half the workforce (Adya & Kaiser, 2005), it seems only fair that women should have an equal opportunity to pursue whichever career they choose. Traditionally, masculine jobs, such as those in science, mathematics, and technology, should not be out of reach for women. Men and women differ not only in their physical attributes and reproductive function but also in many other characteristics, including the way they solve intellectual problems. For the past few decades, it has been ideologically fashionable to insist that these behavioural differences are minimal and are the consequence of variations in experience during development before and after adolescence (Kimura, 2002).

In much of the feminist literature concerning science education of girls, authors acknowledge that gender differences persist but these authors seem to be divided into two general camps. The first camp's focus is getting girls more involved with and comfortable in the existing science community because, "attitudes developed in the early years [are] vital" (Whitelegg, 1992). This camp focuses on interventions such as role modeling, mentoring, out-of-class science experiences, and other endeavors designed to increase science self-efficacy and success.

The second camp says that this is not the proper solution because it still considers masculine levels of achievement as the benchmark for success and portrays women as passive and insecure acceptors of roles (Phipps, 2007). Instead, this camp insists that the entire structure, language, and epistemologies of science need to be evaluated and changed. Few actual interventions are proposed as a means of implementing this solution.

Although there are serious problems with the structure, language, and epistemologies of science, a complete overhaul of science is nearly impossible to implement. The more feasible approach is to discover the most prevalent symptoms of the problem of the gender gap in science education (e.g., belief in stereotypes, lack of science self-confidence, dissatisfaction with the way science is presented) and address these with treatments such as Team-Teaching perhaps, with enough widespread treatments the gender gap will become negligible or a mere memory. An over view of similar study like team-teaching have been discussed in this study.

2.12 **Over**view of Similar Studies

According to Ubah (2005), researches have been carried out on team teaching strategies in secondary schools and colleges. Doebler & Cheri (1996) investigated the effect of team teaching on performance of junior secondary two students on an introductory educational psychology course in Montevallo. They purposively sampled 120 students. The instrument used was

Educational Psychology Achievement Test (EPAT). Lesson plan was also prepared by the researcher and used for the experiment. Data analysis was done with mean and standard deviation by the researcher. The findings revealed that team teaching was effective in the learning of educational psychology.

Also Uwameiye and Ojikutu (2008) carried out a study on Effect of Team Teaching on the Academic Achievement of Students in Introductory Technology on two secondary schools that were randomly selected for the study. The instrument used for data collection was the Introductory Technology Achievement Test (ITAT) which contains 50 multiple-choice items. The result of the study showed that there was a significant difference between the mean posttest achievement of students taught using team teaching and those taught in a conventional single-teacher teaching classroom. Anowai, Chukwuka, Ezenwugo & Obienyem (1998) worked on the effect of team teaching psychology. It was recommended that more emphasis should be placed on incorporating team teaching into all courses in the department of educational psychology.

Anowai, Chukwuka, Ezenwugo & Obienyem (1998) team teaching and conventional class teaching in mathematics performance of J.S.S. two students. The researcher Sampled 104 students in four selected secondary schools using a random sampling technique. Achievement test of 10 items formed the instrument while mean, standard deviation and chi-square were used for data analysis. In Ubah (2005), the findings indicated that the performance of junior secondary school students in mathematics dependent on the method used. In the present study, the researcher tends to find out if the result is still being the same.

Ubah (2005) worked on the effect of team teaching on students' achievement in Further Mathematics. The effect of team teaching on male and female students' achievement was also considered. The design of the study was quasi-experimental. He used intact class and not randomized groups. A sample of 160 Junior Secondary School students selected from four co-

education schools in Onitsha and Nnewi educational zones in Anambra state was used. The selection was done using a purposive sampling technique. Two schools were the experimental while the other two schools were control groups. The two groups were taught the same content using the same length of time. The study lasted for four weeks. The instrument used for the study was Further Mathematics Achievement Test (FMAT). This instrument together with lesson plan was validated before administration on the subjects. Three research questions and three hypotheses guided the study. The data collected were analysed based on each research question and hypotheses by computing the mean score, standard deviation and analyses of covariance (ANCOVA) with the pre-test scores as covariance at $p \leq .05$ probability level. The result showed that students taught through Team Teaching Strategy had a better achievement than students taught through Individualised Teaching Strategy. It was recommended that mathematics teachers should teach further mathematics using Team Teaching Technique. However, the researcher recommended that an equivalent research should be carried out on the study using different subject.

2.13 Implication of Literature Reviewed on the Present Study.

In this chapter, the researcher has traced the history or origin of Basic Science. Basic Science started as the rudiments of science which were introduced by missionary doctors attached to the theological and medical centres in Nigeria by the Methodists' Missionary in their primary school Badagry which was established in 1843. The launching of the first satellite (Sputnik) into space by the Soviet Union in 1957 that had a dramatic influence in the growth and development of Basic science globally and Nigeria.

The teaching of Basic Science involves different instructional strategies used for drilling students. The strategies include: group, activity, inquiry, conventional (traditional), demonstration, lecture, discussion, laboratory, field trip/excursion, problem-solving, project method, and team teaching, discovery teaching tactics, open-ended field or laboratory exercises all are used but depends on the suitability of the topic at hand.

Apart from Integrated Science which comprises of Biology, Chemistry, Physics and Earth science, Basic Science infused environmental education, drug abuse education, population family life education (POPFLE), sexually transmitted infections (STIs) including HIV/AIDS and Basic Technology related themes. Having rich curriculum designed for Basic Science, but still there is lack of trained qualified teachers and learning materials to teach the subject even at the primary level.

There is poor enrolment of the Nigerian youths into science and technology oriented courses as a result of the poor background received right from primary school. Bouillion & Gomez (2001) suggested that providing students with culturally sensitive learning materials and activities can facilitate students' interest in science which will meet the enrolment requirement of youths into science and technology at the tertiary institutions. This means that Basic Science teachers should incorporate constructivist-based teaching strategy in their methods of teaching which will improve academic achievement of Junior Secondary School Students in Basic science. This is in line with Bimbola and Daniel (2010) who found that Science plays vital role in Nigerian science education programme because it prepares pupils at the Junior Secondary School level for the study of core science subjects at the Senior Secondary School level which in turn brings about students' interest in science oriented courses at the tertiary institutions.

Theoretical bases for the study and related studies were reviewed. Particular attention was paid to the effect of team teaching on performance of concepts learnt. The findings of this study: Students

in the experimental group (taught with team teaching strategy have higher marginal achievement scores than their counterparts in control group (taught with single teacher teaching strategy) in Basic/Integrated Science at JSS levels.

The findings from other subject areas showed that team teaching enhances students' academic performance. However, the studies did not clearly indicate the extent/degree of retention and performance. For instance, when a child is taught using team teaching, will he improve for example from 30% performance to 50% or 60%?. It is generally and severally reported that Basic Science teachers predominantly use individual teaching strategy but rarely use the inquiry and interaction teaching techniques which is recommended by Basic Science Specialists. Also, research studies are silent on the use of team teaching in Basic Science at JSS level. These gaps were the pitfalls this present study sought. The study therefore aimed at investigating impacts of team teaching strategy on academic achievement and interest of JSS 2 Basic Science students in Potiskum Educational Zone.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This study investigated the Impact of Team-Teaching on the Academic Achievement and Interest in Basic Science at JSS II level in Potiskum Educational Zone. The methodology therefore is discussed under the following subheadings:

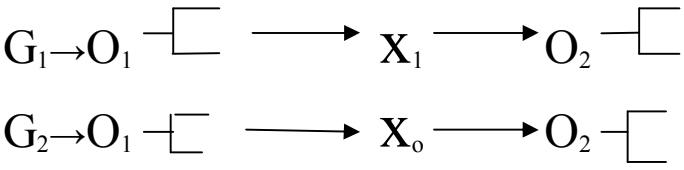
- Research Design
- Population of the Study
- Sample and Sampling Techniques
- Instrumentation
- Pilot Testing
- Training of Research Assistants
- Validity of the Instruments
- Reliability of the Instruments
- Procedure for Data Collection
- Data Analysis

3.2 Research Design

This research study used quasi-experimental control group design involving pretest and posttest. The pretest and posttest were administered to the two groups (experimental and control). The pretest was administered to the subjects in order to determine their academic ability level before the treatment, while posttest was administered after the treatment. The experimental group was exposed to treatment using team teaching techniques while the control group was exposed to individual teaching techniques (conventional). The tests were conducted to both groups of students in order to determine the students' achievement and interest in Basic Science at JS 2

level. The instruments BSAT and SIQ used for pretest were the same for the posttest. The design of the study is illustrated in Figure 3.1.

Fig 3.1 Research Design Illustration



G_1———Experimental group

G_2———Control group

X_1———Team-Teaching

X_o———Single-Teacher Teaching

A--------Academic Achievement

I----------Interest

O_1 ____Pre-test

O_2 ———Post-test for experimental and control group respectively.

3.3 Population of the Study

The population of the study is all government junior secondary two [JS 2] students in Potiskum educational zone, Yobe State. There are 16 junior secondary schools running Basic Science Programme with the population of 3.597 boys, 2,330 girls, and a total of 5,927 students in the study area. All those schools running co-educational (mixed) but single sex school were not included. The summary of the population is presented in the Table 3.1.

Table 3.1 Study Population		Enrolement		
S/N.	Name of school	Boys	Girls	Total
1	G.D.J.S.S. Chadi	358	206	564
2	G.D.J.S.S.Kara	648	388	1036
3	G.D.J.S.S. Arikimi	421	162	583
4	G.D.J.J.S.S. Mamudo	186	81	267
5	G.D.J.S.S.Dorawa	258	265	523
6	G.D.J,S. S. Yarimarari	95	55	150
7	G.D.J.S.S. Badejo	70	60	130
8	G.D.J.S.S. Garbawa	82	63	145
9	G.D.J.S.S. Bula	33	12	45
10	G.D.J.S.S. Jumma'a	85	57	142
11	G.D.J.S.S. Dakasku	39	31	70
12	G.D.J.S.S. Danchuwa	54	25	79
13	G.D.J.S.S. Sabon Gari	8	16	24
14	G.D.J.S.S. Yindiski	35	29	64
15	G.D.J.S.S. Central Pot.	720	531	1251
16	G.D.J.S.S. Sabon Layi	513	362	875
	Total	3597	2330	5927

Source:State Universal Basic Education Board (SUBEB) Potiskum, Yobe State (2009)

The researcher used JS2 students for the study. This is because JS3 students were preparing for their JS3 final examination and JS1 were fresh junior secondary school students from primary school system.

3.4 Sample and Sampling Techniques

Four secondary schools were selected out of 16 schools from Potiskum educational zone by using simple random technique involving balloting method, writing 'yes' on only four of the ballots the remaining 12 were 'no' written on them. Then the ballots were folded and squeezed and put in the box of chalk. Then the representatives of those 16 schools picked one of the ballots. Out of the four schools that picked 'yes,' only two equivalent schools were used for the study. The two groups were also selected for team-teaching and single teacher-teaching strategy by using simple random sampling techniques writing team-teaching and single teacher-teaching techniques. The

group that picked team-teaching and single teacher-teaching strategy were used as group 1 and group 2 respectively. The researcher sampled out two schools out of sixteen (16) schools running co-education in the study area.

The researcher used random sampling in selecting the two schools. The method used in selecting the experimental and control group was picking the folded paper by the representative of the two schools. There are forty (40) males and thirty-three (33) females in the experimental groups while in control group there are forty-seven (47) males and thirty-four females as seen in table 3.2.

Table 3.2 Sample for the Study

Group	School	Number of Males	Females	Total
Team Teaching	G.D.J.S.S Kara	40	33	73
Single Teaching	G.D.J.S.S Chadi	47	34	81
Total		87	**67**	**154**

3.5 Selected Topic for the Study

Energy as a topic was selected for the study from the Basic Science Text Book Two, Pages: 57-59, 105-115, 140-141, University Press PLC. Ibadan 2008. The reason for selecting this topic was because it cuts across the three core science subjects (Biology, Chemistry and Physics). Besides, the topic contains several activities with the representation of the three disciplines; the researcher also confirmed from their teachers through oral interview that their students fail most questions on energy aspect during their JSS 3 final examination. Similarly, the researcher confirmed from the Education Resource Centre (ERC) that students find difficulty in passing the questions on topics under Energy as seen in result of JSS 3 final examination of Junior Secondary School Kara, Potiskum Local Government, Yobe State. The researcher therefore prepared lesson

for six weeks which were used for teaching the topic. **Source:** State Universal Basic Education Board (SUBEB, 2009) Potiskum Education Zone, Yobe State.

3.6 Instrumentation

The researcher used two instruments for the study. The instruments are Basic Science Achievement Test (BSAT) and Students' Interest Questionnaire (SIQ). Basic Science Achievement Test contains 30 multiple choice items while Students' Interest Questionnaire (SIQ) contains twenty (20) statements. The chosen topics which were taught using team-teaching were shared by two Basic Science teachers including the researcher while the control group was taught by a single teacher. During the teaching of these topics in the experimental class, one teacher taught at a time while the other stayed in the class to observe and give support where necessary. The instrument of the study was prepared from the topics in JS2 Basic Science second term scheme of work as planned in the syllabus and students' interest inventory on Team-Teaching developed specifically by the researcher for this study. 30 items (BSAT) were constructed based on topics covered as contained in JS2 scheme of work. The main topic dealt with was "Energy" in which the sub-headings were broken into: forms of energy, sources of energy, energy conversion, uses of energy, energy classification, and energy sort cards.

Table 3.3 Table of Specification Based on Number of Questions per Topic

Content/Objective	Weight	Knowledge	Comprehension	Application	Total
	%	35%	35%	30%	100%
Energy	30	2	2	2	6
Forms of energy.	10	1	2	1	4
Sources of energy	15	2	1	1	4
Energy conversion	15	1	1	2	4
Uses of energy	10	2	1	1	4
Energy classificatn.	10	1	2	1	4
Energy sort cards	10	1	1	2	4
Total	**100**	10	10	10	30

Source: Adapted from Obeka (2009).

3.7 Pilot Testing

The pilot study was conducted in Old Army Barracks Junior secondary school Potiskum. This school is one of the schools in the study area. The subject used in the pilot study comprised a total of 33 students in JSS 2. Before then, the researcher applied for permission through the principal of the school to the class teacher to enable him access to the class intended to be used for pilot study. This feasibility study is a small experiment designed to test logistics and gather information prior to a larger study in order to make some adjustments where necessary and to improve the latter's quality and efficiency i.e the information obtained on logistical issues should be incorporated into the main study design. It also reveals deficiencies in the design of a

proposed experiment or procedure and these can then be addressed before the main treatment and resources are expended on large scale studies (Ruxton & Colegrave, 2006).

3.8 Selection of Research Assistants

The researcher selected three Basic Science teachers in the selected schools. Two teachers teaching this Basic Science used team-teaching strategy and taught the first group which was selected in GDJSS Kara, One teacher from GDJSS Chadi used a single-teacher teaching who taught the second group. They were selected because they had experience in Basic Science teaching and above all they were the class teachers teaching the subjects in those schools. All the teachers were graduates in Science Education.

3.9 Training of Research Assistants

The researcher trained three (3) research assistants for the study. The researcher gave a five-day intensive training to the research assistants to get them acquainted with the method used during instruction for six (6) weeks. During the training, the researcher coached the research assistants on how to go about the Team-Teaching Models (lesson planned) and the steps to be followed. The researcher also taught the research assistants how to handle the instructional materials in the class, i.e how and when to use them in the class. The third teacher taught the second group using single-teacher teaching technique all alone.

3.10 Validation of the Instruments

The instruments for the research were validated. Validity is the extent to which an instrument or test measures what it purports to measure. Kazeni (2005) opined that every research instrument which may be questionnaire, psychological test, observation or interview, etc is expected to gather dependable information on certain characteristics, ability or traits of the

respondents or group of people. The dependability of this instrument on the data gathered is what is called validity. There are different types of validity which are used in research work, for example, construct validity, content validity, face validity, criterion related validity (James, 1997).

The constructed instrument contains 30 items (BSAT) which were used for final data collection.The instrument was validated by the Basic Science specialists in measurement and evaluation from Curriculum Department, lecturers with Ph.D degree from Ahmadu Bello University Zaria. Also three experienced secondary school teachers from Basic Science Department validated the items. Their criticisms, comments, corrections, suggestions, and recommendations were effected to produce the final version.

3.11 Reliability of the instruments

The degree with which repeated observation and/or measurements are taken under identical circumstances will yield the same results. Reliability refers to where data is collected, quantified or evaluated. Reliability refers to the ability of the data gathering process to provide results that are consistent and within expected ranges. It is the degree of accuracy with which the instrument, test or set of tests measures whatever it is measuring. Reliability has to do with consistency and stability of the instrument or test (Abiola, 2007). For example, an instrument in which a student scored 65 per cent, 64 per cent and 66 per cent respectively in a test conducted within a specified period can be said to be consistently stable and so it is reliable.

The reliability coefficient of a test can be determined by different methods such as test-retest, split-half, parallel test. In this study the test retest reliability coefficient was used and the analysis using Pearson Product Moment Coefficient (PPMC) scores was obtained from the pilot testing of the Basic Science Achievement Test (BSAT). The reliability coefficient for the test was found to be 0.87. And the interest in team teaching strategy was analyzed by using split-half method. The

Kuder Richardson correlation coefficient statistics of r value was found to be 0.77 of Students' Interest Questionnaire the second instrument indicating that the instruments for the study were reliable..

3.12 Treatment

The research assistants under the supervision of the researcher conducted the test to the two groups as the pre-test. After the pre-test, the research assistants under the guidance of the researcher administered the treatment for six weeks. In the first group, the first teacher presented the lesson from introduction to step one and the second teacher took over and continued. After each lesson presentation, the two teachers teaching the first group using team-teaching met and made observations, suggestions. They also checked the strength and weaknesses of the strategy and made some adjustments where necessary. The third teacher who taught the second group taught alone for the same period using single-teacher teaching technique. The teaching lasted for six (6) weeks, after which the examination (post test) was conducted to both groups.

3.13 Procedure for Data Collection

The researcher sought permission from the principals of the selected schools to allow their schools to be used for the study. The researcher and the research assistants conducted the pre-test to both groups of students to determine their entry level and they were post-tested after they had undergone the treatment for six (6) weeks. The first group was taught by two teachers using team-teaching strategy, while the second group was taught by the third teacher using single teacher-teaching strategy. Two Basic Science teachers made up the team teachers, while one teacher taught for the control group using conventional method. Each of the groups, experimental group (team teaching group) and control (Conventional) taught for six weeks. In the control group, a trained Integrated Science teacher exposed the students to the usual conventional method of teaching

where he taught the class all alone. At the end of each class, the teachers in experimental group held a meeting to critique the teaching. At the end of the six weeks, the Basic Science Achievement Test (BSAT) was administered as a post-test to the students in the two groups.

3.14 Procedure for Data Analysis

After the treatment administration, the researcher and the research assistants conducted the test to the subjects. When the data were collected, the researcher took the result to the statistician for the analysis. The independent simple t-test statistics was used to test the Hypotheses 1, 11 and IV of Basic Science Achievement Test (BSAT) and paired sample t-test statistics was used to test Hypothesis 1II of Students' Interest Questionnaire (SIQ) at 0.05 alpha levels of significance.

CHAPTER FOUR

DATA ANALYSIS: PRESENTATION, RESULTS AND DISCUSSION

4.1 Introduction.

This chapter presents the data analysis of the study, results and discussion under the following subheadings:

- Data analysis
- Results
- Summary of Findings
- Discussion

4.2 Data analysis

Research question 1: What is the difference in academic achievement between students who are exposed to team-teaching with those that are exposed to single-teacher teaching?

Table 4.2.1: The Mean Score of Students Exposed to Team-Teaching and those Exposed to Single-Teacher Teaching Strategies.

Groups	N	Mean	Std.dev	Std.Err
G_1 Experimental (using team-teaching)	50	33.10	5.20	.73
G_2 Control (single-teacher teaching)	50	32.06	5.31	.75

Based on the results in Table 4:2:1 indicates that the mean achievement score of students in the experimental group was 33.10 and the mean achievement score of students in the control group was 32.06. Students in the experimental group have the mean achievement score of 1.04 higher than the control group. This shows that the students in the experimental group have higher mean achievement score of 1.04 than their control group counterparts. The standard deviation of the experimental group was 5.20 and that of control group was 5.31.

Research question 2: What is the difference between the mean score of male and female students who are exposed to team-teaching strategy at JSS level?

Table 4.2.2: Summary of Mean Scores of Male and Female Students Exposed to Team-Teaching Strategy.

Sex	N	Mean	Std.dev	Std.Err
Male	25	33.48	4.19	0.84
Female	25	32.72	6.11	1.22

The result in the Table 4.2.2 compared the mean achievement scores of male and female students exposed to team teaching strategy in Basic science. Their mean scores were 33.48 and 32.72 for male and female students respectively. The male students have mean achievement score of 0.76 higher than their female counterparts in the same group, which means that the standard deviation of male students is closer to the main mean score than the standard deviation of their female counterparts in the same group.

Research question 3: What is the impact of team teaching strategy on interest of JSS Basic Science students?

Table 4.2.3: The Mean Difference of Impact of Team Teaching Strategy on Interest of JSS Basic Science Students

Interest	N	Mean	Std.dev	Std. Err
Before exposure to team teaching	50	55.82	18.47	2.61
After exposure to team teaching	50	64.60	14.93	2.11

The result in the Table 4.2.3 reveals that there is difference between the mean scores on interest of JSS Basic science students before and after exposure to team teaching. This is because the mean score of interest of students before exposure to team teaching was 55.82 and it roused to 64.60 after exposure to the team teaching strategy. The difference between the interests of students before and after exposure to team teaching is 8.78. This indicates that students have developed interest in Basic Science after the exposure to team teaching Strategy.

Research question 4: What is the difference on the interest of male and female students in Basic Science?

Table 4.2.4: The Difference in the Interests of Female Students taught via Team Teaching and those taught via Single Teacher Teaching Strategies.

Groups of female	N	Mean	Std.dev	Std.Err
Team-Teaching	25	32.72	2.90	0.84
Single-Teacher Teaching	21	33.38	4.20	0.63

The result in the Table 4.2.4 indicates that female students in the first group taught Basic Science using team-teaching had a mean score of 32.72 as compared to their counterparts in the second group who were taught Basic Science using single-teacher teaching with a mean interest score of 33.38. This implies that the control group of female students had higher mean interest scores of 0.661 higher than their experimental group counterparts, meaning that students taught by the single teacher had high interest score in the learning strategy than those taught by two teachers.

4.3 Testing of Research Hypotheses

Hypothesis One (Ho_1): There is no significant difference between the mean achievement scores of students taught Basic Science using team-teaching strategy and those taught with single-teacher teaching strategy.

Table 4.3.1: Independent t-test sample statistic on the Difference between the Mean **Achievement Scores of Students Taught Basic Science using Team-teaching strategy and those taught with single-teacher teaching strategies.**

Groups	N	Mean	Std.dev	Std.Err	df	t-cal.	t-critical	Sig (p)
Team-teaching	50	33.10	. 199	.735	98	0.99	1.96	0.33
Single-teacher teaching	50	32.06	5.31	.751				

Calculated t < 1.96, calculated p > 0.05

The result in Table 4.3.1 shows that t-cal (0.99) is less than t-critical (1.96) at df 98. Also, p-value of 0.33 is greater than alpha level of significance ($p \leq 0.05$). Based on these results in Table 4.3.1, the research Hypothesis One (1) which states that " There is no significant difference between the mean achievement scores of students taught Basic science using team-teaching strategy and those taught with single-teacher teaching strategy is therefore retained. while the t-calculated value of 0.99 is less than the t-critical value of 1.96 at df 98 and the mean achievement scores were 33.10 and 32.06.

Hypothesis Two ($H0_2$): There is no significant difference between the mean achievement scores of male and female students taught Basic Science using team-teaching strategy.

Table 4.3.2: Difference between the Mean Achievement Scores of Male and Female Students Taught Basic Science Using Team-Teaching Strategy.

Sex	N	Mean	Std.dev	Std.Err	df	t-cal	t- Cri.	Sig (p)
M	25	33.48	6.11092	1.22218	48	0.513	1.96	0.61
F	25	32.72	4.18848	.8377				

Calculated t < 1.96, calculated p > 0.05

The independent t-test statistics on Table 4.3.2 revealed that the calculated p value of 0.61 is greater than the alpha level of significance (*$p \leq 0.05$*) while the t-calculated value of 0.51 is less than the t-critical value of 1.96, at df 48. The mean achievement scores were 33.48 and 32.72 for male and female students respectively in the experimental group. The male mean achievement score was 0.76 higher than the female counterpart. This shows that there is significant difference between the mean achievement scores of male and female students taught Basic science using team-teaching strategy. This implies that the null Hypothesis Two ($H0_2$) which states that "There is no significant difference between the mean achievement scores of male and female students taught Basic science using team-teaching techniques" is hereby rejected.

Hypothesis Three ($H0_3$): There is no significant difference in the interest of Basic Science Students before and after exposure to team teaching.

Table 4.3.3: Paired Sample t-test statistic in the Difference on the Interest of Basic science Students before and after exposure to Team Teaching Strategy.

Interest	N	Mean	Std.dev	Std.Err	Df	t cal.	t-critical	Sig (p)
Before exposure	50	55.82	18.47	2.61	48	3.74	1.96	0.00
After exposure	50	64.60	14.93	2.11				

Calculated t > 1.96, calculated p < 0.05

The result in the Table 4.3.3 indicates that the alpha level of significance *($p \leq 0.05$)* is greater than the calculated p-value of 0.00, while the t-calculated value of 3.74 is greater than the t-critical value of 1.96 at df 48. The mean interest level scores were 55.82 and 64.60 before and after exposure to team teaching strategy respectively. This implies that students' interest in Basic science is significantly higher after being exposed to team teaching strategy. The null Hypothesis Three ($H0_3$) which states that "There is no significant difference in the interest of Basic Science students before and after exposure to team teaching strategy" is hereby rejected in favour of single teacher since the result of the paired sample t-test statistic revealed that there is significant difference in the interest of Basic Science students before and after exposure to team teaching strategy.

Hypothesis Four ($H0_4$): There is no significant difference in the interest of male and female students in Basic Science taught team-teaching.

Table 4.3.4: Independent t-test Sample Statistic on the Interest of Male and Female Students in Basic Science.

Groups male & female		N	Mean	Std.dev	Std.Err	df	t cal.	t-cri.	Sig (p)
Team-Teaching	M	25	32.72	4.19	. 84	44	0.61	1.96	0.54
Team-Teaching	F	21	33.38	2.89	. 63				

Calculated t < 1.96, calculated p > 0.05

The result in the Table 4.3.4 shows that the calculated p-value is 0.54 is greater than the 0.05 alpha level of significance while the t-calculated value of 0.61 is less than the t-critical value of 1.96 at df 44. The mean scores on interest of male and female students in experimental group taught by team-teaching are 32.20 and 33.38 respectively. The null hypothesis four ($H0_4$) which states that "There is no significant difference on the interest of male and female students in Basic Science taught team-teaching strategy is not accepted because the independent t-test statistics revealed that there is significant differences on the interest of male and female students taught Basic Science using team-teaching strategy. Since the calculated p-value of 0.54 is greater than the 0.05 alpha level of significance and the t-calculated value of 0.61 is less than the t-critical value of 1.96, at df 44. Therefore, the null hypothesis which states that there is no significant difference in the interest of male and female students in Basic Science is hereby rejected.

4.4 Summary of Findings

The following are the major findings of this study:

1. Students in the experimental group (taught with team teaching strategy have the mean score of 33.10 and the mean score of those exposed to single teacher teaching strategy was 32.06. Students in the experimental group have 1.04 achievement scores higher than their counterparts in control group taught with single teacher teaching strategy) in Basic Science at JSS levels. This finding is in line with Karin (2000) who stated that team teaching is used in increasing the students' level of understanding and interest, in addition to enabling the students to obtain higher achievement.
2. The male mean achievement score was 33.48 and female mean achievement score was 32.72. The male have 0.76 higher mean achievement score than their female counterparts when exposed to team teaching strategy in the experimental group.
3. The mean interest level scores of students before exposure to team teaching strategy was 55.82 and the mean interest level scores of students after exposure to team teaching strategy was rouse to 64.60. This implies that students' interest in Basic science is significantly higher after being exposed to team teaching strategy with 8.78 higher interests in Basic Science than before exposure to team Teaching strategy.
4. Female students in the experimental group had mean scores of 32.72 as compared to their counterparts in the control group with mean achievement scores of 33.38. This implies that the control group female students had little or marginal higher mean scores of 0.66 than their experimental group counterparts.

4.5 Discussion

The data collected for this study were based on the Basic Science Academic Achievement test (BSAT) and responses obtained from the Students' Interest Questionnaire (SIQ). They were analysed in line with the focus of the research questions and research hypotheses which were formulated in the design of the study. According to the outcome from Table 4.2.1, the mean achievement scores of students in the experimental group were 33.10 as compared to those of control group with the mean score of 32.06. This shows that students in the experimental group (taught by team-teaching strategy) have the mean achievement scores of 1.04 higher than their control group counterparts (taught by single-teacher teaching).

The result in Table 4.2.2 indicates that the mean scores 33.48 and 32.72 for male and female students respectively. The male students have mean achievement score of 0.76 higher than their female counterparts in the same group.

The result in the Table 4.2.3 reveals that there is difference between the mean scores on interest of JSS Basic Science students before and after exposure to team teaching. This is because the mean score of interest of students before exposure to team teaching was 55.82 and it rose to 64.60 after exposure to the team teaching strategy, meaning that the change in interest after the exposure to the team teaching strategy was 8.78.

The result in the Table 4.2.4 indicates that female students in the first group taught Basic Science using team-teaching had a mean score of 32.72 as compared to their counterparts in the second group who were taught Basic Science using single-teacher teaching with a mean interest score of 33.38. This implies that the control group of female students had higher mean interest scores of 0.661 higher than their experimental group counterparts.

The result in Table 4.3.1 shows that t-cal (0.99) is less than t-critical (1.96) at df 98. Also, p-value of 0.33 is greater than alpha level of significance *($p \leq 0.05$)*. Based on these results in Table 4.3.1 the research hypothesis one (1) which states that " There is no significant differences between the mean achievement scores of students taught Basic science using team-teaching strategy and those taught using single-teacher teaching strategy is therefore accepted. Since the calculated p-value of 0.33 is greater than the 0.05 alpha level of significance while the t-calculated value of 0.99 is less than the t-critical value of 1.96, at df 98.

The finding of this hypothesis is in agreement with what Ubah (2005) who stated that the performance of junior secondary students in mathematics was dependent on the method used and the teacher, which is also in conformity with the findings of Doebler (1996) whose finding revealed that team teaching was effective in the learning of educational technology.

The independent t-test statistic on Table 4.3.2 revealed that the calculated p-value of 0.61 is greater than the alpha level of significance ($p \leq 0.05$) while the t-calculated value of 0.51 is less than the t-critical value of 1.96, at df 48. The mean achievement scores were 33.48 and 32.72 for male and female students respectively in the experimental group. This shows that there is significant difference between the mean achievement scores of male and female students taught Basic Science using team-teaching strategy. It also agreed with Ukwuagwu (2002) who opined that girls' performance in Basic Science was poorer than that of boys, this is also supported by Heather (2007). The null hypothesis two ($H0_2$) which states that "There is no significant difference between the mean achievement scores of male and female students taught Basic science using team-teaching strategy" disagreed with the statement.

Table 4.3.3 indicates that the alpha level of significance *($p \leq 0.05$)* is greater than the calculated p-value of 0.00, while the t-calculated value of 3.74 is greater than the t-critical value of 1.96, at df 48. The mean interest level scores were 55.82 and 64.60 before and after exposure to

team teaching strategy respectively. This implies that students' interest in Basic science is significantly higher after being exposed to team teaching strategy. The null Hypothesis Three ($H0_3$) which states that "There is no significant differences in the interest of Basic Science students before and after exposure to team teaching strategy" is hereby rejected since the result of the paired sample t-test statistic revealed that there is significant difference in the interest of Basic Science students before and after exposure to team teaching strategy as seen in Table 4.3.3.This result agreed with the finding of Karin (2000) and Uwameiye & Ojikutu (2008) who carried out a study on Effect of Team Teaching on the Academic Achievement of Students in Introductory Technology.

Table 4.3.4 shows that the calculated p-value 0.54 is greater than the 0.05 alpha level of significance and the t-calculated value of 0.61 is less than the t-critical value of 1.96, at df 44. The mean scores on interest of male and female students in the experimental group taught by team-teaching are 32.20 and 33.38 respectively. The null hypothesis four ($H0_4$) which states that "There is no significant difference in the interest of male and female students in Basic Science taught by team-teaching strategy disagreed with the statement because the independent t-test statistics revealed that there is significant difference in the interest of male and female students taught Basic Science using team-teaching strategy. Since the calculated p-value of 0.54 is greater than the 0.05 alpha level of significance and the t-calculated value of 0.61 is less than the t-critical value of 1.96, at df 44. Therefore, the null hypothesis which states that there is no significant difference in the interest of male and female students in Basic Science is hereby retained. This findings supports Jahun and Momoh's (2001) and Adya & Kaiser (2005) findings which showed that girls found Basic Science difficult, experienced greater anxiety and hated the subject more than boys did.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMENDATIONS

5.1 Introduction

In this chapter, the researcher made the presentation under the following subheadings:

- Summary
- Conclusion
- Implications of Findings
- Recommendations
- Contribution to knowledge
- Limitations of the Study
- Suggestions for Further Studies

5.2 Summary

This study investigated the impact of Team teaching strategy on Academic achievement and interest in Basic Science concepts among junior secondary school students in Potiskum Educational Zone. The researcher used quasi experimental group design involving pretest and postest. Army Day Secondary School Potiskum was used for the pilot study. There are sixteen (16) schools with the population of five thousand (5,927) students running co-education system in the study area. The researcher used simple random sampling technique for the sample in which only two schools i.e Government Day Secondary School, Kara and Government Day Secondary School, Chadi with a population of one hundred (100) subjects were used for the study. The research had four research questions, four research hypotheses. It also contained significance of the study, basic assumptions and scope of the study. The study had two instruments: Basic Science Achievement Test (BSAT) which contains thirty (30) objective tests and Students Interest Questionnaire (SIQ) with twenty (20) statements involving likert scale i.e strongly agreed, agreed, disagreed and strongly disagreed.

The researcher trained the research assistants for five days before the actual treatment. The researcher and the research assistants taught the subjects for six weeks before the instruments were administered to the subjects. The results collected were analysed at $p \leq 0.05$ level of significance. The respondents' responses formed the data analysis of this study using the SPSS Statistical Package. The first section presented the bio data variables analysis by means of frequencies and percentages, while the second section answered the research questions using frequencies, means and standard deviations of each item.. The third section presented and interpreted the five null research hypotheses by means of inferential statistical techniques of Independent t-test sample statistics for hypotheses one, two and four and the paired sample t-test statistic for hypothesis three .All hypotheses were tested at 0.05 alpha level of significance. The fourth section outlined the major findings of the study and the last section made some recommendations.

5.3 Conclusion

The following conclusions are made based on the findings of the study:

1. Team Teaching encourages corporation, share ideas, patience and tolerance and encourages unity, friendship, cohesion interaction and sociable among teachers. The cooperation of students observed between the team teachers serves as a model for teaching students positive teamwork skills and attitudes.
2. Students develop high interest in learning of Basic Science Concepts when Team Teaching Strategy is used in learning and teaching.
3. Team Teaching increases positive attitude charge among both teachers and students as they discuss issues together and lead to their creativity among others.

5.4 Implications of Findings

Abell (2000) opined that joint work is a strong version of collegiality that shifts teaching from the individualistic to the collective, breaking down the barriers of privacy and leading towards new kinds of teaching. Working together as a team yields better result. Team Teaching Strategy encourages high cohesion among teachers of Basic Science. Working in teams spreads responsibility, encourages creativity, deepens friendships, and builds community among teachers. Teachers complement one another. They share insights, propose new approaches, and challenge assumptions. It increases students' level of interaction in the class. However, the strategy needs enough classroom space for it to be effective. Effective teaching and learning were difficult to achieve due to class congestion, difficulties in class management and use of instructional materials. Teachers need high level of patients and understanding each other in carrying the job.

5.5 Recommendations

Based on the findings of this study, the following recommendations are made:

1. Teachers of Basic science should be encouraged by the school management to attend seminars, workshops and conferences during long vocation to adopt how to use team teaching strategy or update them with the knowledge on team teaching strategy.
2. Stakeholders, especially commissioners for education, directors of schools, principals and other resource personnel should always emphasise on the use of team teaching for instruction in the class especially the teachers in the service.
3. Teachers of Basic science in Potiskum local government Yobe State should be encouraged to adopt constructive team discussion to increase their knowledge on team teaching strategy at JSS two (2) level in secondary schools.

4. Teachers and students should be encouraged to solve class problem so that the spirit of team working will be developed among students.
5. More emphasis should be placed on incorporating team teaching into all courses in the department of Basic Science Education.

5.6 Contribution to Knowledge

1. The study has added literature to the existing literatures.
2. Several studies carried out on Team Teaching Strategy, did not show positive attitudinal change and interest towards learning Basic Science Concepts.
3. Team Teaching Strategy encourages gender friendly as the teachers students work together in team.

5.7 Limitations of the Study

The Limitations experienced during study were:

1. Teachers found difficulty in terms of class management as a result of students over population in the class.
2. Inadequate sort cards that could not go round large number of students in the class.
3. Difficulties found in explaining some concepts which had to be explained with students' native language (common spoken language) rather than English language.
4. Teachers' experience, qualification and commitment were not controlled and students' interest towards learning.

5.8 Suggestions for Further Studies

This study was carried out on the Impact of Team Teaching Strategy on the Academic Achievement in Basic Science, the researcher is of the opinion that:

1. Similar studies can be carried out at JS in Yobe State as a whole.
2. This study has concentrated on only Basic Science; further study should be carried out on other fields of Science courses such as biology, chemistry, physics and geography using Team Teaching Strategy.
3. Similar studies of Team Teaching should also be carried out at higher institution such as College of Education, Polytechnics, Mono-technics and University.

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APPENDIX A

LESSON PLAN FOR EXPERIMENTAL GROUP

Lesson One

Method of Teaching Basic Science Lecture Method

Group Experimental

School G.D.J.S.S. Kara

Class: JS 2

No. Of Students in the class 50

Subject Basic Science

Topic: Energy

Duration: 40 minutes per period

Average age of the students: 13 years

Instructional Materials: Box of chalk, stone, books etc.

General Objective: To teach students energy.

Specific behavioural

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

(i) define the term energy ,

(ii) demonstrate two examples of energy in the class.

(iii) describe the term energy

Previous Knowledge: Students have been carrying things such as books.

Teaching Mode: Team-teaching

Content Development	Teacher's Activities.	Students Activities
Introduction	The 1st teacher introduces the lesson by asking the students questions from their previous knowledge e.g what do you carry when coming to school?	Students mention examples of things they carry when coming to school e.g books, bags, biro, pencil, ruler e.t.c.
Presentation Step 1	The 1st teacher presents the lesson by defining and explaining the term energy as "ability to do work" or "capacity to do work".	Students listen to the explanation and ask where it is not clear
Step 11	The 2nd teacher cites some examples of energy such as taking a book from a table and explains to the	Students form groups of five and list some examples of

	students that he uses energy to pick them. Then he asks students to form groups of five to list kinds of work that we do.	work we do e.g run, walk, dance, etc.
Evaluation Step 111	The 1st teacher evaluates the lesson by asking questions e.g. what is energy? while the second teacher jots down the points raised by the students on the chalkboard.	Students answer the questions, e.g. energy is the ability/capacity to do work. etc.
Conclusion	The 1st teacher concludes the lesson for the day by asking the Students to copy the summary on chalkboard into their notebook.	Students copy the summary points into their notebook

LESSON PLAN FOR EXPERIMENTAL GROUP

Lesson Two

Method of Teaching Basic Science Lecture and Activity Method

Group Experimental

School G.D.J.S.S. Kara

Class: JS 2

No. of Students in the class 50

Subject Basic Science

Topic: Forms of energy

Duration: 40 minutes per period

Average age of the students: 13 years

Instructional Materials: Diagrams, chart cards etc.

General Objective: To teach students forms of energy.

Specific behavioural Objectives: By the end of the lesson, students should be able to:

(i) list forms of energy,

(ii) describe at least three forms of energy,

(iii) draw a boy riding a bicycle in their note book.

Previous Knowledge: Students have been taught about energy.

Teaching Mode: Team-teaching

Content Development	Teacher's Activities	Students' Activities
Introduction	The 1st teacher introduces the lesson by asking the students questions from their previous knowledge e.g what is energy?	Energy is the ability/capacity to do work.
Presentation Step 1	The 1st teacher presents the lesson by explaining the forms of energy and their example each e.g.	Students listen to the teachers' presentation
Step 11	The 2nd teacher lists examples of forms of energy on the chalkboard e.g. mechanical energy, chemical energy, electrical energy, sound energy e.t.c.	Students listen and ask questions where they don't understand.
Step 111	The 1st teacher asks the students to form groups of five and list five examples of forms of energy,	Students form groups as instructed and list the forms of

		energy e.g light energy, heat energy etc.
Evaluation Step iv	The 2nd teacher evaluates the lesson by asking questions. e.g. mention two forms of energy that you know. And he jots down the points raised by the students on the chalkboard.	Students answer the questions, e.g. the examples of two forms of energy are: chemical energy, electrical energy.
Conclusion	The 2nd teacher concludes the lesson by asking the Students to find more about forms of energy when they go home as an assignment.	Students do their assignment as instructed by the teacher.

LESSON PLAN FOR EXPERIMENTAL GROUP

Lesson Three

Method of Teaching Basic Science Lecture Method

Group Experimental

School G.D.J.S.S. Kara

Topic: Sources of energy

Class: JS 2

No. of students in the class 50

Subject Basic Science

Duration: 40 minutes per period

Average age of the students: 13 years

Instructional Materials: Charts/diagrams on card board paper etc.

General Objective: To teach students sources of energy.

Specific behavioural

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

(i) describe sources of energy,

(ii) mention some examples of sources of energy,

(iii) draw some examples of sources of energy such as power plant into their notebook

Previous Knowledge: Students have been taught about forms of energy.

Teaching Mode: Team-teaching

Content Development	Teacher's Activities	Students Activities
Introduction	The 1st teacher introduces the lesson by asking the students questions from their previous knowledge. e.g. name two forms of energy.	The examples of two forms of energy are chemical and electrical energy.
Presentation Step 1	The 1st teacher presents the lesson by explaining what is meant by sources of energy to the class e.g "food" when you eat you get strength to do work such as carrying books.	Students listen and watch on the chalkboard as the teacher explains and describes source of energy.
Step 11	The 2nd teacher shows students different charts/diagrams of sources of energy on the chalkboard and explains one by one.	Students watch, listen and ask questions where they don't understand
Step 111	The teacher evaluates the lesson by asking	Students list some sources of

Evaluation	some questions e.g. list two sources of energy. And he jots down the points raised by the students on the chalkboard.	energy such as food, petrol, coal, wood e.t.c.
Conclusion	The teacher concludes the lesson for the day by asking the students to draw the diagram of power line on chalkboard into their notebook.	Students draw the diagram of power line on the chalkboard into their notebook.

LESSON PLAN FOR EXPERIMENTAL GROUP

Lesson Four

Method of Teaching Basic Science Lecture and Activity Method

Group Experimental

School G.D.J.S.S. Kara

Topic: Uses of energy

Class: JS 2

No. of Students in the class 50

Subject Basic Science

Duration: 40 minutes per period

Average age of the students: 13 years

Instructional Materials: Charts/diagrams on cardboard paper etc.

General Objective: To teach students uses of energy.

Specific behavioural

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

(i) describe uses of energy at home,

(ii) list examples of some appliances use energy at home e.g. iron, radio, television, telephone e.t.c.

(iii) draw two examples of the appliances that are used at home into their notebook

Previous Knowledge: Students have been taught sources of Energy

Teaching Mode: Team-Teaching

Content Development	Teacher's Activities	Students Activities
Introduction	The teacher introduces the lesson by asking the students questions from their previous knowledge e.g. Name two examples of sources of energy	The two examples of sources of energy are food, power plant etc.
Presentation Step 1	The Ist teacher presents the lesson by explaining the uses of energy at home.	Students pay attention and watch on the chalkboard as the teacher explains.
Step 11	The 2nd teacher lists the examples of appliances that use energy at home e.g. telephone, radio, iron, fan, car etc, on the chalkboard and explains each.	Students watch, listen and ask questions where they don't understand
Step 111	The 3rd teacher asks students to form groups	Students form group of five

	of five to list three examples of appliances that are used energy at home.	and list some examples of appliances that use energy at home etc.
Evaluation	The Ist teacher evaluates the lesson by asking questions e.g. what do we use for heat energy at home?	We use heat energy at home for cooking, heating water, roasting fish, e.t.c.

LESSON PLAN FOR EXPERIMENTAL GROUP

Lesson Five

Method of Teaching Basic Science Lecture and Demonstration Method

Group Experimental

School G.D.J.S.S. Kara

Topic: Conversion of energy

Class: JS 2

No. of students in the class 50

Subject Basic Science

Duration: 40 minutes per period

Average age of the students: 13 years

Instructional Materials: Wood, candle, matches, battery, wire, bulb e.t.c.

General Objective: To teach students conversion of energy.

Specific behavioural

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

(i) explain how energy are converted.

(ii) demonstrate how to connect battery and bulb with wire and produce light and heat,

(iii) enumerate other examples on energy conversion.

Previous Knowledge: Students have been taught uses of energy

Teaching Mode: Team-teaching

Content Development	Teacher's Activities	Students Activities
Introduction	The Ist teacher introduces the lesson by asking the students questions from their previous knowledge. For example, name two uses of energy in our homes.	The two uses of energy in our homes are heat energy for cooking our food etc.
Presentation Step 1	The Ist teacher presents the lesson by explaining the term 'energy conversion' to the students.	Students pay attention and watch on the chalkboard as the teacher explains.
Step 11	The 2nd teacher uses battery, wire and bulb to demonstrate energy conversion on the chalkboard and explains that from chemical energy to electrical energy.	Students listen and watch to the teacher's demonstration
Step 111	The teacher allows students to demonstrate by themselves and moves round in the class to see what the students are doing.	Students demonstrate by themselves with the materials given to them.
Evaluation	The teacher evaluates the lesson by asking students some questions and asks them to write more examples at home as home work.	Students answer questions and write more examples at home as assignment.

LESSON PLAN FOR EXPERIMENTAL GROUP

Lesson Six

Method of Teaching Basic Science Lecture Method

Group Experimental

School G.D.J.S.S. Kara

Topic: Energy classification

Class: JS 2

No. Of Students in the class 50

Subject Basic Science

Duration: 40 minutes per period

Average age of the students: 13 years

Instructional Materials: Energy cards of generator, sun, dry cell battery, gasoline e.t.c.

General Objective: To teach students energy classification.

Specific behavioural Objectives: By the end of the lesson, students should be able to:

(i) mention the three energy classes,

(ii) mention at least one example of each class,

(iii) draw one example each of energy class in their note book.

Previous Knowledge: Students have been taught about energy conversion

Teaching Mode: Team-teaching

Content Development	Teacher's Activities	Students Activities
Introduction	The Ist teacher introduces the lesson by asking the students questions from their previous knowledge e.g, briefly explain how energy are converted from one form to the other.	The students explain how energy are converted from one form to the other.
Presentation Step 1	The Ist teacher presents the lesson by listing classes of energy e.g. natural source, manufactured and petroleum products and explains them.	Students pay attention and watch on the chalkboard as the teacher explains.
Step 11	The 2nd teacher cites example of each class of energy and explains them e.g . sun, natural gas, generator	Students listen and watch to the demonstration
Step 111 Evaluation	The 1st teacher evaluates the lesson asking students some questions e.g. enumerate three classes of energy.	.Students list the classes e.g. natural, petroleum product and manufactured sources.
Conclusion	The teacher Concludes the lesson by asking students to write more examples as home work.	Students write more examples at home as assignment.

APPENDIX B

LESSON PLAN FOR CONTROL GROUP

Lesson One

Method of Teaching Basic Science Singe teacher teaching stratesy.

Group Control

School G.D.J.S.S. Chadi

Class: JS 2

No. Of Students in the class 50

Subject Basic Science

Topic: Energy

Duration: 40 minutes per period

Average age of the students: 13 years

Instructional Materials: Box of chalk, books, stone etc.

General Objective: To teach students energy.

Specific behavioural

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

(i) define the term energy,

(ii) demonstrate two examples of energy in the class.

(iii) describe the term energy

Previous Knowledge: Students have been carrying things such as books..

Teaching Mode: Individual-teaching

Content Development	Teacher's Activities	Students Activities
Introduction	The teacher introduces the lesson by asking the students questions from their previous knowledge e.g what do you carry when coming to school?	Students mention examples of things they carry when carry coming to school e.g books, bags, pencil and biro e.t.c.
Presentation Step 1	The teacher presents the lesson by defining and explaining the term energy as ability to do work	Students listen to the explanation and ask where it is not clear
Step 11	The teacher cites some examples of energy such as taking a book from a table and explains to the students that he uses energy to pick them. Then he asks students to form group of five to list kinds of work that we do.	Students form the group of five and list some examples of work we do e.g run, walk, dance, etc.
Evaluation Step 111	The teacher evaluates the lesson by asking questions e.g. what is energy? And he jots down the points raised by the students on the chalkboard.	Students answer the questions, e.g. energy is the ability/capacity to do work. etc.
Conclusion	The teacher concludes the lesson for the day by	Students copy the summary

	asking the Students to copy the summary on chalkboard into their notebook.	points into their notebook

LESSON PLAN FOR CONTROL GROUP

Lesson Two

Method of Teaching Basic Science Lecture Activity Method

Group Control

School G.D.J.S.S.Chadi

Class: JS 2

No. of Students in the class 50

Subject Basic Science

Topic: Forms of Energy

Duration: 40 minutes per period

Average age of the students: 13 years

Instructional Materials: Charts/diagrams, pictures etc.

General Objective: To teach students forms of energy.

Specific behavioural

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

(i) list forms of energy

(ii) describe at least three forms of energy.

(iii)draw a boy riding a bicycle in their note book.

Previous Knowledge: Students have been taught about energy.

Teaching Mode: Individual –teaching

Content Development	Teacher's Activities	Students' Activities
Introduction	The teacher introduces the lesson by asking the students questions from their previous knowledge e.g what is energy?	Energy is the ability/capacity to do work.
Presentation Step 1	The teacher presents the lesson by explaining the forms of energy and their example each e.g.	Students listen to the teachers' presentation
Step 11	The teacher lists example of forms of energy on the chalkboard e.g. mechanical energy, chemical energy, electrical energy, sound energy e.t.c.	Students listen and ask questions where they don't understand.
Step 111	The teacher asks the students to form group of five and list five examples of forms of energy,	Students form the group as instructed and list the forms of energy e.g. light energy, heat energy etc.
Summary Step iv	The teacher evaluates the lesson by asking questions. e.g. mention two forms of energy that you know. And he jots down the points raised by the students on the chalkboard.	Students answer the questions, e.g. the example of two forms of energy are: chemical energy, electrical energy.

Conclusion	The teacher concludes the lesson by asking the Students to find more about forms of energy.	Students do their assignment as instructed by the teacher.

LESSON PLAN FOR CONTROL GROUP

Lesson Three

Method of Teaching Basic Science **Single teacher teaching strategy**

Group Control

School G.D.J.S.S. Chadi

Topic: Sources of energy

Class: JS 2

No. of students in the class 50

Subject Basic Science

Duration: 40 minutes per period

Average age of the students: 13 years

Instructional Materials: Charts/diagrams on card board paper etc.

General Objective: To teach students sources of energy.

Specific behavioural

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

(i) describe sources of energy,

(ii) mention some examples of sources of energy,

(iii) draw some examples of sources of energy such as power plant into their notebook

Previous Knowledge: Students have been taught about forms of energy.

Teaching Mode Individual –teaching

Content Development	Teacher's Activities	Students Activities
Introduction	The teacher introduces the lesson by asking the students questions from their previous knowledge. e.g. name two forms of energy.	The examples of two forms of energy are chemical and electrical energy.
Presentation Step 1	The teacher presents the lesson by explaining what is meant by sources of energy to the class e.g "food" when you eat you get strength to do work such as carrying books.	Students listen and watch on the chalkboard as the teacher explains and describes source of energy.
Step 11	The teacher shows students different charts/diagrams of sources of energy on the chalkboard and explains one by one.	Students watch, listen and ask questions where they don't understand
Step 111 Evaluation	The teacher evaluates the lesson by asking some question e.g. list two sources of energy. And he jots down the points raised by the students on the chalkboard.	Students list some sources of energy such as food, petrol, coal, wood e.t.c.
Conclusion Step iv	The teacher concludes the lesson for the day by asking the students to draw the diagram of power line on chalkboard into their notebook.	Students draw the diagram of power line on the chalkboard into their notebook.

LESSON PLAN FOR CONTROL GROUP

Lesson Four

Method of Teaching Basic Science

Group Control

School G.D.J.S.S. Chadi

Topic: Uses of energy

Class: JS 2

No. of Students in the class 50

Subject Basic Science

Duration: 40 minutes per period

Average age of the students: 13 years

Instructional Materials: Charts/diagrams on card board paper etc.

General Objective: To teach students uses of Energy.

Specific behavioural

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

(i) describe uses of energy at home,

(ii) list examples of some appliances use energy at home e.g. iron, radio, television, telephone e.t.c.,

(iii) draw two examples of the appliances that are used at home into their notebook.

Previous Knowledge: Students have been taught sources of Energy

Teaching Mode: Individual-Teaching

Content Development	Teacher's Activities	Students Activities
Introduction	The teacher introduces the lesson by asking the students questions from their previous knowledge e.g. Name two examples of sources of energy	The two examples of sources of energy are food, power plant etc.
Presentation Step 1	The teacher presents the lesson by explaining the uses of energy at home.	Students pay attention and watch on the chalkboard as the teacher explains.
Step 11	The teacher lists the examples of appliances that use energy at home e.g. telephone, radio, iron, fan, car etc, on the chalkboard and explains each.	Students watch, listen and ask questions where they don't understand
Step 111	The teacher asks students to form groups of five to list three examples of appliances that are used energy at home.	Students form group of five and list some examples of appliances that use energy at home etc.
Evaluation	The teacher evaluates the lesson by asking questions e.g. what do we use for heat energy at home?	We use heat energy at home for cooking, heating water, roasting fish, e.t.c.

LESSON PLAN FOR CONTROL GROUP

Lesson Five

Method of Teaching Basic Science Lecture and Demonstration Method

Group Control

School G.D.J.S.S. Chadi

Topic: Conversion of Energy

Class: JS 2

No. of students in the class 50

Subject Basic Science

Duration: 40 minutes per period

Average age of the students: 13 years

Instructional Materials: Wood, candle, matches, battery, wire, bulb e.t.c.

General Objective: To teach students Conversion of energy.

Specific behavioural

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

(i) explain how energy are converted.

(ii) demonstrate how to connect battery and bulb with wire and produce light and heat,

(iii) enumerate other examples on energy conversion.

Previous Knowledge: Students have been taught uses of energy.

Teaching Mode: Individual-teaching

Content Development	Teacher's Activities	Students Activities
Introduction	The teacher introduces the lesson by asking the students questions from their previous knowledge. For example, name two uses of energy in our homes.	The two uses of energy in our homes are heat energy for cooking our food etc.
Presentation Step 1	The teacher presents the lesson by explaining the term 'energy conversion to the students.	Students pay attention and watch on the chalkboard as the teacher explains.
Step 11	The teacher uses battery, wire and bulb to demonstrate energy conversion on the chalkboard and explains that from chemical energy to electrical energy.	Students listen and watch to the teacher's demonstration
Step 111	The teacher allows students to demonstrate by themselves and moves round in the class to see what the students are doing.	Students demonstrate by themselves with the materials given to them.
Evaluation	The teacher evaluates the lesson by asking students some questions and ask them to write more examples at home as home work.	Students answer questions and write more examples at home as assignment.

LESSON PLAN FOR CONTROL GROUP

Lesson Six

Method of Teaching Basic Science Lecture Method

Group Control

School G.D.J.S.S. Chadi

Topic: Energy classification

Class: JS 2

No. Of Students in the class 50

Subject Basic Science

Duration: 40 minutes per period

Average age of the students: 13 years

Instructional Materials: Energy cards of generator, sun, dry cell battery, gasoline e.t.c.

General Objective: To teach students Energy classification.

Specific behavioural

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

(i) Mention the three energy classes,

(ii) Mention at least one example of each class,

(iii) Draw one example each of energy class in their note book.

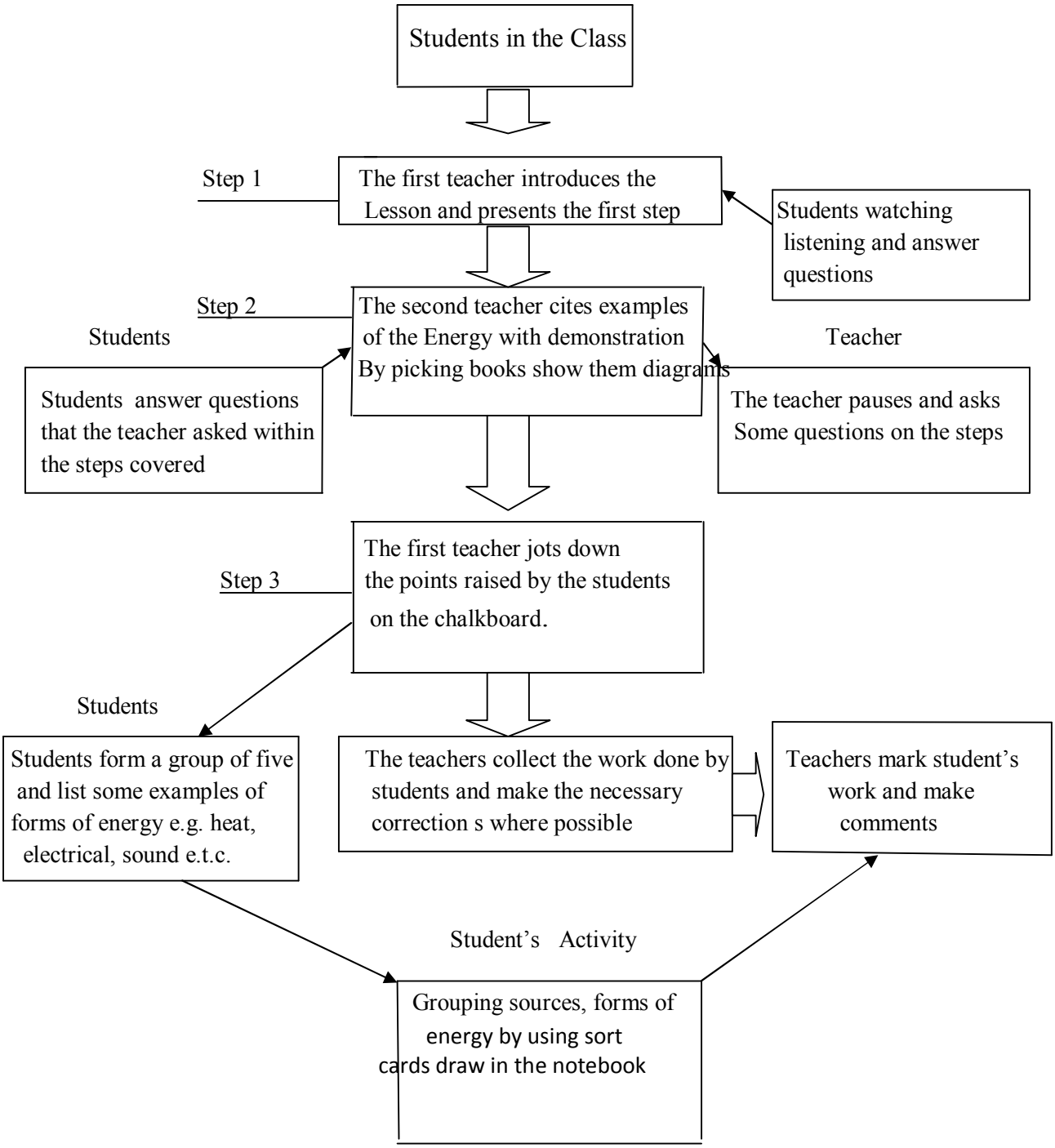
Previous Knowledge: Students have been taught about energy conversion

Teaching Mode: Individual-teaching

Content Development	Teacher's Activities	Students Activities
Introduction	The teacher introduces the lesson by asking the students questions from their previous knowledge e.g, briefly explain how energy are converted from one form to the other.	The students explain how energy are converted from one form to the other.
Presentation Step 1	The teacher presents the lesson by listing classes of energy e.g. natural source, manufactured and petroleum products and explains them.	Students pay attention and watch on the chalkboard as the teacher explains.
Step 11	The teacher cites example of each class of energy and explains them e.g . sun, natural gas, generator	Students listen and watch to the demonstration
Step 111 Evaluation	The teacher evaluates the lesson asking students some questions e.g. enumerate three classes of energy.	.Students list the classes e.g. natural, petroleum product and manufactured sources.
Conclusion	The teacher Concludes the lesson by asking students to write more examples as home work.	Students write more examples at home as assignment.

APPENDIX C

FLOW CHART OF TEAM TEACHING STRATEGY MODEL



SOURCE: Adapted from Joel (2010).

APPENDIX D

Basic Science Academic Achievement Test (BSAT) for Junior Secondary School Students (JSS) 2

Time allowed: 40 minutes

Dear Respondents,

This test is only for research purpose not to test you or your school. Therefore your sincere and honest response will surely contribute to the improvement of Basic Science. Carefully read the questions and tick (√) the appropriate option.

1 What type of energy does an orange fruit possess while hanging on a tree?.

A potential

b chemical

c kinetic

d heat

2 When a torch is used to light up a dark room, what energy conversions are likely to take place?

a electrical to heat

b chemical to light

c potential to chemical

d physical and chemical

3 Potential energy can be defined as.....

a energy of motion

b energy of food

c energy of position

d gravitational force

4 The following are natural sources of energy except.....

a food

b coal

c sun

d battery

5 All these are different forms of energy except.....

a wind

b electrical

c chemical

d heat

6 The energy stored in a torch battery is called.....

a light energy

b chemical energy

c electric energy

d mechanical energy

7 When a boy rides a bicycle the following energy conversion occur.

a mechanical energy to kinetic energy to potential energy

b kinetic energy to potential energy to light energy

c. chemical energy to mechanical energy to kinetic energy

d electrical energy to mechanical energy to sound energy

8 All of these are sources of energy except.....

a food

b petrol

c stone

d dry cell battery

9 Energy can be changed from one form to another, True or False?

10When we eat food we lose energy. True or False?

11 Energy stored in food and fuel is called…….

a mechanical

b light energy

c solar energy

d chemical energy

12 If you rub your palms together for some time, you feel warm. The action amount to converting…….

a potential→ kinetic →heat energy

b potential→ chemical →heat energy

c solar→ mechanical →kinetic energy

d chemical → mechanical →kinetic energy

13 Which of the following is not a form of energy?

a heat

b speed

c sound

d light

14 Which of this energy conversion takes place during phone call?.

a chemical→ electrical → sound

b electrical →sound →electrical

c sound →magnetic → sound

d magnetic →sound → chemical

15 Burning of fire wood for cooking at home is an example of energy change from.

a electrical to chemical energy

b heat to chemical energy

c electrical to heat energy

d chemical to heat energy

16 The form of energy that food possess is.....

a chemical energy

b mechanical energy

c potential energy

d sound energy

17 The common energy used in the village are....

a. electrical and magnetic

b. heat and light

c. chemical and electrical

d. sound and sound

18 Which of the following conversion is correct when a battery lights up a bulb?

a light → electrical → heat

b sound → potential→ heat and light

c chemical →electrical →light and heat

d electrical → chemical → sound

19 At the early age young seedling needs stored food to…..

a protect it from danger

b feed the parasites

c cover it from diseases

d give it energy to grow

20 Chemical energy can be changed to different forms. T/F?

21 Which of the following is not an electrical appliance in our homes?.

a television

b coal pot

c pressing iron

d radio

22 The following are the advantages of appliances over the traditional ones except

a they save labour

b they more efficient

c they are not durable

d they are durable

23 The amount of .....depends on the extent of work done.

a food

b mass

c chemical

d energy

24 They are various .....of energy.

a forms

b classes

c groups

d levels

25 ……is the primary source on which we are dependent for all our energy.

a food

b sun

c fuel

d moon

26 Sun transmit radiant energy to the earth for all lives in form of .....

a electrical and sound

b sound and chemical

c heat and light

d magnetic and kinetic

27 Light energy is converted into food by green plants through……:

a digestion

b mastication

c absorption

d photosynthesis

28 Which of the following is not a secondary source of energy?

a sun

b food

c fuel,

d wood.

29 Man takes in .....by eating plant products like beans, rice, yam, maize e.t.c.

a fatigue

b energy

c beat
d disease

30 The three basic classification source of energy is…….

a artificial, traditional and tertiary
b natural, source and modern
c natural, manufactured and petroleum product
d petroleum, water and food

APPENDIX E

A marking Guide for Basic Science Achievement Test (BSAT)

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

APPENDIX F

Students Interest Questionnaire (SIQ)

Nam of School .....

1. Sex Male ( ) Female ( )

Dear students, you are free to express your feeling about Team-Teaching by selecting /ticking (/) in the appropriate column of your choice based on the teaching of Integrated/basic Science you experienced for the past six weeks. The responses are:

Strongly Agree=SA
Agree=A
Disagree=D
Strongly Disagree=SD

S/No.	Statement	SA	A	D	SD
1	Basic Science has increased my reasoning ability.				
2	I understand Basic Science concept better than other subjects.				
3	I feel happy when it is time for Basic Science period.				
4	I learn better when more than one teacher teach me Basic Science				
5	The topics covered in Basic Science were interesting.				
6	Basic Science has improved the level of my relationship with my classmates.				
7	Basic Science has increased the level of my interest in Science subjects				
8	Basic Science encourages me to participate fully in the class.				
9	Basic Science exposes me to different ideas on Science concepts.				
10	I like Basic Science because it involves different teachers with different experience				
11	Basic Science facilitates my learning ability as i interact with my teachers frequently.				

12	Basic Science exposed me to different methods of teaching and learning activities.				
13	IT is not much that I learn from Basic Science.				
14	I like listening to Basic Science when different teachers are teaching me.				
15	I don't like Basic Science course because it has a lot of activities.				
16	I like Basic Science because it keeps me busy throughout the lesson period.				
17	I would like to read science courses based on the knowledge obtained in Basic Science.				
18	Basic Science is better than any other subject.				
19	I feel freer during Basic Science period than during other subject's period.				
20	Basic Science lesson provides me opportunities for interaction with my class mates.				

APPENDIX G

Validation Form

You are requested to critically examine and assess all the items of the instrument with reference to the following:

1. Whether or not the items conform to the subject matter they are supposed to test.

2 .Weather or not the items are clear, readable and free from ambiguity for the level of the students they are designed to test.

3 .Weather or not the items satisfy the conditions of constructing multiple choice items.

4 .Weather or not the items test the basic items and concept of the study and for the level they meant for.

5 .What general criticism and suggestion can you give to improve the instrument?

Name Rank Signature

APPENDIX H

VALIDATION OF INSTRUMENT

I.....hereby certify that the researcher, Banfe Yaga M. a Masters student of the Department of Education, Science Education Section, Ahmadu Bello University, Zaria, whose research instrument on the "Effect of Team-Teaching Techniques on students achievement and interest on Integrated Science Concepts of Junior Secondary School Students in Potiskum, Educational Zone." I validated has satisfactorily included all the necessary corrections /suggestions I made in his research instrument.

I therefore approve that the instrument is capable achieving the purpose for which it is designed.

Full name of the validator.....

Rank of the Validator.....

Signature of the validator.....

APPENDIX I
TEAM-TEACHING PACKAGE

Through inquiry and a card-sorting activity, students will explore, discover, and demonstrate their understanding of concepts of energy, forms, uses, sources etc of energy. Students will sort cards into categories based on their own prior knowledge and the definitions of the forms of energy. Students will recognize the forms of energy through the completion of several card-sorting activities that require them to record and discuss their reasoning and through analysis of other groups' sorting decisions. Students sort these cards in various ways during the class activity

Instructions

With your partner, sort the cards on your lab table into groups. You may have as many groups or as few groups as you like. Be able to explain your reasoning for the groups. Each group must contain more than one card. All the cards must be used



Roller Coaster



Aquatic Fish



Tilapia Fish



Swans



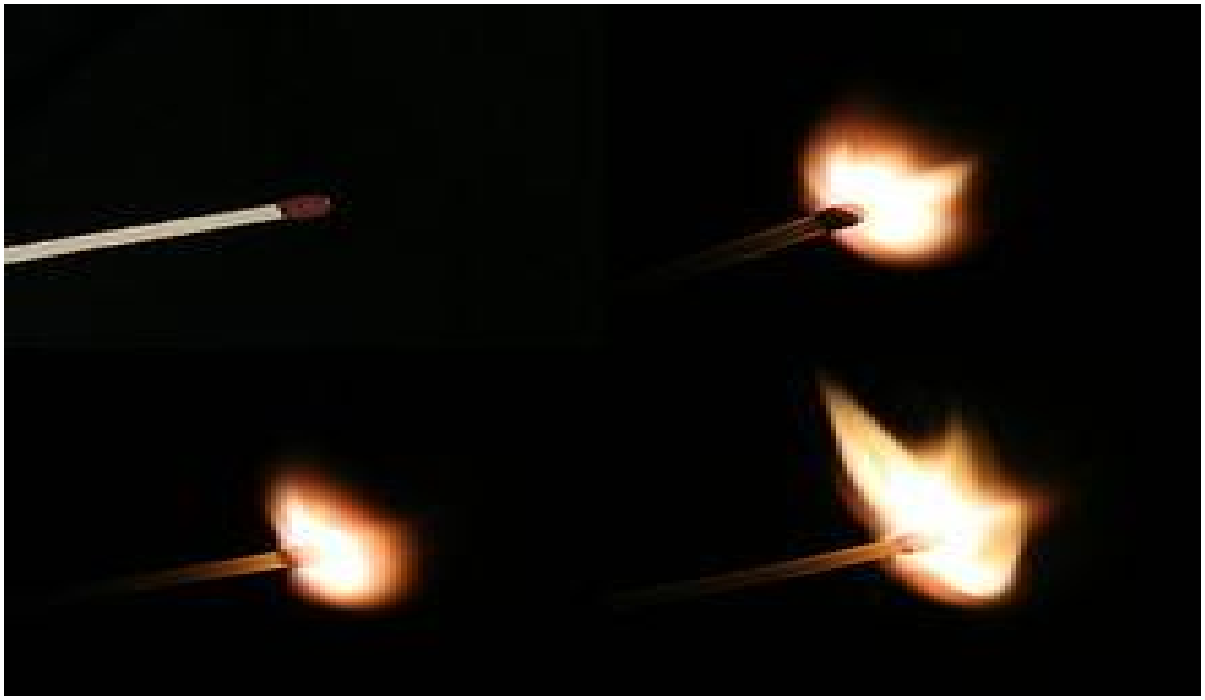
Snail

Instructions

With your partner, re-sort the cards on your lab table into two groups. Be able to explain your reasoning for the groups. Each group must contain more than one card. All the cards must be used.



Matches





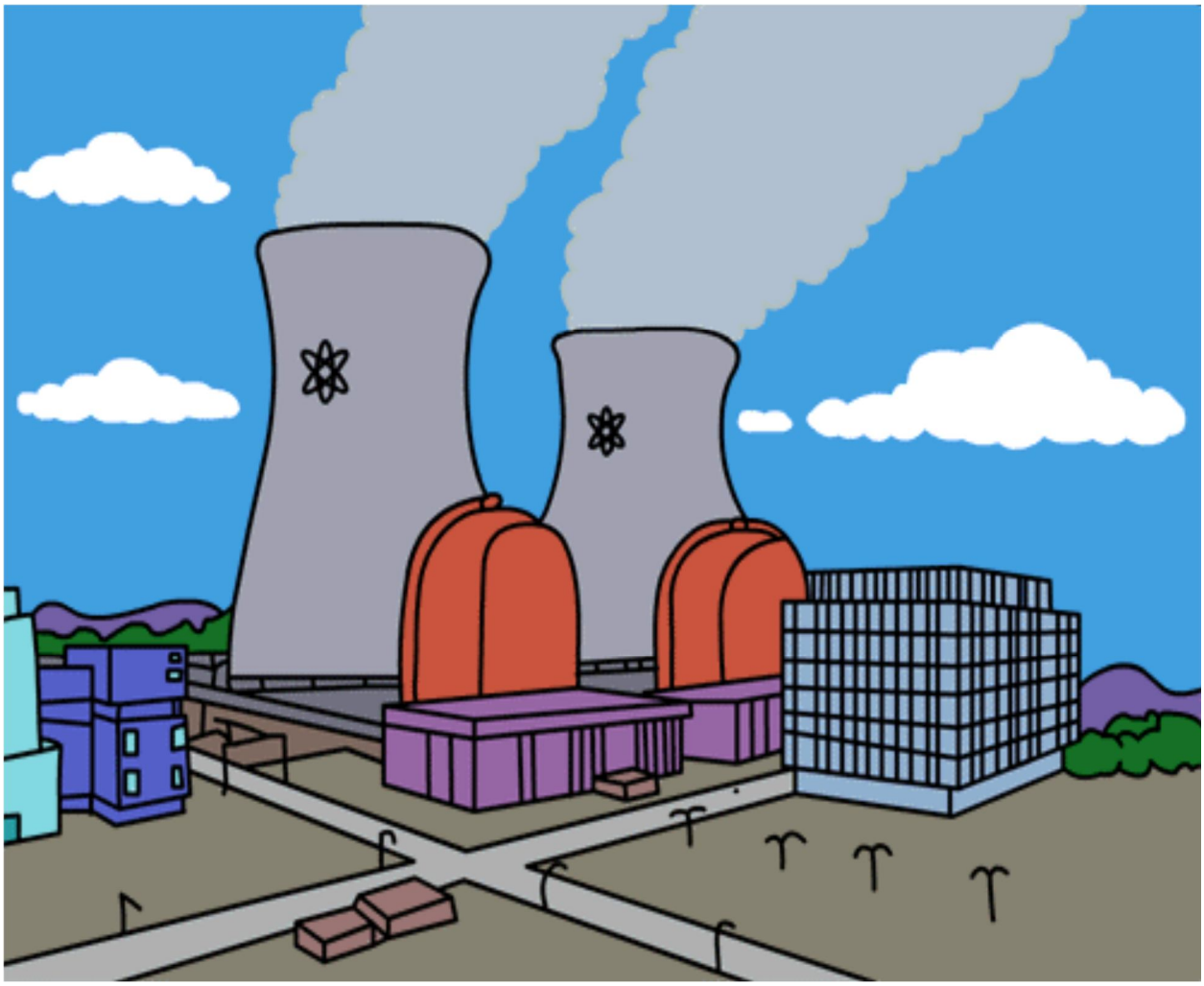
Lit match



Burning Candle



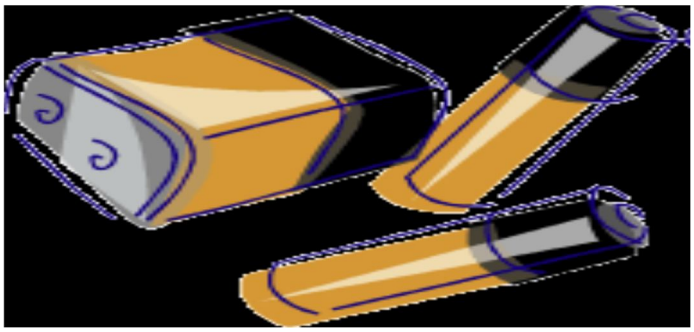
A boy riding a bicycle to school



Power plant



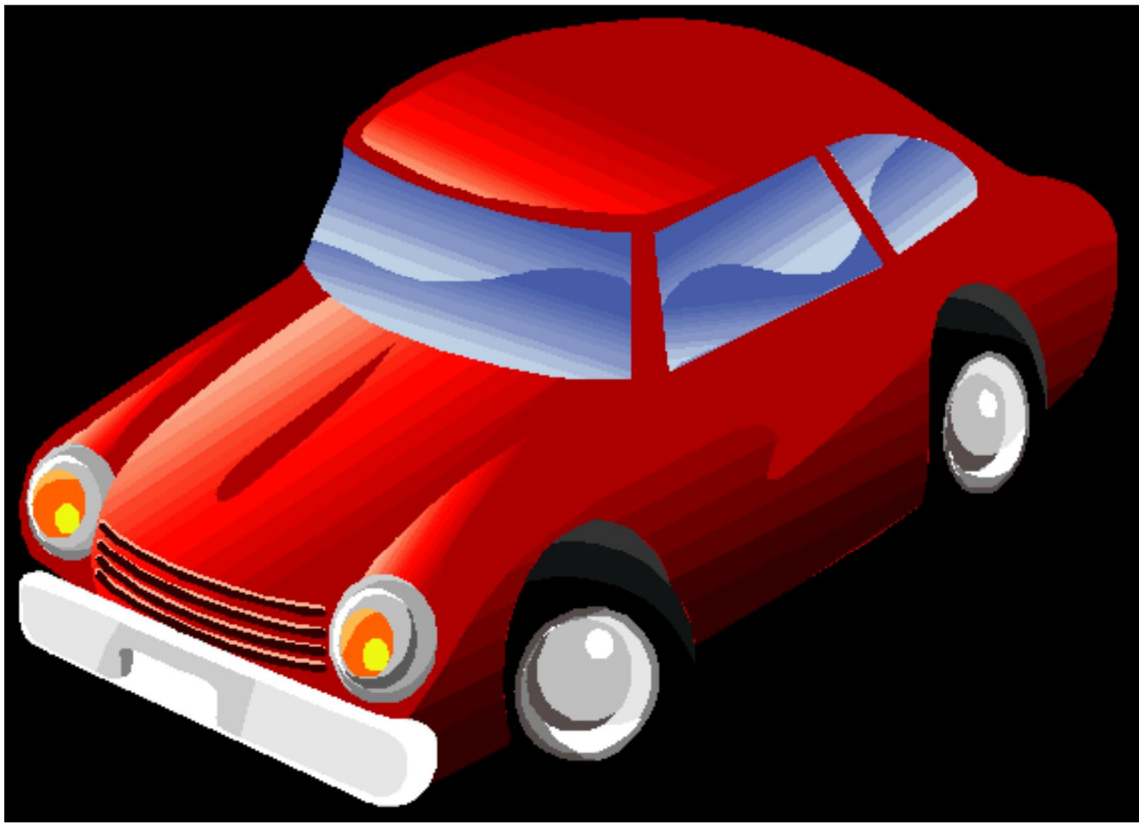
Bat



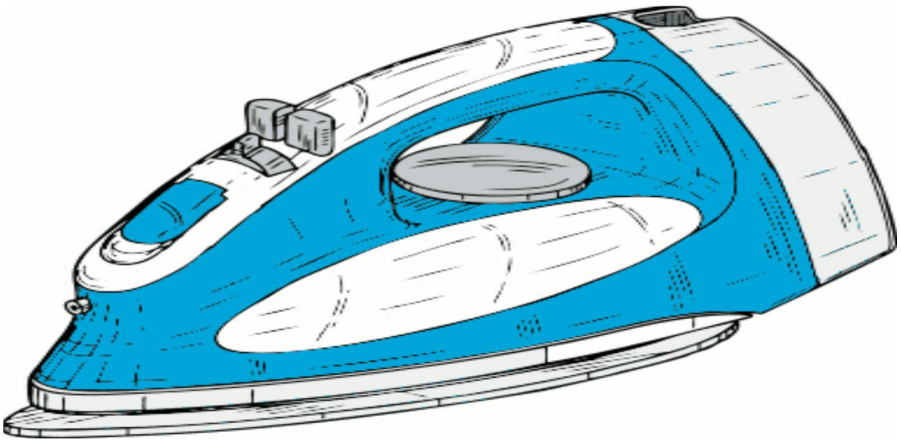
Batteries



Ringing Bell



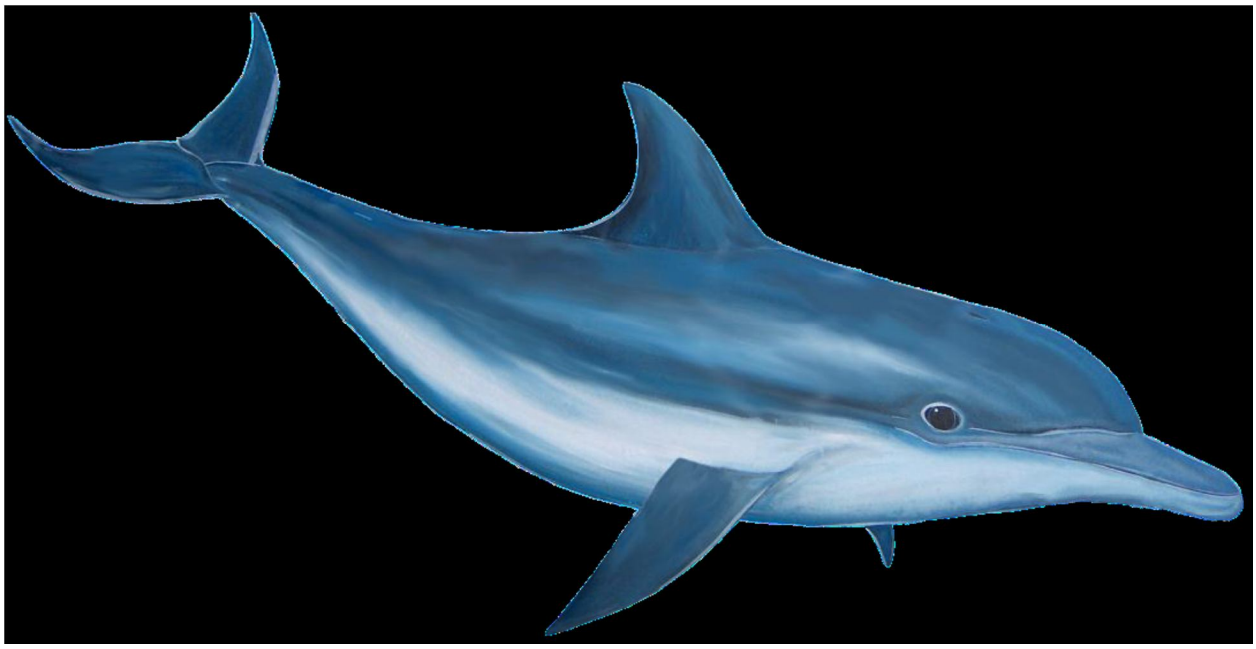
Car



Iron



Coal



Dolphin Fish



A man fishing



Gas Stove (on)



Gasoline



Sun Light Rays



Playing Instruments

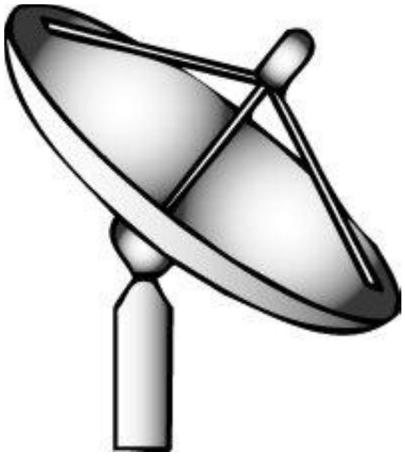
Free Photoshop PSD file download · Resolution 1280x1024 px · www.psdgraphics.com



Telephone Ring



Soup



Satellite Dish



Power Lines



Tree

APPENDIX J

Letter of Introduction

The Principal - - - - -

- - - - - - - - -
- - - - - - - -

Sir/Madam,

The bearer, Banfe Michael Yaga M.ED/EDUC/00903/2008-2009 is a post-graduate student of Ahmadu Bello University Zaria, in the Department of Science Education (Science Education Section) currently undertaking a research on the Effects of Team-Teaching Strategy on Academic Achievement and Interest in Basic Science Concepts among Junior Secondary School Students in Potiskum, Educational Zone.

You may wish to give him all the necessary assistance he may requires.

Thank you.

Student Supervisors:
Rev. Dr. S.S. Obeka
Dr. M.M. Atadoga

Head of Department
Dr. Mamman Musa

Appendix K: Students Achievement Test Scores

	EXPT.		GR				CONT.		GROUP		
S/NO.	BT	AT	SEX			S/NO.	PreT.	PosT.	SEX		
1	13	15	M			51	13	14	F		
2	14	17	M			52	16	15	F		
3	15	19	M			53	12	14	F		
4	17	19	M			54	16	18	F		
5	13	17	M			55	15	17	F		
6	11	14	M			56	13	15	F		
7	18	23	M			57	18	17	F		
8	18	22	M			58	15	21	F		
9	15	21	M			59	18	20	F		
10	17	21	M			60	19	18	F		
11	13	12	M			61	17	16	F		
12	16	16	M			62	18	18	F		
13	12	15	M			63	16	16	F		
14	19	20	M			64	14	17	F		
15	12	12	M			65	17	18	F		
16	14	19	M			66	13	12	M		
17	16	19	M			67	15	17	M		
18	15	18	M			68	14	10	M		
19	17	22	M			69	12	12	M		
20	16	23	M			70	13	11	M		
21	20	27	M			71	14	15	M		
22	17	19	M			72	18	16	M		
23	17	20	M			73	17	15	M		
24	12	11	M			74	15	15	M		
25	12	14	M			75	13	12	M		
26	12	11	F			76	13	14	M		
27	16	20	F			77	20	19	M		
28	15	14	F			78	21	19	M		
29	14	19	F			79	19	17	M		
30	15	17	F			80	15	14	M		
31	15	19	F			81	15	16	M		

32	16	18	F			82	16	18	M		
33	15	17	F			83	13	14	M		
34	16	20	F			84	14	16	M		
35	14	19	F			85	22	20	M		
36	19	20	F			86	16	17	M		
37	17	19	F			87	15	14	M		
38	18	20	F			88	20	21	M		
39	16	20	F			89	16	18	F		
40	15	18	F			90	18	20	M		
41	17	18	F			91	10	08	M		
42	13	15	F			92	14	14	M		
43	17	18	F	EXPT.	GROUP	93	22	24	M	CONT.	GROUP
44	16	18	F	890		94	14	12	M	805	
45	19	19	F	M	F	95	16	14	M	M	F
46	15	17	F	455	435	96	17	18	F	446	359
47	14	18	F			97	17	19	F		
48	11	12	F	av.17.8		98	15	18	F	av.=17.5	
49	13	14	F	F.av.17.4		99	18	18	F	F.av.17.9	
50	15	15	F	M.av.18.2		100	17	14	F	M.av.15.4	
	762	890					793	805			

Appendix L

The Summary Result of Basic Science Certificate Examination (BSCE) of 2013

S/No	Scores	Frequency	Grade	%
1	70-100	13	A	6.5%
2	60-69	11	B	5.5%
3	50-59	13	C	6.5%
4	45-49	21	D	10.6%
5	40-44	42	E	21.1%
6	0 -39	99	F	49.8%
	Total	199		100%

SOURCE: Yobe State Universal Basic Education Board (YSUBEB 2013).

Appendix M
Students' Score Sheet

BECE 03

YOBE STATE MINISTRY OF EDUCATION
BASIC EDUCATION CERTIFICATE EXAMINATION 2013

SHEET 11 OF 574

ZONE POTISKUM RESULT SHEET

INSTITUTION G.D.J.S.S. KARA. CENTRE No. KARA 2013

1 SERIAL NUMBER	2 INDEX NUMBER	3 NAME	4 English Language	5 I. R. K.	6 C. R. K.	7 Social Studies	8 Basic Technology	9 Basic Science	10 Hausa	11 Arabic	12 Home Economics	13 Mathematics	14 Agric. Science	15 Art	16 P. H. E.	17 Business Studies	18	19	20	21 STATE OF ORIGIN/ L.G.A.	22 SCIENCE/TECH.	REMARKS
181	AISHA AHMAD USMAN		EC	1	1	CA	1	CA	EA	AA	CA	CP										
182	AJEJE ABUBAKAR YUSUF		ED	AD	F	D	BD	AD	ND	BCD												
183	AJITA ALHASSAN		FC	CB	F	CB	DA	DE	BC													
184	AL-AMIN MUHD		AB	AC	EA	AB	DA	BB	CB													
185	ALH ABUBAKAR SANI		BA	AA	B	AB	AA	AA	GA													
186	ALHASSAN AYUBA		AB	BC	C	AA	BB	AA	CB													
187	ALHASSAN FATIMA		BB	AA	E	BA	ED	DC	AC													
188	ALHASSAN MAKTARI		FD	DC	E	CB	EB	EB	CC													
189	ALHASSAN UMAR		DC	BD	F	BC	DC	DE	BC													
190	ALHASSAN ZAKARI		FA	AC	D	BC	EC	AI	CD													
191	ALI ABDULLAHI		EA	BI	E	BC	EC	EE	BC	D												
192	ALI AISHA SANI		FD	DB	F	DC	EB	CE	BB	CP												
193	ALI AMINU GHIROMA		AB	BA	F	BB	EA	EC	BC	D												
194	ALI ANWAR MUHD		AB	AB	F	BB	DB	DE	AC	C												
195	ALI BINTA ADAMU		BD	CD	E	CB	DB	EE	AC	D												
196	ALI EMMANUEL EDEN		A	AA	C	I	IC	CA	AC	C												
197	ALI FATSUMA MUHD		AD	AB	B	I	BC	CC	DE	AC	D											
198	AISHA ABUBAKAR BELO		CD	AC	C	CB	CC	CE	BA	CC												

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YOBE STATE MINISTRY OF EDUCATION
BASIC EDUCATION CERTIFICATE EXAMINATION 2013

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ZONE Potiskum RESULT SHEET

INSTITUTION G.D.J.S.S. KARA CENTRE No. KARA 2013

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A433	IBNAHIM	ADAMU	B	B-	A	B-	T	A	C	A	B	E	A	B	D	C						
A434	IBRAHIM	AISHATU M.	A	C-	A	D	B-	T	A	C	B	E	A	B	D	C						
A435	IBRAHIM	AU ADAMU	D	D-	A	C	D-	B	A	E	B	C	D	B	D	D						
A436	IBRAHIM	AMINA	E	D-	A	D	E-	E	A	E	A	D	E	B	D	-						
A437	IBRAHIM	BAKKI	D	C-	A	D	D-	E	A	N	A	B	E	A	D	C						
A438	IBRAHIM	DAHIRU ABDULLAHI	C	C-	A	B	F-	T	B	D	B	D	D	A	D	C						
A439	IBRAHIM	DAUDA	D	B-	A	D	E-	D	B	D	B	E	E	A	C	C						
A440	NWAKWUNTA	MUHD GAMBA	B	C-	A	B	E-	C	B	C	B	T	B	B	C	D						
A441	IBRAHIM	FATIMA USMAN	A	D-	A	B	A-	C	B	C	B	B	A	B	D	B						
A442	IBRAHIM	HABIBA	C	E-	A	C	H-	C	A	C	A	D	E	A	C	C						
A443	IBRAHIM	HADIZA	D	E-	A	D	E-	H	A	C	B	D	D	B	D	D						
A444	IBRAHIM	HASSAN	C	B-	A	B	E-	E	B	D	B	E	E	B	D	D						
A445	IBRAHIM	HAUWA	B	D-	A	B	D-	B	B	D	A	E	D	B	C	B						
A446	IBRAHIM	HAUWA ISMAIL	C	B-	A	B	E-	D	C	B	A	B	D	C	C	C						
A447	IBRAHIM	IBRAHIM BABATO	E	D-	I	C	E-	-	B	-	A	E	E	B	-	D						
A448	IBRAHIM	IDRISS	C	D-	A	B	D-	E	B	C	B	E	E	B	B	A						
A449	IBRAHIM	ISA	D	D-	A	B	F-	E	B	C	B	A	F	B	-	D						
A450	IBRAHIM	KALAMU	B	A-	A	B	E-	D	A	D	A	D	-	B	C	-						

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YOBE STATE MINISTRY OF EDUCATION
BASIC EDUCATION CERTIFICATE EXAMINATION 2013

SHEET 01 OF 54

ZONE POTISKUM RESULT SHEET

INSTITUTION G.D.J.S.S. KARA CENTRE No. KARA 2013

1 SERIAL NUMBER	2 INDEX NUMBER	3 NAME	4 English Language	5 I. R. K.	6 C. R. K.	7 Social Studies	8 Basic Technology	9 Basic Science	10 Hausa	11 Arabic	12 Home Economics	13 Mathematics	14 Agric. Science	15 Art	16 P. H. E.	17 Business Studies	18 Computer	19 CIVICS EDU	20	21 STATE OF ORIGIN/ L. G. A.	22 SCIENCE/TECH.	REMARKS
001	ABAPE	HADIZA MUSA	E	A	-	B	B	E	-	C	B	D	C	A	B	D	D					
002	ABBA	ABDULKADIR	E	B	-	A	D	E	-	D	B	C	D	C	D	B	D	B				
003	ABBA	ABDULLAHI	E	E	-	E	E	E	-	E	C	E	C	E	D	B	F	D				
004	ABBA	AWUNA	F	C	-	C	B	F	-	D	B	D	C	E	D	C	D	D				
005	ABBAS	ABBAS MUSA	C	B	-	A	A	F	-	A	B	C	D	C	B	B	C	E				
006	ABBA	HADIZA	E	B	-	B	C	F	-	C	C	E	C	E	D	C	D	C				
007	ABDU	AZIFE SHEHU	E	D	-	C	B	F	-	E	B	E	B	C	C	A	D	D				
008	ABDULHAMID	AUWAL	E	C	-	B	E	E	-	E	B	D	B	E	E	A	E	D				
009	ABDULHAMID	SULEIMAN	B	B	-	A	A	F	-	C	C	D	B	A	B	B	D	B				
010	ABDULKADIR	YUSUF	B	B	-	A	A	E	-	A	B	C	C	B	C	A	C	C				
011	ABDULKARIM	ABUBAKAR ADAMU	D	B	-	A	A	F	-	D	B	D	D	D	B	C	C	C				
012	ABDULKARIM	HADIZA	D	A	-	A	C	F	-	C	B	C	B	D	A	A	C	C				
013	ABDULKARIM	SANI	E	B	-	B	B	F	-	E	C	E	B	A	E	E	B	D				
014	ABDULLAHI	ABDULLAHI AHMAD	A	A	-	A	B	F	-	C	C	E	B	B	A	B	C	A				
015	ABDULLAHI	ABDULLAHI HASHIMU	E	D	-	B	D	F	-	F	C	E	B	E	E	B	C	E				
016	ABDULLAHI	ABDULLAHI SAIDU	E	B	-	B	B	F	-	D	B	E	C	B	-	A	C	-				
017	ABDULLAHI	ABUBAKAR	F	C	-	B	D	F	-	C	B	D	B	E	B	E	D					
018	ABDULLAHI	ADAMU IBRAHIM	E	E	-	C	A	F	-	C	B	D	C	E	D	A	E	E				

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YOBE STATE MINISTRY OF EDUCATION
BASIC EDUCATION CERTIFICATE EXAMINATION 2013

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ZONE POTISKUM RESULT SHEET

INSTITUTION G.D.J.S.S. KARA CENTRE No. KARA 2013

1 SERIAL NUMBER	2 INDEX NUMBER	3 NAME	4 English Language	5 I. R. K.	6 C. R. K.	7 Social Studies	8 Basic Technology	9 Basic Science	10 Hausa	11 Arabic	12 Home Economics	13 Mathematics	14 Agric. Science	15 Art	16 P. H. E.	17 Business Studies	18 COMPUTER	19 CIVICS EDU	20	21 STATE OF ORIGIN/ L. G.A.	22 SCIENCE/TECH.	REMARKS
209	ALIYU	FIDAUSI	A	A	B	B	B	A	C	B	A	A	C	A								
210	ALIYU	HANNATU IDRIS	C	C	A	A	A	A	A	B	A	A	C	A								
213	ALIYU	ZAINAB ABBAS	B	A	C	D	C	B	D	C	E	B	A	C								
214	ALWALI	FATIMA ABUBAKAR	A	A	A	B	A	A	C	D	B	D	B	C								
215	ALWALI	HAFSA BOBA	C	E	D	B	D	B	B	C	-	C	D	D								
216	ALWALI	KALTUME UMAR	C	E	A	B	A	C	C	C	E	B	C	C								
221	AMADU	HABIBA	A	B	B	A	A	C	B	B	B	B	B	C								
222	AMADU	HADIZA	A	A	D	B	D	-	B	B	A	B	D	B								
224	AMINU	HAFSA MUHD	B	E	B	B	C	-	A	A	C	A	C	A								
229	AUDU	ASHATU ABDULKARIM	A	A	B	A	A	-	C	A	B	A	B	B								
231	AUDU	AMINA	A	E	D	E	D	-	D	A	C	B	E	D								
242	AUWALU	HADIZA	C	A	D	A	D	-	D	C	C	A	D	C								
244	AUWALU	RABI	A	A	-	B	A	-	B	A	B	A	A	C								
245	AUWALU	BUKAYYA	A	A	-	A	B	A	-	A	B	C	A	A								
246	AHMED	FATIMA ABDULLAHI	C	A	-	A	B	-	-	B	C	C	B	A								
249	AYUBA	AISHA	A	A	-	A	B	A	-	B	C	A	B	E								
250	DAHLABI	RABI	A	D	-	E	D	E	-	E	C	-	C	D								
251	BABA	ADAMA MUHD	A	B	-	C	B	B	-	B	B	D	C	D								

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YOBE STATE MINISTRY OF EDUCATION
BASIC EDUCATION CERTIFICATE EXAMINATION 2013

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ZONE POTISKUM RESULT SHEET

INSTITUTION G.D.J.S.S. KARA CENTRE No. KARA 2013

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001	ABAPE	HADIZA MUSA	FA-1	B	B	E	J	C	B	D	C	A	B	D	D							
002	ABBA	ABDULKADIR	EB-1	A	D	F	F	D	B	C	D	C	D	B	D	B						
003	ABBA	ABDULLAHI	EE-1	E	E	F	F	E	C	E	C	E	D	B	E	D						
004	ABBA	AWUNA	FC-1	C	B	F	F	D	B	D	C	E	D	C	D	D						
005	ABBAS	ABBAS MUSA	CB-1	A	A	F	F	A	B	C	D	C	B	B	C	C						
006	ABBA	HADIZA	EB-1	B	C	F	F	C	C	E	C	E	D	C	D	C						
007	ABDU	AZIZ SHEHU	ED-1	C	B	F	F	E	B	E	B	C	C	A	D	D						
008	ABDULHAMID	AUWAL	EC-1	B	E	E	J	E	B	D	B	E	E	A	E	D						
009	ABDULHAMID	SULEIMAN	BB-1	A	A	F	F	C	C	D	B	A	B	B	D	B						
010	ABDULKADIR	YUSUF	BB-1	A	A	F	J	A	B	C	C	B	C	A	C	C						
011	ABDULKARIM	ABUBAKAR ADAMU	DB-1	A	A	F	I	D	B	D	D	D	B	C	C							
012	ABDULKARIM	HADIZA	DA-1	A	C	F	I	C	B	C	B	D	A	C	C							
013	ABDULKARIM	SANI	BB-1	B	B	F	J	E	C	E	B	B	E	B	D							
014	ABDULLAHI	ABDULLAHI AHMAD	DA-1	A	B	F	J	C	C	E	B	A	A	B	C	A						
015	ABDULLAHI	ABDULLAHI HASHIMU	ED-1	B	D	F	I	F	C	E	B	E	B	C	E							
016	ABDULLAHI	ABDULLAHI SAIDU	EB-1	B	B	F	J	D	B	E	C	B	I	A	C	I						
017	ABDULLAHI	ABUBAKAR IBRAHIM	FC-1	B	D	F	I	C	B	D	B	E	E	B	E	D						
018	ABDULLAHI	ADAMU	EE-1	C	F	F	I	C	B	D	C	E	D	A	E	E						

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YOBE STATE MINISTRY OF EDUCATION
BASIC EDUCATION CERTIFICATE EXAMINATION 20 13

SHEET 02 OF 19

ZONE POTISKUM RESULT SHEET

INSTITUTION G.D.J.S.S. KARA CENTRE No. KARA 2013

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073		ABUBAKAR FATIMA ALIYU	C	B	-	B	C	B	-	B	A	B	B	B	B	B	C	B				
074		ABUBAKAR FATIMA IDRISS	B	B	-	B	B	D	-	A	B	D	B	B	A	B	C	B				
075		ABUBAKAR FATIMA MUHD	F	F	-	C	C	F	-	D	A	F	B	B	D	B	D	C				
077		ABUBAKAR HASSANA INUSA	D	B	-	C	D	F	-	D	B	C	A	A	A	C	D	C				
078		ABUBAKAR HASSANA BASHIR	A	C	-	B	C	F	-	A	C	C	B	A	A	C	C	B				
079		ABUBAKAR HAUWA	C	F	-	A	B	B	-	C	C	D	A	F	D	C	D	C				
080		ABUBAKAR HAUWA MUHD	B	B	-	A	A	B	-	B	C	D	A	D	A	B	D	B				
081		ABUBAKAR HUSSAINA BASHIR	B	B	-	-	B	D	-	A	C	C	A	A	A	B	C	B				
082		ABUBAKAR HUWAILA	F	D	-	A	D	F	-	D	C	F	B	D	-	B	D	-				
086		ABUBAKAR MAIMUNA D.	-	-	-	-	-	-	-	-	-	-	F	F	C	D	C					
093		ABUBAKAR RABI	F	F	-	A	D	F	-	D	B	D	B	C	F	B	C	C				
098		ABUBAKAR TAHANABU	F	-	-	A	F	D	-	C	B	C	C	F	-	B	F	-				
099		ABUBAKAR ZAINAB ABUBAKAR	C	F	-	A	C	B	-	B	B	D	B	C	C	C	D	C				
115		ADAMU AISHA	F	F	-	A	C	F	-	F	B	C	C	D	F	B	F	D				
116		ADAMU AISHA MUHD	F	B	-	A	B	-	-	A	B	B	C	F	-	B	D	B				
117		ADAMU ASMAU BAHIRU	F	F	-	A	F	D	-	D	C	D	C	F	F	C	F	C				
121		HAUWA UMARU YAYA	C	C	-	B	C	B	-	C	A	B	B	C	B	B	C	C				
122		ADAMU FATIMA UMARU	D	D	-	B	B	F	-	B	B	C	D	D	B	C	D	B				

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YOBE STATE MINISTRY OF EDUCATION
BASIC EDUCATION CERTIFICATE EXAMINATION 2013

SHEET 03 OF 19

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124	ADAMU	HADIZA HABU	E	F	-	A	D	C	D	B	D	C	C	E	B	D	C					
125	ADAMU	HADIZA BALA	F	F	D	F	E	-	C	-	C	E	-	B	C	D						
126	ADAMU	HAFSAT	E	E	-	B	D	F	-	C	D	E	B	B	E	B	D	C				
127	ADAMU	HADARA MUSA	E	-	B	C	B	-	D	B	D	C	E	D	B	D	D					
128	ADAMU	HALIMA SALISU	C	B	-	B	C	B	-	B	B	E	C	B	A	A	D	B				
129	ADAMU	HANNATU	F	E	+	-	F	-	E	B	E	B	B	E	B	C	E					
131	ADAMU	HAUWA	F	E	-	A	F	E	-	C	B	D	B	E	E	A	C	E				
132	ADAMU	HAUWA ALI	F	E	-	-	E	F	-	E	C	E	B	B	E	E	D	D				
133	ADAMU	HAUWA SALE	D	C	-	A	A	C	-	B	B	D	B	B	E	B	D	C				
139	ADAMU	MARYAM MUHD	D	E	-	B	F	F	-	A	C	B	C	E	B	D	C					
149	ADAMU	YAHANASU	D	C	-	A	C	B	-	C	B	E	B	E	E	B	-	D				
151	ADAMU	ZAINAB	E	C	-	A	C	A	-	A	A	B	A	E	B	C	C					
156	AHMAD	AISHA	E	B	-	A	B	F	-	B	B	D	A	D	C	B	C	C				
157	AHMAD	AISHA UMAR	E	C	-	B	B	B	-	D	B	E	B	D	-	A	D	-				
158	AHMAD	AMINA MUHD	C	C	-	C	B	E	-	A	C	D	B	D	D	A	C	D				
159	AHMAD	FATIMA HUSSAINI	E	B	-	A	C	A	-	D	C	E	B	D	E	A	C	D				
160	AHMAD	FIDDAUSI	A	C	-	B	B	E	-	B	C	C	A	A	B	B	C	C				
162	AHMAD	HAUWA	C	B	-	A	B	A	-	A	B	C	A	A	-	C	C	I				

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INSTITUTION G.D.J.S.S. KARA CENTRE No. KARA 2013

1 SERIAL NUMBER	2 INDEX NUMBER	3 NAME	4 English Language	5 I. R. K.	6 C. R. K.	7 Social Studies	8 Basic Technology	9 Basic Science	10 Hausa	11 Arabic	12 Home Economics	13 Mathematics	14 Agric. Science	15 Art	16 P. H. E.	17 Business Studies	18	19	20	21 STATE OF ORIGIN/ L. G.A.	22 SCIENCE/TECH.	REMARKS
209	ALIYU	FIDAUSI	A	A	B	B	B	A	C	B	B	A	A	C	C	A						
210	ALIYU	HANNATU IDRIS	C	C	A	A	A	A	-	A	A	D	B	A	A	C	B					
213	ALIYU	ZAINAB ABBAS	B	A	-	C	D	C	-	C	B	D	C	E	C	B	C					
214	ALWALI	FATIMA ABUBAKAR	A	A	-	A	B	A	-	A	C	D	C	B	D	B	C					
215	ALWALI	HAFSA BOBA	C	E	-	D	B	D	-	H	B	C	B	C	-	C	D	D				
216	ALWALI	KALTUME UMAR	C	E	-	A	B	A	-	C	C	C	C	E	B	C	C					
221	AMADU	HABIBA	A	B	-	B	A	A	-	C	B	B	B	B	B	B	D	C				
222	AMADU	HADIZA	A	A	-	D	B	D	-	E	B	D	B	A	B	D	B					
224	AMINU	HAFSA MUHD	B	E	-	B	B	C	-	A	A	C	A	C	A	B	B	B				
229	AUDU	ASHATU ABDULMUMINI	A	A	-	B	A	A	-	C	A	B	A	E	B	B	D	A				
231	AUDU	AMINA	A	E	-	D	E	D	-	D	A	C	B	E	D	A	E	D				
242	AUWALU	HADIZA	C	A	-	D	A	D	-	D	C	C	A	D	C	A	E	B				
244	AUWALU	RABI	A	A	-	I	B	A	-	I	B	A	B	A	A	C	B	D	I	B		
245	AUWALU	BUKAYYA	A	A	-	A	B	A	-	A	B	C	A	A	B	A	B	A				
246	AHMED	FATIMA ABDULMUMINI	C	A	-	A	B	-	-	B	C	C	B	A	B	A	B	B				
247	AYUBA	AISHA	A	A	-	A	B	A	-	B	C	A	B	E	C	B	C	A				
250	DAHLADI	RABI	A	D	-	E	D	E	-	E	C	-	C	D	E	A	D	D				
251	BABA	ADAMA MUHD	A	B	-	C	B	B	-	B	B	D	C	D	A	A	D	D				

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INSTITUTION G.D.J.S.S. KARA CENTRE No. KARA 2013

1 SERIAL NUMBER	2 INDEX NUMBER	3 NAME	4 English Language	5 I. R. K.	6 C. R. K.	7 Social Studies	8 Basic Technology	9 Basic Science	10 Hausa	11 Arabic	12 Home Economics	13 Mathematics	14 Agric. Science	15 Art	16 P. H. E.	17 Business Studies	18	19	20	21 STATE OF ORIGIN/ L. G.A.	22 SCIENCE/TECH.	REMARKS
377	HAMUNA	AMINA	AA-1	AAA-1	CBBCBBACB												COMPUTER	CIVICS				
378	HAMUNA	FATIMA	CC-1	BBD-1	DBBECEJAC-1																	
379	HAMUNA	HAMBIBA	AC-1	ADEJ	CBDC-EB1-B																	
400	HAMUNA	IDRISS	DB-1	A E	EAICEEBDC																	
401	HAMUNA	KASIM SAMBO	AA-1	AATE-1	EABDBABCC																	
402	HAMUNA	MARTA	DC-1	BETE-1	DBEBEDBCD																	
403	HAMUNA	MUSA HASSAN	DB-1	CEEE-1	EBDABEADC																	
404	HAMUNA	SAFIYA	AB-1	AFEE-1	ECEBDDBTB																	
405	HAMUNA	SALE	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
406	HASHIMU	ABDULLAHI	C-1	A-1	EADADIAD-1																	
407	HASHIMU	ABUBAKAR SADIQ	AC-1	BA-1	EAEBEEBDC																	
408	HASHIMU	MUHD	DD-1	BE-1	DBEBEEBDD																	
409	HASSAN	ABUBAKAR	EB-1	AD	EBDBDCACC																	
410	HASSAN	ADAMU	1A-1	DT	EBBADABCB																	
411	HASSAN	AHMADU	AA-1	AAD-1	CCEABAACA																	
412	HASSAN	AISHA	CB-1	BEE-1	DCEACEBDB																	
413	HASSAN	BILAL	BB-1	BDT-1	CCDADECCC																	
414	HASSAN	DAHIRU ABDULMUMINI	CC-1	AD	EC-1	EAD	EC-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1

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INSTITUTION G.D.J.S.S. KARA CENTRE No. KARA 2013

1 SERIAL NUMBER	INDEX NUMBER 2	NAME 3	English Language 4	I. R. K. 5	C. R. K. 6	Social Studies 7	Basic Technology 8	Basic Science 9	Hausa 10	Arabic 11	Home Economics 12	Mathematics 13	Agric. Science 14	Art 15	P. H. E. 16	Business Studies 17	COMPUTER 18	CIVIC EDU 19	20	STATE OF ORIGIN/ L.G.A. 21	SCIENCE/TECH. 22	REMARKS
037	ABDULLAHI	MUHD	D	C	-	CA	-	-	B	B	D	B	D	D	B	D	D	D				
038	ABDULLAHI	MUHD SULAIMAN	E	B	-	BC	F	-	F	C	D	B	D	D	B	D	C					
039	ABDULLAHI	MUSA	E	B	-	C	F	-	F	E	E	B	B	D	B	E	D					
040	ABDULLAHI	MUSA K.G.	E	C	-	DE	F	-	E	C	D	B	D	E	B	E	D					
041	ABDULLAHI	NAFI'U	E	C	-	I	C	-	C	D	B	D	D	B	E	F						
042	ABDULLAHI	SAIDU IBRAHIM	E	C	-	B	-	F	-	B	C	D	C	B	G	C	D	D				
043	ABDULLAHI	SALE	E	E	-	CE	F	-	E	B	E	C	F	E	E	E						
044	ABDULLAHI	SALISU	D	A	-	A	C	A	-	D	B	C	B	B	C	C	C	B				
045	ABDULMUMIN	HUSSAINI	F	B	-	BC	F	I	-	C	D	C	A	E	B	B	D	E				
046	ABDULLAHI	SULEIMAN	F	B	-	AC	E	-	D	B	C	B	D	B	B	D	D					
047	ABDULLAHI	UMAR MUHD	A	B	-	C	B	C	-	D	B	C	E	D	B	C	C					
048	ABDULLAHI	USMAN MUSA	D	B	-	AC	F	I	-	D	B	D	C	E	D	B	E	D				
049	ABDULLAHI	YAKU	E	A	-	AB	D	-	D	B	C	B	B	C	B	D	C					
050	ABDULLAHI	YUSUF UMAR	E	C	-	AA	B	-	A	C	B	B	C	B	B	C						
051	ABDULLAHI	ZARAU	F	B	-	CD	E	-	B	C	D	B	E	B	B	D	C					
052	ABDULMUMIN	ABBA	D	B	-	B	C	E	-	E	C	E	E	D	A	B	C	D				
053	ABDULMUMIN	ABDULLAHI ABBA	D	-	-	A	E	A	-	E	B	F	C	B	A	C	C	D				
054	ABDULMUMIN	IDRIS	E	B	-	B	C	E	-	D	D	E	C	E	E	C	D					

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INSTITUTION G.D.J.S.S. KARA CENTRE No. KARA 2013

1 SERIAL NUMBER	INDEX NUMBER 2	NAME 3	English Language 4	I. R. K. 5	C. R. K. 6	Social Studies 7	Basic Technology 8	Basic Science 9	Hausa 10	Arabic 11	Home Economics 12	Mathematics 13	Agric. Science 14	Art 15	P. H. E. 16	Business Studies 17	Computer 18	Civics 19	20	STATE OF ORIGIN/ L.G.A. 21	SCIENCE/TECH. 22	REMARKS
163	AHMAD	IBRAHIM	A	B	1	A	C	1	B	C	B	A	A	B	C	B						
164	AHMAD	IBRAHIM BUKAR	C	C	1	C	B	F	1	B	C	D	B	B	E	A	C	B				
165	AHMAD	ISAH MUHD	D	A	1	A	A	A	1	A	C	C	B	C	C	C	A					
166	ABDULLAHI	MUHD IBRAHIM	E	D	1	B	E	E	1	B	C	D	E	E	C	C	D					
167	AHMAD	ISAH USMAN	A	A	1	C	D	F	1	B	C	D	D	D	C	B	C					
168	AHMAD	MUHD A.	D	D	1	C	D	F	1	C	C	E	E	B	B	C	D					
169	AHMAD	MUHD ABUBAKAR	C	1	1	1	1	1	1	1	1	1	1	1	1	1	1					
170	AHMAD	MUHD SHEHU	C	A	1	C	C	1	A	B	C	A	A	E	B	B	C	E					
171	AHMAD	OKASHA HASHIMU	E	A	1	B	C	F	1	C	B	E	D	E	C	D	D					
172	AHMAD	RAMATU UMAR	D	C	1	B	1	D	1	B	1	D	E	C	D	D						
173	AHMAD	SADIQ ABUBAKAR	C	B	1	B	D	E	1	A	B	D	A	D	B	C	C					
174	AHMAD	UMAR-YUSUF	E	B	1	A	A	E	1	A	B	D	B	E	B	C	D					
175	AHMAD	ZUBAIRU	A	D	1	A	A	F	1	B	B	D	E	A	D	B	C	C				
176	AHMADU	HAFSAT	F	D	1	C	C	C	1	C	B	C	B	C	D	B	C	D				
177	AHMADU	MAIMUNA SHEHU	D	D	1	C	B	F	1	E	C	D	E	E	F	C	C					
178	AHMADU	SULEIMAN MUHD	E	C	1	A	B	D	1	B	C	C	C	A	C	C	C					
179	ABDULLAHI	ADAMA ILIYA	E	E	1	D	B	F	1	E	D	D	C	C	E	B	D	D				
180	AISAMU	FATIMA MUSA	E	B	1	A	D	A	1	C	B	D	C	D	A	B	C	C				

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INSTITUTION G.D.J.S.S. KARA CENTRE No. KARA 2013

1 SERIAL NUMBER	INDEX NUMBER 2	NAME 3	English Language 4	I. R. K. 5	C. R. K. 6	Social Studies 7	Basic Technology 8	Basic Science 9	Hausa 10	Arabic 11	Home Economics 12	Mathematics 13	Agric. Science 14	Art 15	P. H. E. 16	Business Studies 17	Computer 18	Civic Edu 19	20	STATE OF ORIGIN/ L. G. A. 21	SCIENCE/TECH. 22	REMARKS
019	ABDULLAHI	AHMAD SULE	F	B	J	A	B	B	J	A	C	D	C	B	B	B	B	D				
020	ABDULLAHI	AISHA USMAN	F	C	-	B	F	E	-	D	C	E	C	D	D	B	D	E				
021	ABDULLAHI	AMINA SHUAIBU	F	C	-	A	E	F	-	E	D	E	B	E	D	B	D	B				
022	ABDULLAHI	AUDU SULE	F	B	-	A	C	F	-	E	C	E	B	B	C	B	E	D				
023	ABDULLAHI	BASHIR	E	C	-	B	C	-	-	E	C	E	C	F	-	B	D	D				
024	ABDULLAHI	FATIMA	E	B	-	C	C	F	-	C	B	E	C	D	D	B	C	C				
025	ABDULLAHI	FUREERA ALI	F	B	-	D	B	F	-	D	C	D	B	D	E	C	C	C				
026	ABDULLAHI	HADIZA	C	B	-	B	C	E	-	B	C	B	B	B	D	C	C	C				
027	ABDULLAHI	HAFSAT	C	B	-	A	B	F	-	D	C	E	B	B	B	C	D	B				
028	ABDULLAHI	HAMZA MUTTI	F	B	-	B	D	F	-	C	C	E	B	E	C	B	D	D				
029	ABDULLAHI	IDRISS DAUDA	E	A	-	A	B	E	-	A	B	C	C	A	C	C	C					
030	ABDULLAHI	IDRISS SULE	E	C	-	B	D	E	-	B	B	C	C	E	D	B	C	C				
031	ABDULLAHI	ISHAKU IBRAHIM	E	B	-	B	B	F	-	C	C	D	C	D	D	B	D	B				
032	ABDULLAHI	M. AHMAD	F	D	-	B	D	E	-	A	B	D	B	C	B	E	C	C				
033	ABDULLAHI	MAIMUNA SANI	E	-	-	C	E	F	-	B	C	E	B	E	D	E	C	D				
034	ABDULLAHI	MARYAM	A	B	-	A	B	E	-	D	B	E	C	D	E	C	D	B				
035	ABDULLAHI	MAICHAM SULEIMAN	E	B	-	A	B	F	-	C	C	C	C	E	B	C	D	C				
036	ABDULLAHI	MUHD DATTI	C	C	-	A	C	E	-	B	C	B	C	B	D	B	D	C				

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INSTITUTION G-D-J-S-S. KARA CENTRE No. KARA 2013

1 SERIAL NUMBER	2 INDEX NUMBER	3 NAME	4 English Language	5 I. R. K.	6 C. R. K.	7 Social Studies	8 Basic Technology	9 Basic Science	10 Hausa	11 Arabic	12 Home Economics	13 Mathematics	14 Agric. Science	15 Art	16 P. H. E.	17 Business Studies	18 COMPUTER	19 CIVICS EDUC	20	21 STATE OF ORIGIN/ L. G.A.	22 SCIENCE/TECH.	REMARKS
A433	IBRAHIM	ADAMU	B	B-	C	A	C	F	-	A	D	A	E	F	A	D	C					
A434	IBRAHIM	ASHATU M.	A	C-	A	D	B	-	F	A	C	B	E	A	B	D	C					
A435	IBRAHIM	AJI ADAMU	D	D-	A	C	D	-	B	A	E	B	C	D	B	D	D					
A436	IBRAHIM	AMINA	E	D-	A	D	E	-	B	A	E	A	D	E	B	D	-					
A437	IBRAHIM	BAKI	D	E-	A	D	D	-	E	A	A	B	E	A	D	C						
A438	IBRAHIM	DAHIRU ABDULLAHI	D	C-	A	B	F	-	F	B	D	B	D	A	D	C						
A439	IBRAHIM	DAUDA	D	B-	A	D	E	-	D	B	D	B	E	E	A	C	C					
A440	MAMMUD	MUHD GAMBA	B	C-	A	B	E	-	C	B	C	B	T	B	B	C	D					
A441	IBRAHIM	FATIMA USMAN	A	D-	A	B	A	-	C	B	C	B	B	A	B	D	B					
A442	IBRAHIM	HABIBA	C	E-	A	C	T	-	C	A	C	A	D	E	A	C	C					
A443	IBRAHIM	HADIZA	D	E-	A	D	E	-	T	A	C	B	D	D	E	B	D					
A444	IBRAHIM	HASSAN	C	B-	A	B	E	-	F	B	D	B	E	E	B	D	D					
A445	IBRAHIM	HAUWA	B	D-	A	B	D	-	B	B	D	A	E	D	B	C	B					
A446	IBRAHIM	HAUWA USMAN	C	B-	A	B	E	-	D	C	B	A	B	D	C	C	C					
A447	IBRAHIM	IBRAHIM BABATO	E	D-	C	E	E	-	B	-	A	E	E	B	-	D						
A448	IBRAHIM	IDRISS	C	D-	A	B	D	-	E	B	C	B	E	B	B	E	A					
A449	IBRAHIM	ISA	D	D-	A	B	T	-	E	B	C	B	A	F	B	-	D					
A450	IBRAHIM	KALAMU	B	A-	A	B	E	E	-	D	A	D	A	D	-	B	C	-				

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INSTITUTION G.D.J.S.S. KARA CENTRE No. KARA 2013

1 SERIAL NUMBER	2 INDEX NUMBER	3 NAME	4 English Language	5 I. R. K.	6 C. R. K.	7 Social Studies	8 Basic Technology	9 Basic Science	10 Hausa	11 Arabic	12 Home Economics	13 Mathematics	14 Agric. Science	15 Art	16 P. H. E.	17 Business Studies	18	19	20	21 STATE OF ORIGIN/ L. G. A.	22 SCIENCE/TECH.	REMARKS
055	ABD/MUMUNI/YUSUF		EC	I	D	EF	I	EF	D	CD	CD	AC	DB	EF	DC	EF	COMPUTER	CIVICS EDU				
056	ABDULRAHMAN MUHD		DB	I	I	DF	I	DF	D	BC	CD	AC	DB	EF	DC	EF	D	B				
057	ABDULRAHMAN SADIQ		FC	I	C	DF	I	EB	EC	DD	BD	BD	D									
058	ABBA HASSAN		FC	I	BF	I	I	B	I	EB	DB	DB	B									
059	ABDULRAHMAN IDRISS		AA	I	A	AF	I	CC	EB	BA	BC	B										
060	ABDULRAHMAN SANI		ED	I	CF	FI	I	EC	DB	EE	BE	D										
061	ABDULSALAM FATIMA		FB	I	BE	B	I	DB	EC	EC	CB	DC										
062	ABDULSALAM HAJARA		EA	I	BC	EI	A	BB	DC	DD	BC	B										
063	ABDUL SALAM IBRAHIM		DC	I	BD	FI	D	BB	BC	EB	CC	B										
064	ABDULSALAM MUHD SAUD		AA	I	AA	FI	B	CC	CA	AC	DB											
065	ABUBAKAR ABDULLAHI		AB	I	AE	FI	D	CD	CE	DB	DC											
066	ABUBAKAR ABUBAKAR IBU		EI	I	BC	EI	D	CD	CA	AC	CB											
067	ABUBAKAR ADAMU SALE		EA	I	AA	D	I	AC	DC	BB	AD	C										
068	ABUBAKAR AISHA AMADU		CB	I	BD	A	I	BB	EB	CC	BC	B										
069	ABUBAKAR AMADU		ED	I	AD	EI	I	BE	BC	I	GD	E										
070	ABUBAKAR AMINA MUHD		ED	I	CE	FI	I	BB	EB	CD	BB	E										
071	ABUBAKAR ASHIRU SULEIMAN		BA	I	AB	C	I	CB	BD	CA	BC	DB										
072	ABUBAKAR ASMAU ADAMU		DE	I	AB	F	I	CB	BD	IC	BB	AC	DC									

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INSTITUTION G.D.J.S.S. KARA. CENTRE No. KARA 2013

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181	AISHA	AHMAD USMAN	EC	I	I	CA	CA	CA	CA	CA	CA	CA	CA	CA	CA	CA						
182	AJEJE	ABUBAKAR YUSUF	ED	I	ADF	I	D	BDA	DDB	CD												
183	AJITA	ALHASSAN	FC	I	CBF	I	CB	DAD	EBC	C												
184	AL-AMIN	MUHD	AB	I	ACE	I	A	BDA	BBC	CB												
185	ALH	ABUBAKAR SANI	BA	I	AAB	I	A	BAA	AAE	CA												
186	ALHASSAN	ATUBA	AB	I	BCC	I	AA	BBA	AAC	CB												
187	ALHASSAN	FATIMA	BB	I	AAE	I	BA	EBD	DCE	C												
188	ALHASSAN	MARYAM	FD	I	DCE	I	C	EBE	EBC													
189	ALHASSAN	UMAR	DC	I	BDF	I	BC	DCD	EBC													
190	ALHASSAN	ZAKARI	FA	I	ACD	I	BC	EBC	ECD													
191	ALI	ABDULLAHI	EA	I	BIE	I	BC	EEE	BCD													
192	ALI	AISHA SANI	FD	I	DBF	I	DC	EBC	EBC	E												
193	ALI	AMINU GHINGMA	AB	I	BAF	I	BB	BAE	ECB	CD												
194	ALI	AUWAL MUHD	AB	I	ABF	I	BB	DDE	ADC													
195	ALI	BINTA ADAMU	BD	I	CDE	I	CB	BDB	EAC	D												
196	ALI	EMMANUEL EDEN	A	I	AAA	C	I	CCA	AAC	C												
197	ALI	FATSUMA MUHD	AD	I	ABB	I	BC	CCD	EAC	D												
198	AISHA	ABUBAKAR BELLO	CD	I	ACC	I	CB	CBC	CEB	AC												

*In coll. 22 indicate if candidate interested for Tech. Or Sc. In SS