EFFECT OF ACTIVITY–BASED INSTRUCTIONAL STRATEGY ON THE ACADEMIC PERFORMANCE OF STUDENTS IN INTEGRATED SCIENCE IN JUNIOR SECONDARY SCHOOLS IN KADUNA STATE

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DECLARATION

I hereby declare that this thesis "Effect of Activity-Based Instructional Strategy on the Academic Performance of Students in Integrated Science in Junior Secondary School Level" submitted for the award of Master of Education(M ED) Degree in Education has been written and compiled by me, under the supervision of Dr. (Mrs) H. O. Yusuf and Prof M. Ben-Yunusa of blessed memory.

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CERTIFICATION

This thesis entitled "Effect Of Activity–Based Teaching Strategy And Traditional Method on The Academic Performance of Students in Integrated Science In Junior Secondary Schools in Kaduna State" by Dawaki Jummai Habu meets the regulations governing the award of the degree of Masters of Education (M.ED) of Ahmadu Bello University, Zaria, and it is approved for the contribution to knowledge and literacy presentation.

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DEDICATION

This work is dedicated to the five wonderful gifts of God to my life. Ndola, Minkir, Kuna, Hamagham, and Yarang for adding love and meaning to my life.

AKNOWLEDGEMENT

I would like to appreciate the Giver of life, the Almighty God who enabled me to complete this work. My parents in the Lord Bishop and Bishop Mrs Fred Addo. My biological Mother Nana Hauwa, and Nana Hajara my Mother-in-law for their prayers.

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ABSTRACT

This study was designed to examine the effect of Activity-Based Instructional Strategy and Traditional Method on the academic performance of students in Integrated Science in Junior Secondary Schools Kaduna North Local Government Area. Three research question and three hypotheses were formulated to serve as a guide for the study. The research design used was Quasi-experimental where Pre-test and Post-test was used to achieve the objective of the study. sample comprised 238 junior Secondary School students (J.S.S.One), from Government Girls Junior Secondary School Independence Way and Asma'u Makarfi Government Secondary School Unguwan Shanu being the Experimental and Control female groups respectively. And Government Junior Secondary Doka Boys and Government Junior Secondary School Badarawa being the Experimental and Control male groups. The instrument used to asses the students performance was an adapted test (consisting of 30 objective test) of a multiple choice in Integrated science produced by Inyang and Nwaiwu (2001).The mean was used to answer the research question and the t-test statistic was used to test the hypotheses. The results indicated that(i) the Activity-Based strategy is more effective than the Traditional Method. (ii) The Traditional Method is also effective in a way since there was an improvement observed in the mean performance of students taught using it. (iii) The Traditional Method could be used with other methods such as Activity-Based for effective teaching and learning. The researcher concluded that if Integrated Science teachers could incorporate Activity-Based teaching strategy into their teaching methods there might be an improvement in academic performance of junior secondary schools students in Integrated Science.

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Operational Definition of Terms

1) Effect: A change in students academic performance caused by using the Activity-Based Instructional Strategy

2) Activity-Based Teaching is child-centered in nature, where the students actively participates in his/her learning experiences physically and mentally (discussion, debate, role-play, simulation and scientific process skills which involve manipulation of materials and equipment).

3) Academic performance refers to the quality of result produced by students as reflected in the quality of their examination scores.

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CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

The cry to improve effective teaching and learning of Integrated Science in most junior secondary schools has proved abortive, possibly because the curriculum planners are different from the curriculum implementers. Educators should understand that change in students must be supported by parallel changes in curriculum and instruction. However, it is apparent that many of today's teachers are caught in the midst of a change for which they may not have been prepared for professionally (Dogru and Kalender, 2007). More so, no special emphasis has been placed on the method of teaching and learning of the science by school supervisors despite the suggested method of the use of guided inquiry method of teaching and learning that is meant to promote learning by doing by the Nigerian Educational Research and Development Council (2007) as such, what the researcher has been observing in the past two decades of teaching Integrated Science at the junior secondary school level is usage of Traditional Teaching Method which is mainly Talk and Chalk. This could be the cause of the poor performance in the Junior Secondary Certificate Examination (JSCE) results. The performance in science by the students has continued to decline over the years as indicated by JSCE results as shown from 2000-2010 NECO JSCE results. This could be attributed to the fact that students are not getting the concepts due to inadequate teaching and instructional methods adopted by science teachers. Studies by Usman and Shuaibu (2001) point out that most science teachers use traditional method and copying of notes by

students. These methods according to them do not allow active students participation in science lessons rather, students memorize, regurgitate facts and concepts without the basic understanding of what it is.

The teaching and learning of integrated science in Kaduna North local Government area is not an exception to the rule, there has also been failure in performance of students in Junior Secondary School Certificate in JSC Integrated Science result from 2000 to 2010. There might be other causes such as unqualified teachers and inexperienced ones and over population of classes. This study intends to investigate two methods of teaching with the aim of determining which one is more effective in teaching and learning of Integrated Science. Therefore, the study is aimed at determining the effect of Activity-Based Instructional Strategy and the Traditional Methods on students' academic performance in integrated science at the junior secondary school level. Activity-Based Instructional Strategy, which is Student-Centered in nature, invites the student to participate actively in his or her own learning experiences (discussion, debate, role-play & simulation and scientific process skills which involve manipulation of materials and equipment). The greater the range of decision that pupils can be involved in, the greater the degree of personal responsibility which they are encouraged to develop, the more likely it is that progression in learning will occur (Nayak & Rao, 2002). In this method of teaching, all pupils regardless of their ages must be active, either mentally or physically or both during the entire lesson (Rowland & Birkett, 1992). It encourages hands on discovery, which enhances the development of valuable learning skills through direct experiences (Tolman, 1999). During activity based teaching,

classroom environment is authentic because it is based on activities planned with the child's interest in mind. Teacher respects children by upholding children's rights to their feelings, ideas and opinions. It gives the children the opportunity to develop personalities characterized by self-confidence, respect for self and others and active, inquiring, creative minds. It is clear that when children are allowed to inquire, classrooms become alive with human interaction (Hendricks 1997). In activity-based classroom, students are at the position of inquirer, not just a receptor of facts and procedures. Pupils have the opportunity to make significant decisions about their learning (Nayak & Rao, 2002).

1.2 Statement of the Problem

The teaching and learning of Integrated Science in most classrooms face a lot of problems. Most of the teachers use the Traditional Teaching Method that comprises Talk and Chalk, Note Taking and Memorization. They do not make use of Activity-Based Teaching Strategies, where the learners play an active role in the learning process. This inability of the Integrated Science Teachers in the use of Activity-Based Instructional Strategies might be the cause of poor performance in the subject at both teacher made examinations and Junior Secondary Certificate Examinations (JSCE). Since Integrated Science is the foundation of sciences in the senior secondary school subjects, such as Biology, Chemistry, Physics, it has been argued that Junior Secondary School (J.S.S.) Students, must be well grounded in Integrated Science at the J.S.S. level for them to be able to study the Core Science subjects (Biology, Chemistry, Physics, etc) at the Senior Secondary School level (Olarewaju, 1994).

Studies by Alake (2007), Odubunmi & Balagun (1991) have shown that Activity-Based which is child centered is effective in teaching and learning science. Over the last three decades, the framework for understanding the psychological basis of teaching and learning has shifted from teacher-centred to child-centred teaching and learning where the responsibility is rested on learners for their own learning of science but most teachers prefer to use the Traditional Method and this might have caused the failure in performance. Thus this study is aimed at comparing the mean performance of students taught using the Activity-Based Instructional Strategy and Traditional Method in order to determine which one is more effective in teaching Integrated Science in Junior Secondary Schools.

1.3 Objectives of the Study

The study is designed to achieve the following objectives:

i. To investigate the effect of Activity-Based Instructional Strategy on the academic performance of male students in Integrated Science.

ii. To examine the effect of activity based instructional strategy on the academic performance of female students in integrated science

iii. To compare the academic performance of male and female Students taught using activity based and traditional method in Integrated Science

1.4 Research Questions

This research was set to find answers to the following questions:

i. What is the effect of the Activity-Based Instructional Strategy on the academic performance of male students in Integrated Science?

ii. What is the effect of Activity-Based instructional strategy on academic performances of female students in Integrated Science?

iii. What is the effect of the Activity-Based Instructional Strategy on male and female students' academic performance in Integrated Science?

1.5 Null Hypotheses

The following null hypotheses were tested in the course of the study.

Ho_1: There is no significant difference between the performance of male students taught Integrated Science using Activity-Based Instructional Strategy and those taught using Traditional Method.

Ho_2: There is no significant difference between the mean performance of female students taught Integrated Science using Activity-Based Instructional Strategy and those taught using Traditional Method

$Ho_{3;}$ There is no significant difference in the performance of male and Female students taught Integrated Science using Activity-Based Instructional Strategy.

1.6 Basic Assumptions

i. The Schools used for the study are representatives of Junior Secondary Schools in Kaduna State.

ii. The selected topics are appropriate for the level of the students in the schools selected for the study.

iii. The Activity-Based Instructional Strategy and Traditional Method of teaching are appropriate for teaching the topics listed in the scheme of work.

iv. Learning by doing could enhance and motivate Students to improve on their performances in Integrated Science.

v. The teachers teaching in the schools are qualified to teach the subject.

1.7 Significance of the Study

The findings of this study will help in the following ways:

The Integrated Science teachers will find the findings useful in their science classrooms; helping students' understanding in Integrated Science concepts through Activity-Based Instructional Strategies.

The study finding is expected to provide bases for help educational planners and curriculum designers to recommend among other, Activity-Based Instructional Strategy in the schools to improve teaching/learning situations currently existing in Junior Secondary Schools.

1.8 Scope and Delimitation of the Study

The scope is limited to junior secondary schools in Kaduna North local Government. The study involved junior secondary one (JSS 1) Integrated Science students only. The study is also limited to four randomly selected schools in Kaduna North Local government, two being the experimental group while two serve as the control group, the Kaduna north local government do not run co-education thus the two boys' schools and two girl's schools are used.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

2.1 Introduction

Science pedagogy has attracted the attention of many researchers over the years. The Activity-Based approach to science teaching has been the concern of many science educationists. Science as an experimental subject and practical work should form the basis of teaching and learning but what operate largely in schools presently are more of reading and hearing science, very far from doing science. (Haggerty 2000, Usman and Shuaibu (2001) Bajah 1983,Cooper,Fromer,Gordon, and Nicholas,2002), Olukitibi 1989.Ajala,2005)

In this chapter the literature review was discussed under the following headings: Theoretical framework, An Overview of Activity–Based Instructional Strategy, An Overview of the Traditional Method, An Overview of Objectives of integrated science, An Overview of Student Performance in Science and Integrated Science Empirical Studies, and Summary.

2.2 Theoretical Framework

The underlying philosophy of this study lies in the theories of cognitive science particularly that of constructivism. The constructivist theory emphasizes that students learn when they construct their own meaning, and deep learning takes place when students are engaged in active learning. Focusing on a more educational description of constructivism, meaning is intimately connected with experience (Mahoney, 2004). According to Mahoney, students come into a classroom with their own experiences and a cognitive structure based on those experiences. These

preconceived structures are valid, invalid or incomplete. The learner will reformulate his/her existing structures only if new information or experiences are connected to knowledge already in memory. Inferences, elaborations and relationships between old perceptions and new ideas must be personally drawn by the student in order for the new idea to become an integrated, useful part of his/her memory. Memorized facts or information that has not been connected with the learner's prior experiences will be quickly forgotten. The learner must actively construct new information onto his/her existing mental framework for meaningful learning to occur. Vonglasersfeld (1989) in Olorukooba (2002) pointed out that the responsibility of learning should reside increasingly with the learners where they are actively involved in the learning process-unlike previous educational view point where the responsibility rested with instructor to teach. Here the learners play a passive role. In a constructivist the role of the teacher is to organize information around conceptual clusters of problems, questions and discrepant situations in order to engage the student's interest. Teachers assist students in developing new insights and connecting them with their previous learning. Ideas are presented holistically as broad concepts and then broken down into parts. The activities are student-centred and students are encouraged to ask their own questions, carry out their own experiments, make their own analogies and come to their own conclusions. Cognitive theorists believe the role of the teacher is to provide learners with opportunities and incentives to learn, holding that among other things:

1. All learning, except for simple rote memorization, requires the learners to actively construct meaning,

2. Students' prior understandings and thoughts about a topic or concept before instruction exert a tremendous influence on what they learn during instruction

3. The teacher's primary goal is to generate a change in the learner's cognitive structure or way of viewing and organizing the world and

4. Learning in co-operation with others is an important source of motivation, support, modelling, and coaching (Feden, 1994).

The constructivist theory of learning supports cognitive pedagogy, for opposing that humans have an innate sense of the world and this domain allows them to move from passive observers to active learners. Carlson (2003) supports a strong emphasis on identifying, building upon and modifying the existing knowledge (prior knowledge) students bring to the classroom, rather than assuming they will automatically absorb and believe what they read in the textbook and are told in the classroom Method which actively involves the students is what Constructivist emphasized in it teaching approach hence knowledge gained last long in their memory, since human being are not passive recipients of information. Traditional teacher as information giver and textbook guided classroom has failed to bring about the desired outcome of producing thinking students (Young and Collin, 2003). A much heralded alternative is to change the focus of the classroom from teacher dominated to student centred using an Activity-Based strategy Constructivism is not accepting what you are told but your prior knowledge about what you are taught and your perceptions about it. Active involvement of students is emphasized in

Constructivism, hence knowledge gained last long in their memory, Yager (1991) attested to the fact that 'one only knows something if one can explain it''Learners actively take knowledge, connect it to previously assimilated knowledge and make it theirs by constructing their own interpretation (Cheek, 1992)

2.3 An Overview of Activity-Based Instructional Strategy.

One of the best ways to understand something is to get ones hands on it, and just like the great philosopher Confucius put it. "I hear and I forget", I see and I remember", I do and I understand". Activity curriculum organization which according to Ben-Yunus (2008, p.34) "is a child centered activity where learners are challenged, through meaningful activities to find solutions to simple problems that are within their range of ability".

An Activity-Based teaching revolves around students learning through *'hands-on mind-on"* activities since most students in the junior secondary schools are within the range of concrete operational stage and their thinking being concrete rather than abstract. Abstract concepts are difficult for most students to grasp simply by hearing them explain; hence the Activity-Based instruction can make abstract concrete. (Deboar, 1991). This could involve manipulating materials resources for learning, writing answers to simple quiz questions, going out of the classroom environment to observe things in their natural habitats. Anarly, (1978, p.33) states that *"involvement is the key to intellectual development and for the school student this includes direct physical manipulation of objects."* Instructional approaches that have been shown to be effective for improving student achievement in science are active learning

strategies (Roth and Roychoudhury1993, and Scharman (1989) reported that Science activities with process component assist in developing Science content and knowledge. Recent findings indicate that the use of active learning materials resulted in improved science achievement and more positive attitudes about science (McManus, Dunn, & Denig, 2003). Similarly, the use of active learning strategies for a general chemistry course was associated with improved student achievement (Kovac, 1999). Further, the use of student-centred classroom instructional strategies for a life sciences course resulted in positive student responses and was effective for student performance on standardized exams (Lunsford & Herzog, 1997). Finally, the use of active learning strategies for sixth-grade science was associated with positive attitudes regarding learning gains and high levels of motivation to succeed in science (Maheady, Michielli-Pendl, Mallette, & Harper, 2002). There has been much emphasis on participatory classroom activities because there is a general agreement that effective learning requires students to be active in the learning process (Roth and Roychoudhury, 1994; Strage and Bol, 1996; Stepanek, 2000; Parkinson, 2004). In addition, researchers believe that the more students are involved in the learning process, the more they learn the topic (Trowbridge *et al*, 2000; Deboer, 2002). Taras (2002) suggests that student-centred learning has, in theory, promoted and brought about greater student participation and involvement. Therefore, for students to be at the centre of the learning and teaching process, their needs and requirements must be at the heart of this process. Meaning can only be formed in students' minds by their own active efforts (Saunders, 1992) and cannot be created by someone else for students. This suggests that students are not simply passive recipients of information

from the teacher Deboer, 2002). Researchers believe that this is a result of a sense of ownership and personal involvement that active learning creates. In active learning contexts, students see their work as important because they feel important and their ideas and findings are valued. Amos (2002) argues that students' active participation also requires a positive, supportive learning environment in which they feel free to ask their own questions, express their ideas and thoughts and receive support and encouragement. When students realise that their ideas and thoughts are valued and treated with respect by the group members, when they actively involve themselves in group activities, they feel more confidence, and thus, participate more in the activities (Brown, 1995).

Many different methods and strategies have been suggested for involving students in lessons and engaging them in active learning (Trowbridge et al 2000; Deboer, 2002; Goodrum et al, 2002). However, in order for any method to be successful, effective lesson planning is essential (Henson and Eller, 1999; Harlen, 1999). A lesson plan requires teacher to be clear about the sequence of the activities in the lessons, the purpose and goals of the lessons. The planning process involves clarification of the roles of the teacher and students. Thus, it makes easier for students to follow the teacher's material and encourages them to participate more in the lesson and take responsibility for their own learning (Good and Brophy, 1994; Calderon et al, 1996). For these reasons, effective lesson planning has a positive effect on students' learning (Brown, 1994; Tomic, 1994; Glenn, 2001). Moreover, according to the above, teachers should allow some flexibility in lesson planning in order to encourage students to participate more in the lessons. It is important to be sensitive

to the mood of the class and if something is not going well to abandon it and move on or change tack completely. Otherwise, a rigid lesson plan potentially hinders rather than helps the teaching-learning process, since it could prevent students from being involved in the lessons. Questioning is the most common strategy that teachers use for involving students in the learning process (Bliss, 1995; Glenn, 2001; Amos, 2002). Indeed, Amos (2002) reports that up to one-fifth of what a teacher says in a classroom is likely to be in the form of questions. If teachers ask open-ended questions, they allow students to think freely and flexibly, to express their own ideas and thoughts without thinking that they have to give one 'right' answer and they promote successful discussions that stimulate student participation (Harlen, 1999).

Amos (2002) supports the use of open-ended questions, arguing that closed and subject-oriented questions that rely on linear processes and logical reasoning discourage students from thinking differently from the teacher and may deter students from answering the questions asked. In addition to the nature of the questions asked, the process of asking questions is also important for students' learning and development. Providing sufficient 'wait time', about 3-5 seconds, after asking a question for students not only increases student participation but also provides them with opportunity to think critically and create more ideas and responses (Yates and Yates, 1990; Bliss, 1995; Trowbridge *et al,* 2000; Amos,2002).

Role-playing can also be a useful teaching and learning activity to encourage

Students to participate more in the lessons and facilitate their understanding. However, researchers report that role-playing in science lessons is underrated and

underused, often because of misconceptions about what role-play is and how it can be put to use in science education (Resnick and Wilensky, 1998; McSharry and Jones, 2000). McSharry and Jones (2000) point out that the theory behind the use of role-play in science teaching and learning supports 'active', 'experiential' or 'student-centred' learning. Therefore, students are encouraged to be physically and intellectually involved in their lessons to allow them to both express themselves in a scientific context and develop an understanding of difficult concept.

Another useful method for enabling students to participate in the learning process is to conduct practical work (Hodson, 1993; Amos and Boohan, 2002; Millar, 2002). The important point in doing practical work is to ensure that students are mentally active because engaging students in practical tasks does not mean that they are active in their learning. Inquiry-based teaching and learning (Trowbridge *et al*, 2000; Deboer, 2002) and cooperative learning groups (Slavin, 1990; Kagan, 1992; Jones and Carter, 1998; Goodrum *et al,* 2001) are also useful contexts where students actively participate in learning process to develop their own understandings of scientific knowledge.

In short, student participation is necessary for their learning. Active participation can increase students' learning, understanding and motivation to learn. Teachers should make sure that students are mentally active in the lessons and create opportunities for them to participate in the lessons. For instance the systematic studies of the universe in the form of Integrated Science cannot but involve the active participation of the learners, if he or she is to acquire the necessary skills that will make him function in

the scientifically and technologically oriented world. The Teaching and learning of integrated science, is essential that students are discouraged from resorting to unnecessary retention of facts, where the sole aim is to consciously commit information to memory so as to recall it later (Cooper, Frommer, Gordon, and Nicholas, 2002).This is why Integrated Science teaching is aimed at teaching the pupils what science is and how scientist works. The National Curriculum for junior secondary school volume 1 - science spelled out the objectives of integrated science which is aimed at enabling the child who is exposed to it, acquire the following skills.

i. Observing carefully and thoroughly
ii. Reporting completely what is observed
iii. Organizing information acquired
iv. Generalizing on the bases of acquired information
v. Predicting as a result of generalizing
vi. Designing experiments (including controls where necessary to check prediction).
vii. Using models to explain phenomena where appropriate
viii. Continuing the process of inquiry when new data do not conform to prediction.

And also recommended the following strategy for instruction

Use of a discovery teaching tactics, the inclusion of problem solving activities, the involvement of students in open-ended activities.

2.3.1 Discovery teaching tactics of integrated science

This is an instructional method which allows the students the independence to use his/her mental processes to contribute to knowledge understand hitherto difficult concepts, generalizations, and principles or provide answers to problems suited with minimal guidance from the teacher on the attainment of instructional objective. Discovery method is students centered and agrees with early psychologist like Bruner (1966) who said that learning involve activities processing of information that is organized and constructed in a unique way by each individual. The processing will lead into exploration and discovery. Abdullahi (1982) and Benedate (1992) defined discovery method in terms of exploration in the laboratory in which students perform such processes as observation, measurement, classification and so forth, and finally draw conclusion from information gathered. Discovery method can either be guided or unguided and the guided can either be inductive or deductive. Both guided and unguided discovery involves finding out and requires students to engage in some complex mental processes including:

Formulating problems for investigation, formulating hypothesis to guide investigation, design experiment to collect data, making generalization from knowledge acquired from data, to find solution to problem, developing certain scientific attitude like objectivity, curiosity, open-mindedness and honesty.

Advantages of Discovery

i. Whether guided or unguided, discovery approach, trains and opens up students minds to knowledge from interacting with the environment and eventually use the knowledge to solve problems.

ii. It develops student's potential and ability to work on their own, thereby gaining skills to deal effectively with their environment.

iii. Discovery approach offers the best tool for developing manipulative skills in students.

iv. It provides intellectual development of the student leading to high degree of assimilation and retention of thing student have discovered on their own.

v. Successful discovery builds up self confidence in the students and provides motivation for further exploration.

vi. It allows room for individual development, every student progressing at his/her own speed and place value on all students.

vii. It allows room for individual development every student progressing at his/her own speed and

viii. The work of a teacher becomes that of a director, supervising and directing every student in his class instead of just a "talker"

Disadvantage of Discovery

i. Discovery method is slow and time consuming

ii. It does not lead to coverage time

iii. It requires much fund to buy materials and equipment.

iv. It can become frustrating for both teacher and students as the students may not be discovering anything or things outside the intended.

2.3.2 Problem Solving Method

In the **p**roblem solving method, the student actively participate in the learning experiences in the process of finding solutions to problems, the students, who learn

through their mistakes or successes, become creative and develop reflective or critical thinking. The problem-solving method as stated by Mezieobi,etal (2008) entails that students should select problems that are relevant to their needs, the object of study and the priority or pressing needs of the society, to reflect the changing times and needs. Okon and Ibanga (1982). outlined the following procedures

i. The teacher may introduce and clarify the problem in which the problem is stated

ii. Students are then left on their own to provide tentative suggestion or solutions to the problems through their working individually, in pairs or in groups.

ii. With the actual results, conclusion and generalizations may be reached. The initial problem may be completely solved or partially solved in which case further data would be sought to ensure that problems are remedied or considerably reduced.

vi. In the utilization of the problem solving teaching-learning methods, the student is actively and directly involved in defining his own learning task, setting his goals, collecting, rearranging and evaluating the necessary data to help him solve the problem.

The advantages and disadvantages of problem-solving as stated by Meziobi eta l(2008)

Advantages of Problem Solving Method

Advantages of this teaching method include;

i. The problem which is presented to the students poses challenges to the students and makes them work independently or in groups, to find solutions to the problems.

ii. This method inculcates reflective thinking in the learners and ultimately makes them critical thinkers.

iii. Since this method, in some situations, allows students to seek solutions to problems, in groups or in pairs, such teamwork enhances social interaction among the students.

iv. It elicits the active participation of learners in the teaching-learning process.

v. It inculcates in the learners the spirit of creativity which in fact is the basis of this method.

Disadvantages of the Problem-Solving Method

The shortcomings of this method include:

i. It is time-consuming and energy sapping as some of the problem-solving activities may take a long time to accomplish.

ii. It entails patience or endurance on the part of the teachers and the students who on losing their patience in the face of seeming difficult problems may see their situation as frustrate

iv. Most Integrated Science Teachers forget their nurturance role in the problem-solving activities such as helping or guiding learners out of difficulty, and, therefore, make the problem-solving approach teachers-dominated instead of learner-centered.

iv. The dynamism of society may render out-modeled social problems needing to be discussed in the schools as outlined in the syllabus.

v. The reading inertia of most primary and secondary school teachers in Nigeria may keep them in the dark about current problems needing solution in the society.

2.3.3 Inquiry;

In recent years, there has been a growing movement to integrate inquiry into science education (Tamir, 1983; Trowbridge *et al*, 2000; King, Shumow, and Lietz, 2001; Deboer, 2002). The importance of inquiry grew from Dewey's ideas. Dewey (1938) argues that citizens in a democratic society should be inquirers with regard to the nature of their physical and social environments and be active participants in the construction of society. They should ask questions and have the resources to find answers to these questions, independent of external authority. Since there is a shared, collaborative aspect to life in a democratic society, students also need to develop a capacity for communal inquiry into the nature of the world. Therefore, formal education needs to give students the skills and dispositions to formulate questions that are personally significant and meaningful to them. Trowbridge *et al* (2000, p207) define inquiry as '*the process of defining and investigating problems, formulating hypotheses, designing experiments, gathering data and drawing conclusions about problems'*. A potential result in inquiry-based teaching enables students to gain insights into the nature of scientific inquiry (Amos and Boohan, 2002) and understand how and why to apply the scientific method at the same time

as they come to understand the subject. They can also understand what science is like and what scientists do (Harlen, 1999).

Engaging in inquiry can also help students develop a wide range of skills, such as psychomotor and academic or intellectual skills. Psychomotor skills involve doing something physical, like gathering and setting up apparatus, making observations and measurements, recording data and drawing graphs while academic or intellectual skills include analysing data, making comparisons, evaluating results, preparing reports and communicating results to the others or the teachers. Furthermore, students' attitudes and dispositions such as curiosity, inquisitiveness, and independence of mind, freedom from external authority, and a personal search for meaning about the world can also improve.

Therefore, it would appear that inquiry-based learning can prepare students to be lifetime learners rather than classroom-only learners (Tamir, 1983; Trowbridge *et al,* 2000; King *et al*, 2001; DeBoer, 2002).In order to implement inquiry-based teaching successfully in science, teachers should fulfil some important conditions (Suchman, 1966 quoting Trowbridge *et al* 2000 p210). First of all, teachers should allow students to have 'freedom' to seek out desired information. Students must be allowed to try out their ideas and invent ways of accounting for what they see and can ask their own questions (Tamir, 1983; Dillon, 1990; Lemke, 1990; Bliss, 1995; Dori and Herscovitz, 1999; Joyce *et al*, 2000a; Trowbridge *et al,* 2000; Amos, 2002). Furthermore, teachers should encourage students to discuss and talk to one another about the topic being taught during the class (Lemke, 1990; Trowbridge *et al*, 2000). Hipkins *et al (*2002) argue that in any format, discussion can provide opportunities

for students to clarify and share their own understandings, test out their understandings, ask questions and challenge the views of other students and the teacher, and use the new ideas with confidence. Moreover, Trowbridge *et al* (2000) suggest that teachers' asking and 'telling' should be at a minimum level because classrooms where the teacher is always the questioner and students are the respondents, do not easily promote student inquiry and participation. Instead, they encourage student passivity and dependence. Therefore, teachers need to use less question-answer dialogue but organise more class time for student questions, student individual and group reports and whole class and small group discussions. However, there are issues in this approach which need to be addressed: classroom management, time, teacher doubts about students' ability to originate a feasible research project and distrust that students will follow through to the end of the investigation (Abrams, 1998). In addition, teachers' subject matter knowledge may also prevent students from asking their own questions (Wragg, Bennett and Carre, 1989; Glenn, 2001; Alsop *et al*, 2002; Amos, 2002). Teachers who have low levels of understanding of subject matter knowledge may not wish their students to ask questions because they may not know how to respond. Therefore, as Lemke (1990) argues, it would become difficult for these teachers to move away from a position of student control through questions. The second condition for implementing inquiry-based teaching is that teachers should provide a 'responsive environment', which can be a classroom, a laboratory or the outdoors on a field trip (Suchman, 1966). It is not enough to supply only a sterile classroom or lecture hall for students. Instead students need a range of resources including books, a laboratory with enough equipment, library, and

computers (Joyce *et al*, 2000a; Trowbridge *et al,* 2000). For example, using ICT facilities makes student inquiry easier, quicker and a richer process than doing the equivalent using a textbook (Boohan, 2002). Mintzes *et al* (1998) argue that as long as they are carefully guided in their search of knowledge, students can obtain important information about a particular topic that has not been covered in textbooks (Mistler-Jackson and Songer, 2000; Peat and Fernandez, 2000; Boohan, 2002).

The third condition suggested by Suchman (1966) is that teachers should provide 'focus', which means that inquiry is a purposeful activity, a search for particular meaning in some event, object or condition that raises questions in the inquirer's mind. It is stimulated by confrontation with a problem. Knowledge is generated from inquiry (Joyce *et al,* 2000b). The final condition that teachers should fulfil is to provide 'low pressure'. This indicates that students will gain their reinforcements directly from the success of their own ideas in adding meaning to the environment (Suchman, 1966). In order to provide 'low pressure' to students, teachers should be positive and flexible to encourage students further (Joyce *et al,* 2000b).Furthermore, there is also need for a positive and supportive learning environment in order to foster student inquiry and to encourage students to ask their own questions (Alsop *et al,* 2002; Amos, 2002; McKeon, 2002). In non-threatening and trusting classroom environments, students can show their willingness to seek understanding and express their curiosity. On the contrary, in such classrooms where the conditions are not supportive and encouraging, students may not put forward questions. The teachers' role in encouraging student inquiry is often dependent on the creation of a co-operative social environment, where students learn how best to negotiate and solve

conflicts necessary for problem solving (Joyce *et al*, 2000a). In addition, teachers should also '*guide students in methods of data collection and analysis, help them frame testable hypotheses, and decide what would constitute a reasonable test of a hypothesis'* (p98). They should ask open-ended, higher level questions to their students to encourage them to find out answers to the problems at hand and reveal their own ideas and thoughts (Dori and Herscovitz, 1999; Glenn, 2001; Amos, 2002).To summarise, inquiry-based teaching is helpful for students to construct their own meaning and understanding and to gain some important skills that they can use throughout their lives. Therefore, teachers should encourage inquiry-based learning among students and create opportunities for them to conduct inquiry about a particular problem or issue, since is an activity-oriented, thought-provoking creative method in which students, out of curiosity and on their own, under the guidance of the teacher, probe, investigate, and interpret relevant issues and problems with a view to providing solution through reflective thinking and rational decmision-making which this method develops in the inquirer. This inquiry method involves the scientific approach of identifying problems, formulating hypothesis, collecting relevant data to authenticate the data, drawing conclusion even if tentatively and developing generalization. It is through exposing students to the more or less independent activities which the inquiry method entails that the students develop the intellectual skills essential for problem-solving.

Advantages of inquiry method

i. It inculcates in the learner reflective thinking through exposure to inquiry oriented processes and skills as well as issues and problems requiring solution.

ii. The reflective thinking acquired through the inquiry method enables the beneficiary to independently, or in collaboration with knowledgeable ideas, solve personal societal problems thereby living and surviving successfully in a complex society

ii. It arouses the curiosity of the learners, stimulates their interest and makes them actively involved in the teaching-learning process

iv. Inquiry oriented teaching engenders real learning because it fosters self-reliance which is consistent with one of the laudable Nigerian National objectives- the building of "a self reliant nation" (NPE, 2004).

Disadvantages

i. It is time-consuming and as a result the syllabus is rarely covered in depth.

ii. The planning of a good inquiry lesson is not easy

iii. In problematic situations, within only the reach of gifted or

iv. Burden and frustration.

2.3.4 Laboratory Method

Mari (1984) observes that laboratory can be conceptualized as a place designed, organized and managed to help students learn what science is and how scientists carry out investigation laboratory method is defined as the teaching procedure in

which the learner is helped to acquire firsthand experience regarding the subject matter usually obtained from investigation or experiment. The printed laboratory manuals are given to student in order to carry out the investigation (Abdullahi 1982). Atadoga and Anaolapo (2008) views laboratory method activity carried out by one or more persons through laboratory exercise and experimental approaches. This is explained below as:

i. Laboratory exercises are activities carried in order to provide practice in designing, operating, and interpreting experiments.

ii. Experiments are operations or procedures employed for the purpose of testing a hypothesis or supposition, confirming the known and discovering the unknown.

Odubunmi,(1995).observed that there are certain laboratory exercises that might be directed towards promoting verification of a concept, while others might attempt to promote science process skills, whatever may be the desired outcome every teacher needs to follow three steps when using laboratory method.

i Pre-laboratory discussion this prepares the students for laboratory activity. Here the science teacher discusses the important points concerning the activities to be carried out in the laboratory.

ii Giving Directives: Direction for laboratory exercise must be explicit. The students are made to understand what the problem is and objective of the experiments, and safety precautions required.

Post-laboratory discussions

Iii Report made by individual or groups are submitted for discussion, corrections are made, difference are identified and explained.

Advantages of Laboratory Method

i Laboratory method makes the students learn about the nature of science and technology thereby enhancing the students' interest and sharpening his/her understanding.

ii It offers student opportunity to develop manipulative skills through several attempts and traits in the laboratory.

iii Laboratory method has the potential of stimulating a lifetime interest in science in the students. Scientific attitude and character are also develop such as curiosity, open-mindedness, objectivity, honesty, reverence for life, and rationality.

iv It gives students opportunities to gain exposure to facts of scientific phenomena which and retention of information

Disadvantage

It is time consuming and need such care when handling equipment.

2.4 An Overview of Traditional Method

This is an oral (lecture) method of teaching, (Rhodes and Bellamy, 1999). It is essentially a one-way process. The current Nigerian classroom whether primary, secondary or tertiary institutions level, tends to resemble a one-person show with a captain but often comatose audience. Classes are usually driven by "teacher-talk"

and depend heavily on textbooks for the structure of the course. There is the idea that there is a fixed world of knowledge that the student must come to know. Information is divided into parts and built into a whole concept. Teachers serve as pipelines and seek to transfer their thoughts and meanings to the passive students. There is little room for student-initiated questions, independent thought or interaction between students.

The Traditional Method according to (Dianye and Gbamaja, 1990) is defined as a teaching technique in which one person usually the teacher presents a spoken discourse on a particular subject. Yore, (2001) sees the method as a teacher dominated approach to teaching. According to Bello (1981), the science teacher comes to the class fully armed with a mass of facts, he presents ideas or concepts, develops and evaluates them and summarizes the main point at the end, while the students listen and take down notes. He also observed that students merely "absorb and absorb" scientific facts and factual memorization of discrete facts. The traditional instructional method is also referred to the expository method which is an old aged long traditional method of teaching in which knowledge or information are presented, conveyed imparted, or transferred to learners by the teachers who dominates the authoritarian teaching-learning process, talks as an autocrat, as a repository of knowledge, to passive listening students who unquestionably see the teachers presentation as sacrosanct. The expectation is that the latter should be able on demand to regurgitate a rote-memory stored knowledge presented by the teacher. (mezieobi, Fubara and Mezieobi 2008).

Traditional method is fully teacher centred process. Students are given update of the factual materials in direct and logical manner and this has got a number of limitations. Communication is one way, experts are not always good teachers, and audience is passive. Learning becomes difficult to grasp. Proficient oral skills are necessary. Lecture should contain clear introduction and summary. As it is audience specific it must include examples. Hence there are many flaws in the present teaching system that is employed in our setup. Students are passive listeners; there is no exposures to critical thinking; No active learning; Discourages students from learning. There is lot of confusion in their minds and therefore subject as a whole is never grasped.

Traditional teaching is teacher-centred. In this paradigm teacher is authoritative person and students are the passive recipients of information (e.g. lecture, demonstration, Socratic etc. Students are expected blindly to accept the information they are given without questioning the instructor (Stofflet, 1998). The teachers seeks to transfer thought and meanings to the passive students leaving little room for student initiated questions, independent thought or interaction between students (Vast, 1998). Even the lab activities although done in a group, the traditional teacher dodge discussion or exploration of the concepts involved (Yore, 2001).

The Traditional Method of exposition has this advantage. It saves time and energy in that the teachers cover a large amount of materials (syllabus) to a large class size in a very short period. This is however a detriment to student learning in that only one sense organ is involved in learning. The Advantages of lecture method according to (Oladapo, 2008) includes the following.

i. It saves time and energy: It is not expensive as only the chalk is required. Good command of English and boldness saves the teacher a lot of challenge in the class.

ii It offers easy coverage of syllabus and faster dissemination of scientific information and facts.

iii. It allows easy handling of large classes without much stress.

The students are given the same material content at the same time that is there is uniformity in the facts the students are given.

iv. The students' efforts in searching for facts in books are saved as they are told the facts by the teachers.

v. The teacher has the full control of what the students should learn or know.

Disadvantages

i. Meaningful learning of science is never promoted as it appeals to only the sense of hearing

ii The different ability groups present in any given class are not taking care of those students who will learn better by handling and manipulating of objects are completely left out. This can be frustrating for this group of students.

iii It is stressful for students to sit still for a long time at once listening and writing. It can lead to restlessness and disruption of normal class procedures.

iv Traditional Method encourages only rote learning without necessarily aiding understanding.

vi. The students are passive and spoon-fed. It is teacher-centered

2.5 Overview of Objectives of Integrated Science

The philosophy and objectives of Integrated Science is based primarily on the philosophy and objectives of National Policy on Education as the affect science education in general and integrated science in particular. Based on the National policy on Education (2005), secondary school education is expected to:

i. Prepare the children to become useful to themselves and their society and

ii. Prepare the children for higher education.

Integrated Science philosophy according to Abba (1999) demands that the teaching be relevant to pupils needs and experiences, stress fundamental unity of science, lay adequate foundation for subsequent specialist studies add cultural dimension to science education and skill development through the use of discovery methods, problem solving activities and open-ended laboratory activities. However, many research reports have shown that the implementation of the core-curriculum is facing a lot of problems (Oke, 2000. Wukocha, 2002 and Ifeakor, A.C 2006).

These problems include unqualified teachers, pedagogical skills, learning materials, language and cultural factors and improper implementation of the Basic science curriculum. These problems could be solved psychologically by allowing children learn more by observing, touching and interacting with the environment and its contents. The teachers teaching strategy and methods as observed by STAN (1979) and Oguniyi (1986) should include the use of discovery teaching, problem solving activities and the involvement of students in open ended field of laboratory exercises or activities. It is against this background that the activity-based instructional

strategy was developed to enhance students understanding of scientific concepts through acquisition of the science process skill.

The National Curriculum for junior secondary school volume 1 - science spelled out the objectives of integrated science which is aimed at enabling the child who is exposed to it, acquire the following skills. Observing carefully and thoroughly, Reporting completely what is observed, Organizing information acquired, Generalizing on the bases of acquired information, Predicting as a result of generalizing, Designing experiments (including controls where necessary to check prediction), sing models to explain phenomena where appropriate and Continuing the process of inquiry when new data do not conform to prediction.

2.6 Students Performance in Integrated Science

The issue of poor performance in science has been of great concern to many scholars (Yero, 2009). While Peter (2009) observed that the performance of students in science courses in Nigeria when compared to students from other countries of the world is very unsatisfactory. While Aghadiuno (1995), Okpala and Onocha (1995), Olarenwaju (1999) found out in their separate studies that there is a decline in students performance in Basic science. Similarly previous performances in science have not been encouraging but rather disheartening. This can be traced back as far as 1986 when the then Minister of Education Professor Jibril Aminu express his utmost disappointment over the students performances in science WAEC Examination. The situation has not change credibly as Olotu (1992) also expressed the same view but attributed the situation to bad teaching which is being dominated by facts at the expense of practical work and most recently. Ezekwesili (2007) mentioned that the

specific challenges facing the education sector include: inadequate infrastructural facilities, weak quality assurance mechanism, high gender disparity in the north, and boys drop out in the east among others. A number of researchers such as Eke (1986), Adepoju (1991), Salau (1996) and Atadoga (2003), have attributed the low student performance in science and mathematics to poor laboratory facilities, teachers qualification, work load and teaching method.

Globally there is a general concern on the performance of students in science, technology and mathematics but the problem is so pronounced in developing countries rather than the developed countries. This may be attributed to poor management of Economic resources despite huge investment in the field of science, mathematics and technology education. In Nigeria in particular studies have shown that most teachers are reluctant to use teaching methods shown by research to be more effective than the traditional lecture method while the science curriculum is not properly implemented. This study is an attempt to sensitize practicing teachers on the need to adopt new teaching strategies that will improve students' performance in science.

In Nigeria several factors have been advanced as the causes of students' poor performance in science, mathematics and technology education. The National Population Commission (2004) maintained that many school aged children do not have access to education due to poverty and in ability to afford the prescribed school fees and the many other charges collected by the schools, distance of the school from the home and the security concerns of parents especially when the girl-child is involved. If children lack access to basic education, the issue of participant in the

formal learning process in science and technical subjects is hampered. Njoku (1999) observed that the number of science and technical teachers available in basic and senior secondary levels of education in Nigeria is grossly inadequate most especially in the northern part of the country. It could be noticed also that there is inequality in the distribution of these teachers in urban and rural schools and also in private and federal government colleges as compared to state and local government schools. Another factor which contributes to the poor performance of students in science and integrated science generally is that poor science and technical teacher education programme which Nzewi and Njoku (2006) attributed to inadequate infrastructure, lack of emphasis on pedagogic skills that will enable them adopt learner-centered approaches to teaching, inability to sustain motivation and interest of students and lack of emphasis on method so preparation and production of teaching/learning resources.

Another factor militating against student effective performance in science and technology include inadequate quality of science and technical textbooks which are also gender biased (Njoku, 2000). Majority of science and technology text books are dominated by theoretical concept to the near exclusion of applications and utility aspects of science, hands on the minds-on activities are very few. In addition, learner who use these books sees science and technology as school matter that do not necessarily have any bearing on their everyday life and living. In another view Adeyanju (2006), maintained that poor motivation of science and technical teachers as a result of poor remuneration, delayed payment of salaries and other emoluments, poor and lowly image of the teaching profession and negative attitude of the

government and the general public to teachers. This has resulted in teachers developing negative altitude towards the teaching profession. As a result many teachers in Nigeria public schools are uncommitted, ineffective and unhappy to do their duties. The teaching of science and technology subjects which needs much commitment and personal sacrifices on the part of the teachers has suffered most. Hence student's performance in Science and Technology subjects has over the years been very poor and unimpressive. It appears government have not realized that national development depends on education generally and in science and technology education in particular as only lip-service is paid to this sector. Okeke (1996) reported that guidance counselors give boys and girls gender-biased counseling with regards to Science and Technology subjects, also guidance counselors encourage the boys to enroll and work hard in the physical sciences because of the relevance of the subjects to future studies in the disciplines of engineering, technology, medical sciences, basic sciences and mathematics.

The counselor discourage the girls by telling them that physical sciences and mathematics are difficult and are meant for boys; that they would not need the subject in future since they would invariably not be in the descriptive of science and engineering; and that they can easily make good grades in the humanities. This biased counseling tends to undermine their career interest, motivation, enrolment, participation, retention and attainment in science and technology disciplines.

Based on the above assertions the following basic principles are suggested on which teachers should design science and technology learning environment for the attainment of popular participation of learners and optimum learning out comes

(National Teachers Institutes of learners and optimum learning outcomes (National teachers Institute (NTI), 2005), on which this study is based.

* At the junior and senior secondary education levels, teaching and learning should be learner – centered rather than teacher centered.
* School learning activities should be made relevant to learners by connecting the activities to real life situation at home and in the general society. The socio-cultural environment of the learner should also be considered as it will enable him/her to develop knowledge and skills that she/he can apply in solving daily problems in their world.
* Memorization, drill and practice should not be order of the day but teaching and learning strategies should be geared towards improving understanding and thinking.

The above outlined principles should form the frame work science and technology curriculum and instruction for the modern school, while teachers are advised to use them to organize classroom activities for the students.

2.7 Empirical Study

The Traditional approach to science teaching dominates Integrated Science classes. Studies by Bichi (2002), Nwosu (2000), Martins (1994),and Knowles (1980) attested to the fact that most integrated science teachers today in Nigeria employ the Traditional Method. Ezeh (2005) reaffirms that teachers have just taking to notes copying techniques after the talk, these methods at best emphasize the cognitive aspect of teaching only.

Balogun (1995) in his studies on the experience of Integrated Science teaching in Nigeria find out that teachers and students generally had a favorable attitude towards Integrated Science, although teachers agreed that pupils should be actively involved in the teaching-learning process. This is not reflected in their teaching. He observed expository and note giving and talking predominated the lessons. This view is supported by Hagertty (2000) and Chukwuneke (2009) that teachers continue to teach science as a body of abstract knowledge to the detriment of active learning. Researches carried out in the areas of Activity- Based reports that students learn better when they are actively involved in their learning process (Bichi, 1988 and Inyang, 1988, Mani 1982, Usman 2000)

Piaget stressed the importance of learning by doing, especially in science. His research clearly mandates that the learning environment should be rich in physical experiences. Educational researches have shown many advantages of using Activity-Based, on science programs. Bredderman, (1982), reported the [result of a meta-analysis of 15 years of research on Activity-Based programmes. This synthesis of research was based on approximately 57 studies involving 13,000 students in 1,000 classrooms. All of the studies involved comparing Activity-Based programmes with comparable classrooms using a Traditional approach to science teaching. A variety of students' performance measures were analyzed. The most dramatic differences were found in science process skills where the students in Activity-Based programmed performed 20 percentile units higher that the comparison groups. The students in these programmes scored higher that the control groups in the following measures (ranked from largest to smallest differences) creativity, attitude,

perception, science content and mathematics. Students who were disadvantaged economically or academically gained the most from the Activity-Based programme. Other research by Gradsden, Shymansky, (1988) indicates that Activity-Based Method could improve student creativity in problem solving, promote student independence, and help low ability students overcome initial handicaps (Shymansky & Penick, 1981). Research by Caprico, (1994) indicates that better exam grades were obtained by students taught using constructivist methodology. This is also an Activity-Based. Supporting this finding, Saigo (1999), White (1999) concluded that *"the constructivist model has been found to slightly influence students' achievement in a positive way."* The constructivist model is capable of getting students more involved in learning. Kurt and Somchai (2004) in their own research study on constructivism also found that students used for their study participated more in the use of information thus Skamp (2004) suggested that the mind-on and hands-on method which actively involves the students is what Constructivist emphasized in it teaching approach hence knowledge gained last long in their memory, since human being are not passive recipients of information. Learners actively take knowledge, connect it to previously assimilated knowledge and make it theirs by constructing their own interpretation (Cheek, 1992**).**

However, Dogru and Kalender compared science classrooms using traditional teachers-centered approaches to those using student-centered, constructivist methods. In their initial test of student performance immediately following the lessons, they found no significant difference between traditional and constructivist methods. However, in the follow-up assignment 15 days later, students who learn through

constructivist methods showed better retention of knowledge than those who learned though traditional methods. While some constructivist argues that "learning by doing" enhances learning, critics such as Mayer (2004). Kirschnes, Swellers, and (clark, 2006), have argued that little empirical evidence exist to support this statement given to novice learners. Swellers, (1988) argue that novices do not possess the underlying mental models or *"schemas" necessary for learning by doing"* (Kirschner 2006).

It is a popular notion that the used of practical-oriented approaches facilitate students' better understanding and performance in science than the use of the lecture and teacher demonstration methods. Nonetheless, a search in the literature shows inconclusive findings. Several studies have demonstrated that students taught science using practical work displayed better attitudes to science and had superior science achievement than those taught science using the lecture method (Archibong, 1997; Stohr- Hunt, 1996; Thompson & Soyibo, 2002; Ugwu & Soyibo, 2004). But, Watson, Prieto, and Dillon (1995) and Toplis (1998) reported that the use of practical work had only a marginal impact on 9th-graders' understanding of combustion and 8th-graders' understanding of acids and alkalis respectively. In fact, Bucknor and Soyibo (2001) recorded no significant differences in the knowledge of acids and bases of Jamaican 10th-graders taught using the lecture method, teacher demonstrations and practical work and those who were taught with the lecture and teacher demonstration methods. Noteworthy is that Mulopo and Fowler's (1987) finding that Zambian 11th-graders taught chemistry with the lecture method significantly outperformed their counterparts taught using the discovery approach,

contradicted the findings of many studies (Archibong, 1997; Esiobu & Soyibo, 1995; Storhr-Hunt, 1996; Thompson & Soyibo, 2002; Ugwu & Soyibo, 2004; Walford-Palmer, 2004).Thus this study was undertaking to find out the effect of Activity-Based and Traditional Talk and Chalk method and the results showed that there was significant difference in favour of the Activity-Based.

Gender

In respect to gender differences in high school students' science performance, whilst many studies have reported that male students generally outperformed their female counterparts in science and mathematics tests (Comber & Keeves, 1973; Forrest, 1992; Soyibo & Evans, 2002; Third International Science and Mathematics Study (TIMSS), 1997), reported no gender differences and also (Beaumont- Walters & Soyibo, 2001; Ellis-Hall & Soyibo, 2004; Edwards & Soyibo, 2003; Esiobu & Soyibo, 1995; Greenfield, 1996; Ugwu & Soyibo,

2004). With particular reference to integrated science, Soyibo and Pinnock (1998) found no significant gender differences in Jamaican 11th-graders' performance in integrated science, Stockhausen and Soyibo (2004) reported significant gender differences in Jamaican 9th-graders' performance in integrated science in favour of the girls. On the other hand, Evans (2001) reported that over the last 15 years, Jamaican female students markedly outperformed their male peers at the primary and secondary levels in all school subjects. She observed that the harsh treatments that teachers meted out to Jamaican male primary and secondary students and the inability of these students to read materials written in the English language were among the principal causes of male underachievement in schools. Again, Millar

(1999, p. 296) noted that, all over the Caribbean, girls have surpassed (and continue to surpass) the boys in school achievement at the early childhood, primary, and secondary levels and that at the tertiary level, males continue to maintain the advantage in engineeringrelated subjects, but have lost it in virtually all other subjects - although in science-based disciplines the gap is still relatively small. Furthermore, recent evidence from Northern Ireland indicates that at both the "O" and "A" levels, boys received lower grades than girls in all sciences (Millar, 1999).

2.8 Summary

The review of relevant literature for this study has helped to shed more light on issues relating to Activity- Based and Traditional Talk and Chalk Method on students' academic performance. The studies reviewed have shown that active instructional techniques offer an effective teaching strategy, which could be used as an advantage to teach science in lower secondary classes. In some research topics related to teaching of science indicated that there is a gap between theory and practical teaching despite the call for child centred learning which comprises of activity- based teaching strategy. However teachers have tended towards instructional activities which require the students to memorise more in a passive way. This might be as a result of teachers drifting in practice towards easier, less challenging methods of instruction which is the traditional talk and chalk method.

Teachers need to engage their students and get them actively participating in the Integrated science. Handelsman (2004) published an article in Science that offers a guide to learning how to do scientific teaching. Science is an important subject to teach, students need to know what is happening in their bodies as well as the

environment around them. So the researcher challenges all science teachers to get their students out into the area where they are learning through hands- on minds-on. Activity-Based teaching. Gender Related Studies; in respect to gender differences in high school students' science performance, whilst many studies have reported that male students generally outperformed their female counterparts in science and mathematics tests (Comber & Keeves, 1973; Forrest, 1992; Soyibo & Evans, 2002; Third International Science and Mathematics Study (TIMSS), 1997), reported no gender differences, also (Beaumont- Walters & Soyibo, 2001; Ellis-Hall & Soyibo, 2004; Edwards & Soyibo, 2003; Esiobu & Soyibo, 1995; Greenfield, 1996; Ugwu & Soyibo, 2004). With particular reference to integrated science, whereas Soyibo and Pinnock (1998) found no significant gender differences in Jamaican 11th-graders' performance in integrated science, Stockhausen and Soyibo (2004) reported significant gender differences in Jamaican 9th-graders' performance in integrated science in favour of the girls. On the other hand, Evans (2001) reported that over the last 15 years, Jamaican female students markedly outperformed their male peers at the primary and secondary levels in all school subjects. She observed that the harsh treatments that teachers meted out to Jamaican male primary In respect to gender differences in high school students' science performance, whilst many studies have reported that male students generally outperformed their female counterparts in science and mathematics tests (Comber & Keeves, 1973; Forrest, 1992; Soyibo & Evans, 2002; Third International Science and Mathematics Study (TIMSS), 1997), some reported no gender differences (Beaumont- Walters & Soyibo, 2001; Ellis-Hall & Soyibo, 2004; Edwards & Soyibo, 2003; Esiobu & Soyibo, 1995; Greenfield,

1996; Ugwu & Soyibo, 2004). With particular reference to integrated science, whereas

Soyibo and Pinnock (1998) found no significant gender differences in Jamaican 11th-graders' performance in integrated science, Stockhausen and Soyibo (2004) reported significant gender differences in Jamaican 9th-graders' performance in integrated science in favour of the girls. On the other hand, Evans (2001) reported that over the last 15 years, Jamaican female students markedly outperformed their male peers at the primary and secondary levels in all school subjects. She observed that the harsh treatments that teachers meted out to Jamaican male primary and secondary students and the inability of these students to read materials written in the English language were among the principal causes of male underachievement in schools. Again, Millar (1999, p. 296) noted that, all over the Caribbean, girls have surpassed (and continue to surpass) the boys in school achievement at the early childhood, primary, and secondary levels and that at the tertiary level, males continue to maintain the advantage in engineering related subjects, but have lost it in virtually all other subjects although in science-based disciplines the gap is still relatively small.

Furthermore, recent evidence from Northern Ireland indicates that at both the "O" and "A" levels, boys received lower grades than girls in all sciences (Millar, 1999).

CHAPTER THREE
RESEARCH METHODOLOGY

3.1 Introduction

This study focuses on the effects of Activity-Based Instructional Strategy on the academic performance of Integrated Science students at the junior secondary school level. The chapter described the methodology that is used in carrying out the research work under the following sub-themes. Research design, population of the study, sample size and sampling procedure, instrumentation, pilot study, methods of data gathering and methods of data analysis.

3.2 Research Design

The research design of the study was quasi experimental in nature. A test re-test method was used. This involved a pre-test and a post-test as advocated by Sambo (2005: p 157). It involved two experimental groups and two control groups. All the groups were pre-tested to determine their equivalence. The researcher decided to select the Quasi-experimental design because the school authority may not allow strict randomization because it can disrupt or divide the class. Quasi-experimental research design permits the use of intact classes.

3.3 Population of the study.

The population of the study consisted of all the 3690 junior secondary school class one (JSS 1) students in all the fifteen JSS public schools in Kaduna North Local Government Area. Kaduna State Ministry of Education

Table 3.1: List of Junior Secondary Schools in Kaduna North and their population.

S/No	Schools	Number of students
1.	Government Girls Junior Secondary School Independence way	360
2.	Government Girls Junior Secondary School Doka	240
3.	Government Girls Junior Secondary School Ungwan Sarki	380
5.	Government Junior Secondary School Badarawa	210
6.	Government Boys Junior Secondary School Doka	150
7.	Government Junior Secondary School Kabala Costain	200
8.	Government Junior Secondary School Kawo	300
9.	Government Junior Secondary School Ungwan Rimi	400
10.	Government Junior Secondary School Ungwan Sarki	270
11.	Capital School Government Secondary School	200
12.	Government Girls Secondary School Kawo	180
13.	Rimi College	300
14.	Sardauna Memorial College	320
15.	Asma'u Makarfi Government Secondary School Ungwan Shanu	180
	Total number of population	3690

Source: Kaduna State Ministry of Education. 2010

3.4 Sample and Sampling Procedures

The sample has been drawn from the fifteen Junior Secondary Schools in Kaduna North Local Government Area. And it comprises 238 junior secondary school student (JSS I). A simple random sampling technique was used to select the two experimental groups and two control groups for the study, from Government Girls Junior Secondary School Independence Way and Asma'u Makarfi Government Secondary School Unguwan Shanu being the Experimental and Control female

groups respectively. And Government Junior Secondary Doka Boys and Government Junior Secondary School Badarawa. A coin using head or tail was used to assign the schools as experimental and control groups respectively. The pretest was administered to both groups. The test instrument covered the topics treated during the six weeks of instruction. At the end of the six weeks the same test was administered to both Experimental and the Control group classes as post-test with the numbers changed so that the students may not think it was the same examination.

3.5 Instrument for data collection

The instrument used in this study was an adapted test of a multiple choice in Integrated Science produced by Inyang and Nwaiwu (2001). After covering the five topics from Integrated Science curriculum in the third term work, the learners were post tested after treatment. See Appendix 1 for questions.

3.5.1 Validity of the Instruments

The Integrated Science multiple choice questions are obtained by adapting test items from Inyang and Nwaiwu (2001). The items in the test covered all the units that were taught by the researcher on the topics; Air and its properties, composition of air and its uses, water and water cycle and it uses, purification of water, types of force and friction in use. Science related occupations and Machine (Tools). The test questions selected tested students knowledge and retention of concepts.

3.8.2 Reliability of the Instruments

The reliability of a test is the consistency with which a test repeatedly measures what it is intended to measure. Owolabi and Akinpelu (1998). The co-efficient of correlation between the administrations of the same instrument were computed to determine the reliability of the instrument. Note that a reliable test will have a reliability co-efficient that is close to 1.00. The reliability of the instrument after pilot test was administered was 0.79.

3.6 Pilot Study

The pilot Study was carried out in Demonstration Secondary School Kaduna Polytechnic. It was not part of the sampled schools. The purpose of the pilot study was to determine the reliability co-efficient of the instrument of the study through a trial run. The test questions were administered and scored. This gave room for some adjustment by removing the two questions that all the students that are used for the pilot testing failed before the commencement of the field work.

3.7 Procedure for Data Collection

A letter of introduction was endorsed by the researcher's supervisor and Head of Department and was carried along by the researcher to seek permission from the State Ministry of Education Kaduna North Local Government. It was also used to seek permission from the Principals of the four schools where the study was conducted. A pre test was administered to both groups before the commencement of teaching. After teaching for six weeks a post-test was administered to compare student's performances for both the experimental group and the control group using activity – based instructional strategy and traditional method respectively.

Then the experimental group and the control group were taught using Activity-Based Instructional Strategies and Traditional Method respectively for period of six weeks after which a post-test was administered.

3.8 Procedure for Data Analysis

The t-test (t) statistic was used to determine whether or not there is significant difference between academic performance of students taught using Activity-Based teaching method and the Traditional Method respectively. The t-test was used at 0.05 level of significance, the t-test was used to analyze the data because there were only two groups of students in the study, i.e. Activity Based Instructional group (Experimental group) and Traditional Method group (control group) for both the boy's schools and the girl's schools.

CHAPTER FOUR

ANALYSIS, RESULTS AND DISCUSSION

4.1 Introduction

In this chapter, the analysis of data and the results obtained and their discussion are presented. The analysis essentially involved statistical testing of the hypotheses stated in chapter one using Computer Paired Sample Statistics (PSS). The level of significance adopted is 0.05. This level of significance formed the basis for retaining or rejecting each null hypothesis stated. The t-test statistic was particularly used to test all the hypotheses stated in chapter one.

4.2 Presentation and Analysis of data according to Research Questions.

Research Question 1: What is the effect of Activity Based Instructional Strategy on academic performance of male students in Integrated Science?

The scores collected from the experimental and control groups for the [pre-test and post-test of the boys' schools were analysed and compared as shown in the table below.

Table 4.1 Comparison of the mean values pre-test and post-test of the experimental and control groups of boys' schools.

Group	Test	N	Mean	Std. Deviation
Experimental	Pre-test	58	1.8759	1.2158
Control	Pre-test	58	1.8172	1.2318
Experimental	Post-test	58	6.7368	1.8948
Control	Post-test	58	4.6379	2.4257

From the table above it could be seen that there was negligible mean difference in the performance of pre-test between the experimental and control groups with the mean scores 1.8759, and 1.8178 respectively. However in the post-test scores the experimental group had higher mean score of 6.7368 than the control group with a mean score of 4.6379. This was attributed to the treatment given in the experimental group taught using the Activity-Based Instructional Strategies. However it is worth noting that there is an effect shown from the mean of the control group with 4.6379. Hence the answer to the research questions one is that the Activity-Based Instructional Strategies have a significant effect on male students' academic performance in Integrated Science.

Research Question 2: What is the effect of Activity-Based instructional Strategies on the academic performance of female students in Integrated Science?

The scores collected from the experimental and control groups in the pre-test and post-test of the girls' schools were analysed and compared as shown below.

Table 4.2 Comparison of the mean values of pre-test and post-test of female students of experimental and control groups.

Group	Test	N	Mean	S.D
Experimental	Pre-test	61	1.8689	1.1615
Control	Pre-test	61	1.8197	1.4550
Experimental	Post-test	61	6.7213	1.7714
Control	Post-test	61	4.5410	2.0213

Table 4.2 showed that the female students in the Experimental group perform better than those in the control group in the post-test with the mean score of 6.7213 and 4.5410 respectively. The mean gain being 2.1803 indicated that the Activity- Based Instructional

Strategy is more effective than the Traditional Method even though the Traditional Method also has some effect on the academic performance of the female students. Therefore the answer to question two is, there was a mean difference which showed the positive effect in the performance of those taught using Activity-Based Instructional Strategy.

Research Question 3: What is the effect of Activity-Based Instructional Strategies on male and female Students academic performances in Integrated Science?

Table 4.3 Comparison of the mean values of pre-test and post-test of male and female students taught using Activity Based Instructional Strategy.

Gender	Test	N	Mean	S.D
Male	Pre-test	58	1.8758	1.2159
Female	Pre-test	61	1.8689	1.1615
Male	Post-test	58	6.7368	1.8948
Female	Post-test	61	6.7213	1.7714

The result in table 4.3 above, revealed a similar performance in the mean score of male and female students in both pre-test and post-test. The male and female performances improved after the treatment which is Activity-Based Instructional Strategies with the male mean score of 6.7368 and the female mean score of 6.7213.This showed that the Activity-Based Instructional Strategy is gender friendly. Thus the answer to question three is there was no effect as shown by the nearly the same mean in the performance of both male and female that are taught using Activity- Based Instructional Strategy.

4.3 Presentation and Analysis of Data According to Null Hypothesis

Ho_1: There is no significant difference in the mean performance of male students taught Integrated Science using Activity-Based Instructional Strategies and the mean performance of male Students taught Integrated Science using Traditional Method.

Table 4.4: Post-test comparisons of male experimental and control groups.

Group	Test	N	Mean	S.D	P	Df	Tcal	Tcri
Experimental	Post-test	58	6,7368	1.8948				
					.000	114	6.565	1.966
Control	Post-test	58	4.6379	2.4257				

Table 4.4 above showed that t-calculated 6.565 are far greater than t-critical 1.960 at the degree of freedom 114, at 0.05 level of significance. This showed that there is a significant difference in the mean performance of students taught Integrated Science using Activity-Based Instructional Strategies compared to those taught using Traditional Method. The null hypothesis is therefore rejected. This is based on the decision rule as advocated by Sambo (2008) that if the calculated value of the statistic (t) is greater than the critical value of (t) the null hypothesis is rejected for the alternative hypothesis.

Ho_2: There is no significant difference in the mean performance of female students taught Integrated Science using Activity-Based Instructional Strategy and the mean performance of Female Students taught using Traditional Method.

Table 4.5: Post-test comparisons of female students' experimental and control groups.

Group	Test	N	Mean	S.D	P	DF	T cal	T crit
Experimental	Post-test	61	6.7213	1.7714	.000	120	S 6.336	1.96
Control	Post-test	61	4.5410	2.0213				

The table 4.5 above showed that the t-calculated (6.336) is greater than t-critical (1.960) at the degree of freedom of 120, at the observed level of significance 0.05. This indicated a significant difference in the mean performance of female students taught Integrated Science using Activity-Based when compared to the mean performance of students taught Integrated Science using Traditional method. This showed that the experimental group performed better than the students in the control group. Therefore, the null hypothesis which states that there is no significant difference in the mean performance of students taught Integrated Science using Activity-Based Instructional method is rejected.

$Ho_{3:}$ There is no significant difference between the mean performance of male and female students taught Integrated Science using Activity-Based Instructional strategy.

Table 4.6: Post-test comparisons of male and female students in the experimental.

Group	Test	N	Mean	S.D	P	Df	Tcal	Tcri
Male	Post-test	58	6.7368	i.9579	.000	117	0.158	1.96
Female	Post-test	61	6.7213	2.0760				

Table 4.6 showed the experimental groups for both boys and girls with almost the same mean 6.7368 and 6.7213 respectively. This showed that there is no significant difference in the mean performances of the boys and girls taught Integrated Science using Activity-Based Instructional strategy. The t-calculated was found to be 0.16 which is less than the t-critical 1.96. Therefore the null-hypothesis is retained at 0.05 level of significance according to the decision rule by Nwodu(1990).which says if the t-calculated is less than the t-critical then the Null hypothesis is retained.

4.4 Major findings in this Study

i. The major findings in this study revealed that the Activity-Based Instructional Strategy is more effective than the Traditional Method. However the Traditional Method was found to be also effective in a way since this study discovered that there is significant difference in the performance of students taught using the Traditional method. Hence the traditional method should not be discarded completely rather it could be used with other methods such as Activity–Based for effective teaching and learning. The major findings can be enumerated thus: i the Activity Based Instructional Strategy enhance the teaching- learning process thereby improving academic performance.

ii The Traditional Method was also found to be effective, only that when it was compared to the Activity-Based Instructional Strategy that the later was found to be more effective.

iii The Activity-Based Instructional Strategy is gender friendly, i.e the teaching method is not gender selective since both experimental groups of boy schools

and girl schools performed the same; having mean of 6.7368 and 6.7213 respectively.

4.5 Discussion of findings based on research questions

1 What is the difference between the mean performances of those male students taught Integrated Science using Activity-Based Instructional Strategies and those male students taught Integrated Science using Traditional method?

Table 4.1 reveals that the students in the experimental group perform better than those in the control group in the post-test with the mean score 6.7368 and 4.6379 respectively. The mean gain being 2.0989 suggested that the Activity-Based Instructional Strategy is more effective than the Traditional method. Even though the mean of the traditional method showed that there was an effect on the academic performance of the students. It should be noted that the pre-test of both groups are almost the same with the mean being 1.8758 for experimental and 1.8172 for the control group that means they both had the same base.

2 What is the difference between the mean performances of those female students taught Integrated Science using Activity-Based Instructional Strategies and those female students taught using Traditional method?

Table 4.2 shows that the female students in the experimental group performed better than those in the control group in the post-test with the mean score of 6.7213 and 4.5410 respectively. The mean gain being 2.1803 indicated that the Activity-Based Instructional Strategy is more effective than the Traditional

Method even though the Traditional method also has some effect on the academic performance of the female students.

3. What is the difference between the mean performance of male and female students taught Integrated Science using Activity-based Instructional Strategies?

   The result in table 4.3 revealed a similar performance between the male and female students in both the pre-test and post-test. Both male and female performances improved after the treatment. This showed that the Activity-Based Instructional Strategies is gender friendly and as such there is no difference between the mean performance of male and female students taught Integrated Science using Activity-Based Instructional Strategies, the mean scores being 6.7368 and 6.7213 respectively. Thus the effect on gender based is negligible, so it can be concluded that Activity-Based is gender friendly.

4.6 Discussion of findings based on hypotheses

Ho_1 There is no significant difference on the mean performance of male students taught Integrated Science using Activity-Based Instructional Strategy and mean performance of male students taught using Traditional method.

Table 4.4 shows that the t-calculated 6.565 is greater than the t-critical 1.960 at the degree of freedom 114. The observed level of significance is 0.05. From the decision rule which states that if t-calculated is greater than the t-critical then the null hypothesis is rejected. Therefore this is rejected for the alternative hypothesis. That is to say that there is significant difference between the mean performance of male students exposed to Activity-Based Instructional Strategies and that of the male

students exposed to the Traditional Method in favour of the Activity-Based Instructional Strategies. This is in agreement with Chickering and Gamson(1987) that stated that learning is not a spectator in sport. Students do not learn much just by sitting in class listening to teachers, memorising pre-packaged assignments .More so, recent findings indicated that the use of active learning materials resulted in improved science achievement and more positive attitudes about science (McManus, Dunn, & Denig, 2003). Similarly, the use of active learning strategies for a general chemistry course was associated with improved student achievement (Kovac, 1999). Further, the use of student-centred classroom instructional strategies for a life sciences course resulted in positive student responses and was effective for student performance on standardized exams (Lunsford & Herzog, 1997). Finally, the use of active learning strategies for sixth-grade science was associated with positive attitudes regarding learning gains and high levels of motivation to succeed in science (Maheady, Michielli-Pendl, Mallette, & Harper, 2002). There has been much emphasis on participatory classroom activities because there is a general agreement that effective learning requires students to be active in the learning process (Roth and Roychoudhury, 1994; Strage and Bol, 1996; Stepanek, 2000; Parkinson, 2004). In addition, researchers believe that the more students are involved in the learning process, the more they learn the topic (Trowbridge *et al*, 2000; Deboer, 2002).

Ho_2 There is no significant difference on the mean performance of female students taught Integrated Science using Activity-Based Instructional Strategies and the mean performance of female students taught using Traditional method.

Table 4.5 showed that the t-calculated is 6.336 and the t-critical 1.960 at the degree of freedom 120, and observed level of significance 0.05. From the decision rule the null-hypothesis is rejected in favour of alternative hypothesis since the calculated value of t exceeds the critical or table value. Hence there is significant difference in the mean performance of female students taught Integrated Science using Activity-Based and the mean performance of female students taught using Traditional method.

The finding agreed with Ornstein(2006) who reported that when Activity-Based method of teaching is used, there is a great improvement observed in the academic performance, Basda and Kirisaoghi(2006) also investigated effects of Activity-Based in teaching they found out that students enjoyed and developed positive attitude toward the course and learned the subject better as they observed in the academic performance.

There was also significant difference according to Olonikooba and Lawal(2007) when conducted a study on guided Discovery Approach and Creativity attainment among Basic Science. The experimental group performed better than the control group who were taught with the lecture method. This study was also in agreement with Thompson & Soyibo, 2002; Ugwu & Soyibo, 2004; Walford-Palmer,2004).Conducted their study on the effect of Activity-Based and Traditional Method and the results showed that there was significant difference in favour of the Activity-Based.

Ho_3 There is no significant difference between the mean performances of male and female students taught Integrated Science using Activity-Based Instructional Strategy.

Table 4.6 showed that the t-calculated 0.16 is less than the t-critical 1.96 at the degree of freedom 117, observed at level of significance 0.05. In comparison with the performances of male and female students in the experimental group, the t-test analysis revealed no significant difference.

The studies which concurred with equal performances of male and female students in a science and technology class include; Abu,(2000),reported that there was no significant difference in the performance of male and female students taught using individualized guided discovery method of teaching. This revealed that an Activity-Based kind of teaching method is gender friendly. Ogu,(2010),observed no significant difference between students performances scores according to their gender when they were taught using the proceed skill-based science teaching method. While Odubunmi and Onafowokan(2003) observed no difference in performance based on gender when the subjects were taught using Hands-on experience method of teaching basic science at junior secondary school level.

Bichi(2002) revealed that there was no significant difference in the performance of both male and female students in his study on Effect of Problem Solving Strategy and Enriching Curriculum on Senior Secondary School Students achievement in evolution concepts using problem solving Instructional method.

4.7 Summary

The data collected using the test instrument produced by Inyang and Nwaiwu (2001) was analysed and presented and discussed according to the three research questions from which the three hypotheses derived were tested using the t-test statistic which revealed the rejection of null hypothesis Ho_1 and Ho_2 then the retention of null hypothesis Ho_3.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

In this chapter the summary of the findings from the study are presented. The conclusion from the findings and recommendations are discussed. Suggestions for further studies and contributions to knowledge were also dealt within this chapter.

5.2 Summary

This study was conducted to find out the effects of Activity Based Instructional Strategies on the academic performance of students in Integrated Science in Junior Secondary Schools in Kaduna.

Three (3) research questions and hypotheses were raised. The research was based on educational theory of cognitive constructivism while the interactive review reflected the variables in the research topic which includes Overview of Activity-Based Instructional strategies; Overview of Traditional Method and Review of Empirical study. The research design used was the quasi experimental involving pre-test and post-test non equivalent group while sample used was 238 out of a population of 3690. The instrument of the research was a 30 item adapted test of a multiple choice in Integrated Science produced by Inyang and Nwaiwu (2001). The three hypotheses were tested using t-test statistic. Major findings of the study revealed that students taught using Activity- Based Instructional Strategies performed better than those taught using Traditional Method. More so the result also showed that learning takes

place from the control group taught by the Traditional Method. It can be inferred that if Traditional Method is sandwich with Activity Based Instructional Strategies, effective learning will take place. So it can be said that the Traditional Method should not be discarded totally but should be sandwiched with other methods of teaching that are Child centered, such as Activity-Based method. More so it was discovered by this study that Activity-Based Instructional Strategy is gender friendly.

5.3 Conclusion

The Activity-Based Instructional Strategies which lay emphasis on 'hands-on minds-on' helps students develop manipulative skills (process skills) which are more effective to the Traditional Method. The involvement of students as stated by (Udogu, Ifeakou and Njelita, 2007). Take care of students in different ability groups, that is high achievers and under achievers, as well as gender while the involvement of students in learning has also enhanced the performance of students taught using the Activity-Based Instructional strategies. This finding led to the conclusion that the use of Activity-Based Instructional strategies in teaching and learning Integrated Science was effective, however those in the control group that used Traditional Method equally performed, though when they were compared to the experimental group, the experimental group surpassed the Control group. The researcher however concluded based on the analysis of the results in this study, that the integration of Activity-Based Instructional strategies with the Traditional Method could enhance the performance of students in Integrated Science.

The finding of this study showed that students' academic performance can be enhanced when student-centered learning through Activity-Based is used. The study

found out that students learn better when they are allowed to participate actively in the class by interacting with the teacher and colleagues. Though the result revealed Activity-Based instructional strategies is more effective than traditional method, however the traditional talk and chalk should not be discarded totally because of its effectiveness in the product of science academic performance. Instead both can be incorporated by the teacher for effective teaching and learning.

5.4 **Recommendations**

The findings of this study have several implications for the teaching and learning of Integrated Science at Junior Secondary School level. Based on these findings, the following recommendations are made:

1. In terms of academic performance this study showed that Activity- Based Instructional Strategy enhanced the academic achievement of the experimental group as compared to the Traditional Method (talk and chalk). The use of Activity-Based should be encouraged and enforced in Nigerian junior secondary schools
2. Teachers should be encouraged to use Activity-Based Instructional Strategy in teaching Integrated Science since this Strategy provides students with the opportunity of engaging in series of activities and encourages participatory learning retention of Scientific concepts is enhanced through this method.
3. Activity-Based method should be used alongside the traditional method since traditional method was also proved to be effective in teaching Integrated Science. As the saying goes ‘‘no one method has answers’’ variety is the spice of life. Teachers should be encouraged to combine the salient features of the Traditional Method with those of the Activity- Based to make teaching and learning more effective.

5.5 Suggestions for Further Study

A study of this nature cannot cover every area due to limited time, fund and material available to the researcher; hence the following recommendations for further studies have been suggested.

i The study was carried out using four junior secondary schools comprising two boys' schools and two girls' schools so the study can be extended to co-educational schools.

ii The study can be extended to include Interest and Attitude of students towards learning Integrated Science.

iii The study should include qualification of teachers and field of study of those teaching Integrated Science.

5.6 Contribution to knowledge

The study has revealed that Activity-Based Instructional Strategy sandwiched with traditional method can solve many learning difficulties and equally help fulfill the objective as stated by National Policy on Education (2005), secondary school education is expected to :

i. prepare the children to become useful to them and their society and

ii. Prepare the children for higher education. This is the bases for studying Science subjects at the Senior Secondary School level.

More so the Integrated Science demanded that the teaching be relevant to pupils needs and experiences, stress fundamental unity of science, lay adequate foundation for subsequent specialist studies add cultural dimension to science education. The study has

achieved this through the interaction of students with materials, themselves and their teacher through Activity- Based Instructional Strategy.

5.7 Limitation of the study

The researcher used paper and pencil test to determine the students' performance and there was no assessment of the class activities. This was as a result of time constrain and the largeness of the classes. The classes used were restricted to intact classes which were randomly chosen out of the streams of classes for all the classes used as Experimental and control group.

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APPENDIX 1
Examination questions

1. In which of the following is air NOT likely to be found?

a. the sea

b. the soil

C. empty bottle

d. the atmosphere

e. the moon.

2. The percentage of 'Active Air' which supports burning is about

a. 25%

b. 21%

c. 33%

d. 0.3%

e. 78%

3. When air is blown into a clear solution of lime water, the solution turns milky. This is due to the presence of ---------

a. carbon dioxide in the air

b. oxygen in the air

c. nitrogen in the air

d. rare gases in the air

e. carbon monoxide in the air.

4. The continuous movement of water from the land, rivers, seas, to the atmosphere and from the atmosphere to the, rivers and oceans is referred to as ----------

a. rainfall cycle

b. carbon cycle

c. condensation cycle

d. water cycle

e. water – air cycle.

5. Occupation may be defined as -----

a. activities carried out for pleasure.

b. activities carried out for livelihood

c. activities carried on the basis of interests only.

d. water cycle

e. water- air cycle.

6. The purpose of using a tool to ---

a. enable one apply a small force to overcome a large resistance

b. enable one apply a large resistance in order to overcome a small force.

c. show our level of industrialization and specialization.

d. accomplish a less difficult task in a shorter time

e. attract more money for purposes of balancing our balance of payments.

7. Which of the following groups of tools come craft and engineering tools?

a. cutlass, hammer, syringe, tractor.

b. set of spanners, jack, joes, cutlass

c. hoe. Cutlass, pliers,syringe.

d. hammer, saw, set of spanners, jack

e. pliers, set of spanners, jack, stethoscope.

8. Modern implements for preparing land for cultivation include

a. hoes and cutlass

b. tractor and pail- loader

c. tractor and bulldozer

d. hoes and diggers

e. harvesters and earth – moving machines.

9. Which of the following pairs of tools is not used in an operating theatre?

a. wheelchair and oxygen tent

b. syringe and needles

c. forceps and scissors

d. stretcher and stethoscope

e. screw drivers and spanners

10. Which one of the following events does not require the application of force?

a. pushing a car

b. lifting a log of wood

c. blowing off the roof of a house by the wind

d. rotation of the fan

e. sitting down on a chair for hours.

11. Forces whose sources are in touch with the body on which they are applied are called:

a. frictional forces

b. push and pull forces

c. pull forces

d. forces fields

e. contact forces

12. Forces whose sources do not require contact with the body on which they applied are called

a. frictional forces

b. push forces

d. force fields

e. contact forces.

13. Which of the following is not true of a force or forces?

a. it can bring about motion

b. it can make a body move faster or slower

c. it can cause a change in direction

d. forces occur in singles

e. change in the direction of motion is caused by unbalanced forces

14. If the driver of a fast moving vehicle suddenly applies his brakes on a very wet day, the car skids. This is because:

a. the driver is in experienced

b. the car has a high sense of gravity

c. there is little or no fiction between the wet surface and the car tyre

d. it is against traffic regulation for a driver to apply his brakes at high speed

e. the surface of the road is very rough.

15. When a piece of stone is thrown up, it travels up for a distance and then falls back to the ground. The force which causes it to fall to the ground is known as

a. magnet force

b. electric force

C.force of friction

d. force of gravity

e. force of field

16. The force acting when a piece of magnet is placed close enough to an iron filling is known as

a. gravitational friction

b. force of friction

c. Magnetic force

d. push and pull forces

e. electric force

17. When a dry plastic ball-point pen is rubbed on a dry hair or duster, which of the following is likely to happen?

a. the hair looses it coil nature

b. the hair becomes magnetic

c. the ball point pen becomes charged with electricity

d. the hair looses it magnetism

e. the ball-point pen looses it magnetic properties

18. Which of the following is the unit of force?

a. Newton metre

b. Newton

c. kilometre

d. kilogramme

e. cubic metre

19. Which of the following occupation is not a science related occupation?

a. medicine and engineering

b. dentistry and architecture

c. Pharmacy and agriculture

d. administration and criminology

e. Veterinary and auto mechanics

20 Carpentry is the art and skill of making and repairing objects made from

a. Metal
b. Cottons
c. Wood
d. Wool
e. Paper

21. The instrument used by medical doctor to finding heart beat of a patient is known as

a. thermometer

b.. stethoscope

c. force pump

d. stabilize

e. stabilizer

22. When positive poles of a magnet are brought closer to each other one of the following is likely to happen

a. the magnet will attract each other

b. the magnet will repel each other

c. there is neither repulsion nor attraction

d. a chemical change takes place in one of the magnet

e. the magnet will loose its magnetism

23. An anhydrous copper (ii) oxide tetra oxosulphate(iv)crystals kept outside turns blue in color .this side to presence of

a. oil

b. alcohol

c. acid

d. water

e. nitrogen

24. All vehicles tyres have different thread marks designs instead of being smooth. These thread marks in car tyres are designed to

a. reduce friction between the tyres and road surfaces

b. increase friction between the tyres and road surfaces

c. makes car tyres look nice

d. reduce tear and wear of the tyres

e. reduce the surface area of the tyres

25. In which of the following surfaces is the force of friction least?

a. concrete floor

b. unpolished wooden floor

c. surface or tared road

d. surface of a sheet of glass

e. unplastered wall

26. Which of the following is the commonest occupation of riverine people of your country?

a. fishing

b. hunting of wild animals

c. auto mechanics

d. mining

e. farming

27. One of the following is not a characteristic of traditional tool

a. they do not save us any energy

b. they cause boredom and frustration

c. they limit mass production of goods

d. they make work easier and conveniently done

e. they require more people working in a given area than modern tools will require

28. Which one of the following events does not requires the application of force?

a. pushing car
b. lifting a log of wood
c. blowing off the roof of a house by the wind
d. rotation of the fan
e. Sitting down on a chair for hours

29. A simple tool is a device meant to

a. save the total energy

b. saves one self some energy which one needs to work

c. save the total energy of man kind during any piece of work

d. do a piece of work more easily and conveniently

e. deter the rate of doing a pieces of work

30. The process of water loss from the ocean, rivers and surface of leaves into the atmosphere

a. condensation

b. evaporation

c. precipitation

d. cloudation e. transpiration

APPENDIX 2

TIME-TABLE OF LESSON PRESENTATION

WEEK	LESSON	TOPICS
1	Lesson 1	Air and its properties
	Lesson 2	Composition of air and Its uses
2	Lesson 3	Water and water cycle and its uses
	Lesson 4	Purification of water and types of solutions
3	Lesson 5	Force- Types of force
	Lesson 6	Force- Friction in use
5	Lesson 7	Science related occupations
6	Lesson 8	Machines (Tools)

LESSON ONE

Subject: Integrated Science

TOPIC: Air and its properties

Class: JSS 1

Ability: Average

Sex: Female, and male

Date: 13th June, 2011

Number in Class: 62,58.

Time Duration; 1:10 min

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

1. Recognise that air is very important for all living thing.
2. Recognize that air is everywhere.

Previous knowledge: The students have known from experience that we must keep breathing in and out to stay alive.

Materials: paper, bottle, cork, funnel, candle, plasticine, retort stand, balloons, meter rule, water, razor blade.

Introduction: The students are asked to stand up and breathe in and out, they are also asked to breathe in and hold it for thirty seconds how do you feel?
Presentation

Step 1 the teacher guides the students to discover the needs of air for their survival

Let your sit mate close your mouth and nose for one minute. How easy is it?

- We need air to survive

Step 11 the teacher asked the students to do the following activities:

Activity 1:1. Take a small sheet of cardboard or an exercise book and fan yourself. Do you feel anything? If so what do you feel?
Expected answer: Yes I did. I felt air as I blew myself.

Activity 1:3. Take a clean bottle; put a funnel in the mouth of the bottle so that a little space is left between the funnel and the bottle. Seal up the space with plasticine. Then pour water slowly into the funnel until it is nearly full. Does the water run into the bottle? There is only one way of explaining this, can you say what it is?
Now carefully make a hole with a nail or the end of a pair of divider through the plasticine into the inside of the bottle what happens now?
Expected answer: The water could not get into the bottle because the bottle was full of air. When a hole was made through the plasticine, the air rushes out through the hole and the water runs into take its place.

The teacher leads the students to draw some conclusions from the activities they performed:

Conclusion: From the activities carried out showed that air is all around us. It fills all the spaces we usually think of as empty. When you fan yourself, you feel air moving against your face. When you breath in and out, it is air you take in and out.

Step 111: The students are asked to find out if air is present in the soil and water:

Activity 1:4 Take some loose dry soil from your school compound, put some of it into a beaker. Pour some of it into a beaker. Pour some water on the top of it. What do you see, and what is it?

Expected observation: Bubbles are seen as the water passes through the soil.

-The bubbles are air present in the soil.

Activity 1:5. Is air present in water?

Fill a beaker with water and heat the beaker gently on a stuff until the water is almost boiling. Did you see any bubbles on the sides of the beaker? What do you think the bubbles may be?
Expected answer: Air.

The teacher and the students come up with these conclusions:

Air is present in soil and water. As water displaces air in the soil, bubbles of air are observed to escape from the soil.
This is very important for animals which live in the soil, for they also need air to live. The bubbles of air observed escaping when water was heated indicate presence of air in water. This is why aquatic animals can live in water because of dissolved air in water.

Step III. Let us try the following activities to find out the properties of air.

Activities 1:6. Does air have weight?
Suspend a material from the retort stand, clamp and balance two inflated balloons. Use a razor blade to make a tiny incision on the balloon on the left. The air leaks out slowly. What happens to the system?
Expected observation: As air escapes from the punctured balloon, the beam (metre rule) tilted to the right in favour of the inflated balloon. The difference was made by the air escaped. Therefore air has weight.

Activity 1:7. Air supports combustion or burning.
Obtain two candles of the same size and light both of them. Cover each candle with a gas jar. However, allow air to enter one of the gas jars by standing it on three small wooden blocks and leave for some time.
Expected observation: The candle which is completely covered with a gas jar is extinguished and the inside of the jar is covered with smoke. The second candle with the gas jar standing on wooden blocks continue to burn. This is because air is allowed into the gas jar.

Activity 1:8. Air exerts pressure.
Pour a little water into a metal can and set it up over a burner. Heat the can until steam

issues through the mouth of the can using a towel bring down the can and set it on a wooden board. Quickly cork the can and pour cold water all over it. What happens?
Expected observation: The can crushed depression was seen on the can because of the force which changed its shape is air pressure. When the can was open and contained cold water, the air pressure on the inside walls was the same as that pressing on the can outside. Steam drove out most of the air on heating. Cold water condensed steam back to a very small volume of water. The air inside the can become seriously reduced. Air pressing from outside therefore crushed the can.

Activity 1:9. Compressed air.

Air is said to be compressed when it is squeezed into a space smaller than what it occupied under normal atmospheric pressure. For exampe, the bicycle pump is a mechanical pump used to compress air into a bicycle tyre, to enable it support the weight of the rider.

Summary/ Evaluation

- Air is all around us. It is present in the soil and it is dissolved in water.
- Air has mass/weight and so it occupies space and exerts pressure.
- Air is used during burning (combustion).
-Air can be easily compressed as well as contracts.

Evaluation

- How can you convince your sister or brother that air is all around us
- Describe a simple activity to show any one of the property of air.

Conclusions: The teacher concludes the lesson by going round to help correct the students answer to the evaluation questions.

LESSON: TWO

Subject: Integrated Science:

Topic: Composition of Air and Its Uses.

Class: JSS 1

Ability: Average

Sex: Female

Date:16th June, 2011

Number in Class:62,58.

Time Duration 35

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

1. Identify the main constituents of air.
2. State the importance of air.

Date: 20th June, 2011

Duration: 35min

Previous knowledge: The students have learned that air is all around us and air has mass, occupies space and supports combustion.

Materials: Candles, gas jar, wooden blocks, lime water.

Presentation and Introduction.

The students are asked the following questions from their previous knowledge:

1. In which of the following places is air not likely to be found?
   A. Sea B. Soil C. Empty bottle D. Atmosphere E. Moon.
2. Why did the lighted candle covered with a gas jar go off after some time.
   A. The candle was too long.

B. The gas jar was too thick to allow heat out.

C. There was too much air in the gas jar.

D. There is absence of air in the gas jar.

E. The candle could have been wet.

Step I. Composition of Air.

What is air made up of?

Activity 1:10. Obtain two glass troughs. Fill each trough half way with water. Mount two candles of the same size on the two separate wooden blocks. Light one of the candles and place both on water in two separate troughs. Cover each candle with graduated gas jars. Leave the experiment for some time. What happens to the lighted candle? What do you notice about the level of water in the glass trough with the lighted candle?

Observation: The lighted candle goes off producing smoke after sometimes. The water level in the glass jar rises up to one-fifth of the gas jar. In the control experiment, the water did not rise. Nothing happens. When all the air has been used up, the lighted candle becomes extinguished and the water rises up to one-fifth of the gas jar. Showing the percentage of air (oxygen) used up.

After sometime the candle is extinguished and the level of water in the trough raised up about one fifth which is twenty percent of air. This shows that oxygen that supports combustion is twenty percent.

Activity 1:11. To detect the presence of carbon dioxide in air.

Put some lime water (calcium hydroxide) in a beaker and leave in the open for a whole day

Activity 1:12. Pour about $5cm^3$ of lime water into a test tube. Blow air into the lime water through a glass tube. Record your observation.

Observation: The lime water in both activities turned cloudy (milky). The gas which turns lime water milky is called carbon (iv) oxide. No other gas can do this.

Activity 1:13. To detect the presence of water vapour in air.
Put a small quantity of anhydrous calcium hydroxide in a beaker and place aside for sometimes. What happens to the dry anhydrous calcium hydroxide.

Repeat the activity using white crystals of anhydrous copper II tetraoxosulphate(vi) salt.

Observations: The anhydrous Calcium hydroxide absorbs water vapour from air and later dissolved. And the anhydrous copper ii tetraoxosulphate(vi) turns from white to blue.

Step II: Definition of air
Air can be said to be a mixture of gases. These gases are;
Oxygen - 21%
Nitrogen - 78%
Carbon (iv) oxide - 0.03%
Noble gases – 1%
Water vapour – variable
and their percentages by volume.

Step III: Uses of air.
The students discuss the uses of air

1. Use during respiration by animals and plants and carbon (iv) oxide is released into the air.
2. Plants make use of carbon (iv) oxide during photosynthesis to make their food and all animals depend on the plants to.

Summary/Evaluation

Air consists of an “active part”, which is oxygen and an “inactive part”, which consists of nitrogen and small proportions of carbon dioxide, water vapour and the noble gases.

Man and all living things needs air to breath and for burning. The carbon dioxide in the air is used by plants to make their food.

Evaluation.

1. The percentage of "active air" which supports burning is about
   A. 25% B. 21% C. 33% D. 0.3% E. 78%
2. When air is blown into a clear solution of lime water, the solution turns milky. This is due to the presence of
   A. Carbon (iv) oxide in air
   B. Oxygen in air
   C. Nitrogen in air
   D. Rare gases in the air
   E. Carbon II Oxide in the air.
3. An anhydrous copper II tetraoxosulphate (iv) crystals kept outside turns blue in colour. This is due to presence of
   A. Oil B. Alcohol C. Acid D. Water E. Nitrogen.

LESSON THREE

TOPIC: WATER.

Duration: 1:10min

Date: 23th june,2011

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

1. Identify various sources of water in their environment.
2. Explain water cycle and mention the sea as main source of water in the world.

Materials: Various samples of water from different sources, evaporating dishes, charts of water cycle, beaker, round bottom flask, cold ice water , boiling water.

Presentation.
Introduction: The teacher introduces the lesson using a riddle. Who am i? You use me to freshen yourself before coming to school, am the only thing y0u take to quench thirst. The teacher asked the students to go out of the class room to observe the atmosphere and have a feel of the soil since it is raining season.

- Where can we find water? Is there water in the atmosphere? What about the soil?
- What are the sources of water?

Step I: The students observe that water is all around us. Water is in the atmosphere in the form of water vapour and the soil in the form of moisture.

Step II The teacher asks the students to-do this activity underline the sources of water from the passage.

Activity 3:1.
The sea as the source of all water in the world. The sun heats the sea, and some of the water changes to vapor which rises and cools to form clouds. The clouds when saturated are released as rain. Rain water seeps through the soil and runs as rivers back to the sea. If rain

water reaches a layer of rock through which it cannot seep, it may accumulate and later reappear as a spring which eventually runs back to the sea. This continuous movement of water from the land, rivers and oceans, is known as the water cycle.

Activity 3:2.The students are ask to Look at various samples of water.

Obtain some samples of rain water, river or stream water, pond water, sea water(out of reach), tap water and distilled water. Put them into separate evaporating dishes and label them. Look carefully at each sample using a hand lens. Look out for specks of mud, bits of leaves and any living things.

Record your observations.

Activity 3:3. Activity to demonstrate how rain is formed.

Heat some water until it is near the boiling point. Put some ice-cold water into a round-bottomed flask and place the flask on the beaker at an angle.

It can be observed that the hot water will evaporate, condense on the cold surface of the flask and fall in droplets back into the glass beaker.

Evaluation

1. List five sources of water
2. Water that looks clear to the eyes may be having micro-organisms. True or False
3. Explain how rain is formed.

Conclusion: The teacher corrects all the mistakes and they copy it in their note books.

LESSON FOUR

TOPIC: PURIFICATION OF WATER.

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

1. Purify a given quantity of water by a variety of methods.
2. Demonstrate how to make water fit for drinking in communities without tap water
3. State uses of water.

Date: 27th June, 2011

Duration: 35min

Materials: Bunsen burner or stove, beaker, filter papers, filter beds, chlorine gas, concrete gas, concrete box, sand, charcoal, fine gravel, stones etc.

Previous knowledge: Students have learnt about the various sources of water.

Presentation.

Introduction: The teacher asks the students to state the various sources of water and ask which among them do the students think is safe for drinking.

Step I: The teacher presents muddy water to the students and ask them to use various methods of purification to make it safe for drinking, using the activities below.

Activity 4.1: Put alum into the muddy water and allow it settle.

Activity 4.2: Decant the clear water on top into another beaker and leaving behind the settled mud in the beaker.

Activity 4.3: Place a folded filter paper in a funnel and pour the water into the filter paper.

The students are expected to answer these questions;

1. Were you able to remove all the mud from the water? Where is the mud now?
2. Compare the liquid you have collected in the beaker with the original water. Can you see

any difference?
3. Can you drink this water? If yes, why? If no, why?

Step II: The teacher gives the students a hand lens to observe the filtered water.
Ask what the students observe.

The teacher presents a gas called chlorine and asks the students to add few drops to the filtered water.
It was observed that the chlorine gas killed the micro-organisms.

The teacher asks for an alternative where there is no chlorine gas. Boiling the water kills the micro-organisms.

Step III: The teacher together with the students discuss the various uses of water. For irrigation, as a means of transport, for domestic purposes, it is a universal solvent; both plants and animals need water to grow.

Summary: The teacher asks the students to copy the summary into their note books as the teacher goes round to check.

Step IV: The teacher together with the students mount a filter bed and use it to purify a large quantity of water.

Evaluation:
1. Discuss the process of making water fit for drinking.
2. What are the uses of water?

LESSON FIVE

TOPIC: FORCE

Duration: 1:10

Date: 30th June, 2011

Behavioral objectives: At the end of the lesson the students should be able to
- explain what force is
- state types of force
- carry out simple experiments (activities) to explain the two types of forces with their examples.

Materials: Wheel barrow, classroom door, desks, benches, students, magnets, iron fillings, biro etc.

Previous knowledge: The students must have seen people pushing a broken down car or motor cycle. They must have used a wheel barrow to pack refuse to the incinerator.

Lesson presentation through the following steps

Introduction: The teacher introduces the lesson by asking the students to stand up and push their desks and pull the desks. Can you explain what you feel?

Step I: The teacher distribute rubber band to all the students to do Activity 5.1. Hold two ends of strip of rubber or a rubber band. Stretch it and let it return to its original length. Do this several times and state what you feel.
The students observed that as a pull was exerted on the rubber strip to stretch it, the strip exerted a pull on their hands as it tried to contract or return to its original length.
When they push the desk on the floor, the desk tends to push back.
From the above activities the students and the teacher discover clearly one of the types of forces which is contact force. Contact force is defined as the forces whose sources are in

contact with the body to which they are applied. For example push, pull, and frictional force and tension

Step II: The teacher asks the students to discover examples of non-contact field (force field) through the following activities.

Activity 5.2 Hold a small object up in your hand and let it go.
-Any object above the ground tends to fall back to the ground. The force which the earth attracts towards its centre is called gravitational force.

Activity 5.3 Place a magnet on the table and bring the end of another magnet near it. What happens? Now move one of the magnets towards some iron fillings or nails. What happens? Do you think a force(s) is acting?

Observation: Like poles repel, negative and negative while unlike poles attract, negative and positive poles.
When a magnet is brought near metal objects made of iron, the objects are drawn towards the magnet. A magnetic force field exists around a magnet. When magnetic objects are within this field they are acted upon by the magnetic force.

Activity 5.4 Rub a dry plastic ball-point pen on your dry hair or on a dry duster. Bring the pen close to a small piece of paper. What happens? What must have been acting on the paper?

Observation: when a dry plastic pen is rubbed on dry hair, it becomes charged with electricity

From the above activities, the other types of forces and their examples are observed. Force fields which are non-contact forces and the common examples are gravitational force, magnetic force, and electric force.

Evaluation.
Group the following forces into contact force and force field:
gravity, friction, tension, electric force, magnetic force, push, pull.

Summary: The teacher goes round to mark and correct those who do not get it right

LESSON SIX

TOPIC: FORCE-FRICTION IN USE

Date: 4th July, 2011

DURATION

Behavioural objectives: At the end of the lesson the student should be able to
- Explain balanced and unbalanced forces using simple activities.
- State what is required to keep a body in motion.
- Identify and describe situations where friction is in use
- state advantages and disadvantages of friction.

Materials: students, robes

Previous knowledge: The students have learnt two types of forces and their examples. They also know that friction is an example of contact force.

Presentation
Introduction: From the previous knowledge, the teacher asks the students to write two types of forces and give 3 examples of each.

Step I: The teacher asks the students to rub their hands against each other. What do you observe? The right hand seems to oppose the left hand and also felt heat.

Activity 6.1 Sort yourselves into two groups (A and B), let one of the member of group A hold one end of a rope and the other end by a member in group B.
a, What happens when only A pulls, b, when only B pulls and c, when both A and B pull together?

Observation: In the tug of war between groups A and B, when A pulls B tends to move towards directions of A and vice versa, but when they both pull the opposing forces are

equal and so there is no movement. Since motion occurs when the opposing forces are no longer equal, i.e unbalanced forces cause motion when balanced force is at rest.

Step II: The teacher asks the students to push and pull their desk.
Whenever we try to move an object that is in contact with another object, a force comes into play between the surfaces in contact. This force tries to stop the body from moving. This force is called friction.
Friction is the force which opposes the motion between two surfaces in contact with each other.

Step III: The teacher using everyday life to discuss the usefulness of friction.
Why are tyres of cars having a rough surface? So that when the engine of the car makes the wheels go round, they grip on the surface of the road. If tyres and road were so smooth that there is no friction between them, the car would not go along at all.
Why is your shoe having a rough surface? In order to make us walk without slipping and falling down.
Note. Friction is less on wet slippery road than on dry road. So the motion of a car is less on a slippery road as the car will tend to slip off.

Friction can be a nuisance by causing wear and tear in machines. In order to reduce friction , oils and greases are put between two surfaces in contact. The oil is called a lubricant.

Evaluations

What is friction?
Write two advantages and two disadvantages of friction.

Conclusion: The teacher corrects the answers on the board and asks the students to copy it.

LESSON SEVEN

TOPIC: SCIENCE RELATED OCCUPATIONS

Date: 7th july,2011

Duration;1:10 min

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

1. Identify occupations that are science related.
2. Recognise the work experiences that are related to the occupations

Previous knowledge: The students have been enjoying some of the services given by science related occupations such as medical services, food from farmers and fish.

Materials: Charts of various tools used by various science related occupations. Some physical tools too.

Presentation

Introduction: The teacher asks the students to say what they intend to become.

What do you want to be?

Step I: The teacher explains science related occupations which make use of scientific discoveries and procedures for their operations.

An occupation is human activity which forms basis of livelihood. From students response, their occupations are grouped according to science related and non science related.

Step II: The teacher together with the students identifies various occupations related to science and adds to the list. Farming, fishing, carpentry, engineering, medicine etc.

Step III: The teacher directs the students itemize the work experience of the following occupations as shown in the following occupations as shown in the first example.

	Work experience
1. Farming	Clearing of site, cultivating soil, planting, maintaining soil fertility, protecting the crops, harvesting and storage.
2. Fishing	
3. Carpentry	
4. Engineering	
5. Medicine	

Evaluation

The teacher asks the students to answer the following questions

1. What is occupation?
2. Enumerate six science related occupations
3. Identify work experiences of any of the science related occupation.

Conclusion

The teacher goes round to mark and correct their mistakes.

LESSON EIGHT

TOPIC: TOOLS FOR WORK

Date: 11th August,2011

Duration:

Behavioural objectives: At the end of the lesson the students should be able to;
1. Identify basic tools used by personals in science-related occupations.
2. Describe and operate some of these tools.
3. Discuss the difference between traditional and modern tools.

Materials: Physical tools that are available and chart of various science tools

Previous knowledge: The students have learnt various science related occupations.

Presentation
Introduction: The teacher displays the chart and asks them to name and say which occupation uses it.

Step I.
Activity 8.1 The teacher instruct the students to group or classify the following tools according their uses in agriculture, engineering, medicine, carpentry and fishing- saw, hoe, net, jack, stretcher, spanners, fishing hooks, hammer, screw driver, cutlass.

Step II: The students are asked to visit a carpenter's workshop and find out which tools are used there. Draw them and state their uses.
Do the same for a black smith's shed, auto-mechanic and auto-electricians workshop.

Step III: The students are asked to discuss the advantages of modern tools over traditional tools.
- It saves time and energy

- It is easier and faster.
- It is more convenient

Evaluation

1. Name and describe two tools that are commonly used by both an auto-electrician and auto-mechanic
2. State the advantages of modern tools over the traditional tools.
3. Name two instruments used in hospitals.

Conclusion: The teacher makes the correction as she goes around marking their books.