EFFECT OF COMPUTER-ASSISTED INSTRUCTION ON PERFORMANCE OF SECONDARY SCHOOL STUDENTS IN BASIC TECHNOLOGY EXAMINATION IN SOKOTO STATE, NIGERIA.

By

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MARCH, 2014

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MARCH, 2014

DECLARATION

I declare that the work in this thesis titled: Effect of Computer Assisted Instruction on Performance of Secondary School Students in Basic Technology Examination in Sokoto State,Nigeria. Was carried out by me in the department of Educational Foundations and Curriculum.The information derived from the literature has been duly acknowledged in the text and a list of references provided, No part of this thesis was previously presented for another degree or diploma at this or any other institution.

_____ _____ _____

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CERTIFICATION

This thesis entitled: EFFECT OF COMPUTER ASSISTED INSTRUCTION ON PERFORMANCE OF SECONDARY SCHOOL STUDENTS IN BASIC TECHNOLOGY IN SOKOTO STATE. NIGERIA. By Abdullahi Abubakar YUNUSA, Meets the regulations governing the award of the degree of Masters in Instructional Technology of the Ahmadu Bello University, Zaria and is approved for its contribution to knowledge and literary presentation.

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DEDICATION

This study is dedicated to my parents, siblings, wife, children, and friends.Also tomy teachers for their immeasurable influence on my life.

ABSTRACT

This study investigated the Impact of Computer Assisted Instruction (CAI) on performance of Junior Secondary School Students in Basic Technology in Sokoto State. The study adopted a Quasi-experimental pre-test, post-test,control group design. The participants of the study consist of 55 female and 115 male (170)students selected from the JSSII stream of two schools,Government Day Secondary School Dange and Government Secondary School Kware in Sokoto state; GDSS Dange was the experimental group,located in the urban area of the state, while GSS Kware the control group is located in the rural area, Purposive sampling technique was used to select intact classes used for the study.Basic Technology Performance Test (BATPET) instrument was pilot tested at Usmanu Danfodiyo University Model Secondary School Sokoto,a reliability coefficient of 0.76 was established on the SPSS platform.Data was collected after the control and experimental groups received instructions for seven weeks, Independent t-test statistical analysis of mean and standard deviation was used to analyse data obtained, as well as draw inference from the hypotheses,The findings indicate that the use of technology without satisfying the conditions of learning such as factual information, learners cognitive skills and intellectual ability, especially ability to read, write,and understand does not improve learning.It recommended that for effective teaching and learning,language and communication skills teachers at all levels must be encouraged and trained to ensure learners acquire the requisite rudiments and skills of reading and writing, this is necessary for effective teaching and learning in all disciplines with or without technology.

OPERATIONAL DEFINITION OF TERMS

Academic Performance: Is the outcome of the tests that will be administered on the students before and after they have been taught basic technology with CAI and Traditional method.

Basic Technology: Integrated science and vocational subjects taught at basic secondary schools in Nigeria.

Computer Assisted Instruction (CAI): Is a computer based instructional package developed to enhance teaching and learning. Computer-assisted instruction (CAI) is an educational medium in which instructional content or a computer delivers activities. Students learn by interacting with the computer and appropriate feedback is provided by the computer within the package.

The Traditional method of instruction: Involves the teacher presenting the material in a lecture (chalk and talk) method. The material is then reviewed by samples from the textbook or worksheets derived by the teacher, the textbook, or both. The teacher through observations, quizzes, and tests determines mastery/comprehension of the material.

School location: refers to the geographical position and the configuration of students' population in the schools particularly in terms of urban and rural setting. In this case Government Day Secondary School Dange may be classified as an urban school because, Dange Local Government stretched geographically into the metropolis from the southern end of the state to Mabera Mujaya, OldAirport area,Sokoto. While, Government Secondary School Kware is considered to be situated in a rural area about 30km from the metropolis.

School type:herein refers to Day and Boarding school system, Day School is the school system whereby the school activities run for 8hours during the day time after which the students go back to their respective homes, while Boarding School is a school system whereby the students activities is run and monitored by the school management, the students engage in academic activities during day time and move to dormitories in the evening for extra-curricular activities.

ABBREVIATIONS

AECT: Association for Educational Communication and Technology

BATPET: Basic Technology Performance Test

CABATEP:Computer Assisted Basic Technology Package

CAD : Computer Aided Design

CAI: Computer Assisted Instruction

CBE: Computer Based Instruction

CEI: Computer Enriched Instruction

CESAC: Comparative Education and Adaptation Centre

CMI: Computer Managed Instruction

ICT: Information and Communication Technology

ITU: International Telecommunication Union

JSS: Junior Secondary School

MDG: Millennium Development Goals

MySQL: Structural Query Language

NCC: Nigeria Communication Commission

NERDC: Nigerian Educational Research and Development Council

NPE: National Policy on Education

NEPAD: New Partnership for Africa's Development

PLATO: Programmed Logic and Automatic Teaching Operations

php: Hypertext Processor

TICCIT: Trees into Cartoon, Cartoon Into Trees

UNESCO: United Nations Educational Scientific and Cultural Organisation.

UBE: Universal Basic Education

TABLE OF CONTENTS

Title page……...0
Declaration……i
Certification……...ii
Acknowledgement……iii
Dedication……iv
Abstract……..v
Operational definition of terms……vi
Abbreviation……vii
Table of Contents……viii
List of Figures……ix
List of Tables……..x

CHAPTER ONE: INTRODUCTION

1.1 Background to the study……..1
1.2 Statement of the Problem……11
1.3 Objectives of the Study…….....13
1.4 Research Questions ……13
1.5 Hypotheses……14
1.6 Basic Assumptions of the Study……..15
1.7 Significance of the Study……..15
1.8 Scope of the Study……16

CHAPTER TWO: REVIEW OF RELATED LITERATURE

2.1 Introduction……..17
2.2 Conceptual framework……17
2.2.1 Computer Application in education……18
2.2.2 Advantages and disadvantages of computer assisted instruction……20
2.3 Brief history of computer in Nigerian education system……..24
2.4 Concept of Academic Performance…….27

2.5 Basic Technology Objectives and features…….27
2.5.1 Concept of Blended learning…….28
2.6 Instructional design Theories and Models…….32
2.7. Empirical studies……..37
2.7.1. Gender andstudents' academic performance…….40
2.7.2 CAI,School type,and School location on student performance……41
2.8 Summary of review of related literature…….44

CHAPTER THREE: METHODOLOGY
3.1 Introduction……45
3.2 Research design……..45
3.3 Population of the study……..46
3.4 Sample and Sampling Technique……..46
3.5 Instrumentation……...48
3.5.1 Validity of the Instrument…….....50
3.5.2 Pilot Testing……51
3.5.3 Reliability of the instrument……...51
3.6 Procedure for Data collection…….51
3.7 Procedure for Data Analysis……...52

CHAPTER FOUR: DATA PRESENTATION AND ANALYSES
4.1 Introduction……..53
4.2 Demographic data……53
4.3 Research questions…….....54
4.3.1 Research question one……54
4.3.2 Research question two…….....55
4.3.3 Research question three…….56
4.3.4 Research question four……..57
4.4 Test of Hypotheses……..59
4.4.1 Hypothesis one……..…59
4.4.2 Hypothesis two…….....60
4.4.3 Hypothesis three……60
4.4. Hypothesis four……..61

4.5 Summary of major findings……62
4.6 Discussion of findings…….....63

CHAPTER FIVE: SUMMARY, CONCLUSION AND RECOMMENDATION
5.0 Introduction……...69
5.1 Summary of the study……...69
5.2 Conclusion…….....71
5.2.1 Implication of the findings……..72
5.3 Recommendations…….....73
5.4 Suggestions for further studies……74
REFERENCES……..75
APPENDICES……82

LIST OF FIGURES

2.1:	Hannafin and Peck Instructional Design Model	36
2.2:	Knirk and Gustafson Instructional Design Model	37

LIST OF TABLES

1.1. Students performance in Basic Technology in Sokoto State 2010-2012 10 .

3.3.1. JSSII students population in the Educational zones in Sokoto state. 46

3.5.1. Distribution of questions based on Basic Technology JSS2 syllabus 50 .

4.2.1. Distribution of respondents based on Gender 53

4.2.2. Distribution of respondents based on School Location 53

4.2.3. Distribution of respondents based on School Type 54

4.3.1. Mean & standard deviation of respondents in control and experimental group 55

4.3.2. Mean score and standard deviation of respondents based on Gender 56

4.3.3. Mean score and standard deviation of respondents based on School Type 57

4.3.4. Mean score and standard deviation of respondents based on School Location 58

4.4.1. Difference in performance between control and experimental group 59

4.4.2. Difference in performance based on Gender 60

4.4.3. Difference in performance based on School Type 61

4.4.4. Difference in performance based on School Location 61

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

Basic Technology is an integrated subject offered at the Junior Secondary School Level. According to Olaniyan and Ojo (2008) Basic technology is an eclectic subject that comprises element of woodwork, Metalwork, Building Technology, Auto Mechanic, Electrical/Electronics and Technical Drawing at their basic levels.Technology education is taught in the junior secondary schools as integrated aspect of introductory technology designed to expose the students to the appreciation and stimulation of their interest in various areas of industrial technology. The aim is that at the end of junior secondary school, students would have attained technological and solid foundation laid for their entrance into a vocation of their choice (Uwaifo & Edigin 2011; Kennedy 2011). This is in consonance with the statement in the National Curriculum for Junior Secondary Schools (FRN, 2004),which amongst others states that in order to reduce ignorance about technology, help lay a solid foundation for national development and for increase in skill acquisition, the subject of basic technology is to be offered in junior secondary school. Basic Technology was introduced into the Nigerian education system, 6-3-3-4 in 1982 as a result of the newly defined National Policy on Education that came into being after the National curriculum conference of September, 1969.

The conference held in Lagos to review old and identify new national goals for Nigerian education at all levels with respect to:

(i) The needs of individual youth and adult in the task of nation building.

(ii) The social and economic needs, aspiration and well – being of our society (Fakomogbon, 2004).

Corroborating this fact is the Comparative Education Study and Adaptation Centre (CESAC, 1985) enunciated Nigeria educational goals as:

(iii) To provide pre-vocational orientation for further training in technology.

(iv) To provide basic technology literacy for everyday living .and

(v) To stimulate creativity.

The most significant aspect of the National Policy on Education (Federal Republic of Nigeria, 2004) is the Focus it gives to Nigerian educational system, the need for the Industrialization of the nation in which technical education plays crucial roles and the realization to change from white collar job oriented educational system to science and technological oriented educational system which prepares individuals to be self-reliant and useful to the society, informed the Federal Government to lay emphasis on technical education. Explicitly outlined in the National Policy on Education, (FRN,2004) Section 4, sub-section 18 identified in specific terms the cardinal objectives of secondary school as:

(a) To provide an increasing number of primary school pupils with the opportunity for education of a higher quality, irrespective of sex, or social, religious and ethnic background;

(b) To diversify its curriculum to cater for the differences in talents, opportunities and roles possessed by or open to students after their secondary school course;

(c) To equip students to live effectively in our modern age of science and technology;

(d) To develop and project Nigerian culture, art and language as well as the world's cultural heritage;

(e) To raise a generation of people who can think for themselves, respect the views and feelings of others ,respect the dignity of labour ,and appreciate those values specified under our broad national aims, and live as good citizens;

(f) To foster Nigerian unity with an emphasis on the common ties that unite us in our diversity, and;

(g) To inspire students with a desire for achievement and self-improvement both at school and in later life. To achieve these objectives subsection 19 stated that 'the junior secondary school will be both pre-vocational and academic, and will teach all the basic subjects which will enable pupils to acquire further knowledge and develop skills.'

It is however imperative to express that these goals cannot be realized without developing technical education through the adoption of modern pedagogical approaches to learning technology subjects. Fafunwa (2002) emphasised that "the specific objectives of the Junior Secondary School Education are to develop in the students' Manipulative skills (Manual dexterity) invention, respect for Dignity of labour and above all healthy attitude towards things technical"(P.16) The achievement of these objectives will in no small way help to transform Nigeria into a technologically developed country. The Federal Government of Nigeria after critical examination of the success and failure of the 6-3-3-4 system from its inception in 1982 to 2006 concluded in its wisdom that the system needs restructuring in order to achieve the Millennium Development Goals (MDG) in educational sector in line with the national educational objectives; especially at the basic level hence it launched the Universal Basic Education (UBE) 9-3-4 structure.This marked the turning point in curriculum contents of Introductory Technology as well as the nomenclature that delivered what is today

known as Basic Technology.The attainment of these objectives is bedevilled by challenges some of which Kennedy (2011) observed that;

> Although the curriculum of introductory technology includes some practical oriented contents, the age (12-14 years) characteristics of the students hinders the acquisition of practical skills as they are too young to manipulate tools and equipment for their study. Consequently, more emphasis is on theory than practical, as a result the students cannot acquire here, the necessary competent skills needed in industrial technology. For this lack of practical skills, students in their JSS certificate examination are examined in theory (essay and objective tests) and practical which is only on technical drawing.(P4)

To achieve the goals outlined in the Basic Technology curriculum, teaching of this subject must be predicated on teaching and instruction that makes the learning of Basic Technology functional. This much is reinforced by Omolewa (Babafemi, 2010) 'The 6-3-3-4 programme was conceived as an instrument of national unity, it was designed to inject functionality in to the Nigerian school system, and fashioned to produce graduates who would be able to make use of their hands, the head and the Heart " the 3Hs of education" (Babafemi, 2010). Functionality of education is the production of individuals by the educational system to be relevant to the Social, Economic, Political, Intellectual and Moral growth of the nation. When the 6-3-3-4 system was finally introduced in 1982, there had been inputs by various sectors of Nigerian professional community'. Uwameiye and Ojikutu (2011) defined teaching as the action of a person imparting skill, knowledge or giving instruction, or the job of a person who teaches.Therefore it can be deduced that teaching is an attempt to assist students in acquiring or changing some skill, knowledge, ideal, attitude or appreciation. Teaching is a challenge that requires long hours of work and preparation. It is a continuous, cyclic process involving three phases:

1. pre-teaching during which the teacher plans what to teach and prepares or collects the materials to be used for teaching;
2. classroom interaction, during which there is purposeful interaction between the materials, the subject–matter, the learner and the teacher; and
3. Post-teaching during which the teacher reflects on the task just completed and feeds back his observation into planning the next lesson. This process continues *ad infinitum* (Obanya,1980).

Teaching is carried out for a purpose, especially to generate learning in students in order to produce educated persons. Today computer has found a place in education as a communication medium that optimizes the opportunity for teaching and learning.

Uwameiya and Onyewadume (1999) states that:

> Pre-vocational subjects provide students with a process of orientation in production and consumption through experiences in planning, producing, testing, servicing and evaluating types of consumer and industrial goods. Furthermore, through the exposure of students to pre-vocational subjects, students develop a broader understanding of industrial processes as they explore their individual interests and develop aptitudes. In introductory technology, students at J.S.S level are exposed to various opportunities available in the world of work and are thus oriented, in many occupational areas, to see the need for school continuity at the senior secondary school level and beyond. Introductory technology gives students the opportunity to apply principles of planning and design, construction techniques, and scientific principles, to the solution of problems. (P.2)

The techniques for transmitting technical skills has remained too theoretical and devoid of the use of technology to stimulate interest and sustain the necessary skills required for challenges after school that could lead to advancement in technology. Consequently, undermining the essence and the cardinal objectives of the subject matter of Basic Technology. This assertion is drawn from the perspectives of failures in school

examination which may be ascribed to factors guiding teaching and learning which include archaic pedagogical approaches that not in tune with global practices.

Olawuyi (2008) identified five cardinal structure for engaging Computer in education these are; Computer Assisted Instruction (CAI), Computer Aided Design (CAD), Computer Managed Instruction (CMI), Computer Assisted Language Learning (CALL) and Programming and Problem Solving. CAI is a computer instructional term used in a stimulating teaching/learning environment, It is among the range of strategies being used to improve student performance in school subjects, Programs for CAI have come a very long way since they were first developed over two decades ago. These Computer programs tutor and drill students; diagnose problems, keep records of student progress, and present materials in print and other technology laden manifestations. It is believed that they reflect what good teachers do in the classroom (Kulik, Bangert, & Williams, 1983). Computer Aided Design (CAD) is used for designing, building and Engineering structures, Animation and general graphical representations, CALL is used for language learning and teaching of languages especially Arabic and English, essentially Problem Solving and Computer programming are employed to develop and solve educational programs. There are corroborating perspectives on the concept of Computer Assisted Instruction (CAI). in that regard; Puthawala (2002) defined Computer Assisted Instruction (CAI) as the use of computers and software applications to teach concepts or skills. IBM developed one of the first instructional computer systems in the 1960s using minicomputers. Accordingly, Olawuyi (2008) locate CAI as an automated instructional technique in which a computer is used to present an instructional programme to the learner through an interactive process on a computer. He further identified the following characteristics of CAI that makes it very germane to the development of the learners potentials as; learner controlled instruction, prompt feedback to the learner, self-pacing,

adaptability to instruction, multiple user approach, random access facilities and facilities for revision and updating .

In today's contemporary world the potentials of Computer Assisted Instruction (CAI) cannot be underestimated.There is a plethora of established findings on the instructional value of computer, especially in advanced countries. However, on a general context when Information and communication tools are constructively deployed they provide the leading edge to the actualization of the nations educational goals.

Computer in education is an emerging phenomenon in Nigeria educational system. The International Telecommunication Union (ITU) in her 2013 global ICT chart ranked Nigeria as 122nd in the world behind smaller African countries like Mauritius, Botswana, Kenya, Senegal and South Africa, this position is within the context of ICT integration in schools. In another report, NEPAD scored the level of students' experience with ICTs and their proficiency in using them in Africa very low. Fifty-five percent of students within the continent, including Nigeria, Algeria, Burkina Faso, Cameroon, Republic of Congo, Egypt, Gabon, Lesotho, Mali, Mauritius, Mozambique, Rwanda, Senegal, South Africa, and Uganda (who are participating in the first phase of the NEPAD e-Schools initiative), stated they had no experience at all in using computers. Other findings on the integration of ICT in education suggested that the typical African school environment provides neither opportunity nor training in using ICTS, and that 75% of responding teachers have no or have very limited experience and expertise regarding ICT educational applications. (Esharenana & Emperor, 2010).

The role of computers in Nigerian schools has been mostly administrative and management function, such as in student and staff nominal rolls, production of tests and examination texts (Abimbade, 1999). Due to high cost of Computer and its accessories; only few schools had computers, as such administrative correspondences and school

documents that are supposed to be classified are processed in commercial business outlets as there were no personnel with requisite skills to operate the few available desk top computers in some of the schools (mostly private schools).

The ubiquity of Information and Communication Technology (ICT) in all facets of human endeavour and in education in particular, has improved the situation in our schools;as a result of the Federal Government of Nigeria's launch of the National Policy on Computer literacy in 1998 at Primary, Secondary, and Tertiary levels of education, although it is yet to have the desired impact on the instructional delivery system. There is also the proliferation of Internet infrastructural development across the strata of schools in Nigeria.The most noticeable is the Mobile Telecommunication Network (MTN) built Internet facilities in some selected universities and some higher institutions of learning (Olawuyi, 2008).

The broad objectives of the policy on computer literacy (2001),as reported in Chukwwuka (2012). Includes:

- To bring about computer literate Nigeria by middle 90's
- To enable the present generations of school children at different levels of education appreciate the potentials of the computer and be able to utilize the computer in various aspects of life and later occupation.

The Federal Government of Nigeria's "Computer - for - All" programme which was launched in early 2000 is just evolving, some States and Federal Capital Territory (FCT) adopted the policy at inception by purchasing computers for their schools, leaving them to grapple with the perennial problems of lack of electricity to power the computers; lack of skilled manpower among others.These problems are impeding the pace of integration of computer into teaching, thereby confining teachers to the age-long 'chalk -talk method 'which renders learners passive; making teaching to be ineffective

against the learner-centred approach as recommended by National Policy on Education, (Annulobi,2012).The consequences includes low student interest to learning especially technology contents which are characterized by technicalities, poor learner motivation and less appropriate feedback in teaching and learning with attendant poor performance in examinations, particularly Basic technology.

Academic performance is said to be the result of education, it is the extent to which a student, teacher, or institution has achieved their educational goals. It is about how students deals with their studies, cope with academics tasks, and how they fared in the overall school activities. Academic performance is student's level of pass and failure over a period of time at the end of any academic activity across disciplines,It is measured in a number of ways such as; oral and written tests; presentations, assignments, class work, projects and continuous assessment.Other forms of evaluating student's academic performance include;standardized tests and teacher-made tests. There is universal agreement that a major criterion of technological implementation in schools should be whether such applications actually do improve teaching and learning and improve student academic performance.However, there is a consensus about the complexity and challenge of reliably evaluating the impact of technology. (Noeth & Volkov, 2004).

It is a daunting task to separate the impact of computer technology from the effects of other factors that influence teaching and learning. Results and conclusions must be considered in the context of the interdependent set of variables in which the use of technology is embedded. These variables include access, teacher preparation and experience, student background, gender, school type, school location, curriculum content, and instructional methods. This study would not isolate these variables as they combine to shape and define its outcome at the end. However, emerging body of

research on the impact of CAI on academic performance of students with other variables, such as gender, school location, and school type shows positive outcomes (Yusuf, 2010, Achuonye, 2011, Onasanya, etal. 2010, Basturk, 2005, and Serin, 2011). Reports on students' examination results in Junior Secondary Certificate Examinations (JSCE/NECO) Specifically Students performance in Basic Technology in Sokoto State from 2010 to 2012 indicate poor performance with steady improvement in students' performance (See table 1.1 below).

Table 1.1: Students' Performance in Basic Technology in JSCE, in Sokoto State 2010 – 2012.

Year:	***2010***	***2011***	***2012***
No of candidates Registered:	*8,914*	*10,143*	*12,504*
Candidates that sat for Exam (%):	*8,010 (**90%**).*	*9,830 (**97%**)*	*12,232(**98%**)*
Candidates absent (%):	*904 (**11.3%**)*	*313 (**3.2%**)*	*272(**2.2%**)*
Total Credits Obtained (A1-C6):	*1,378(**17.2%**)*	*2,205(**23%**)*	*3089(**25.2%**)*
Total Pass (P7 & P8):	*2,069(**26%**)*	*2,200(**22.3%**)*	*2,115(**17.3%**)*
Total Fail (F9) %	*4,563(**57%**)*	*5,423(**55.2%**)*	*5,204 (**43%**)*

Source: *Ministry of Education,Sokoto.*

Poor performance in examination cut across the strata of secondary education this position is reinforced by the WAEC External Examiners report 2010, which shows continues decline in students' performance in genetics and related concepts. Retrogression in performance is also reflected in National Examination Councils (NECO) Senior School Certificate Examination (SSCE) results since 2009. "SSCE results of NECO since 2009 has witnessed continuous decline; in 2009 only 10.6% of candidates that sat for the exams obtained five credits and above including Mathematics and English,9.3% in 2010; 8.06%; in 2011 and 31.58% in 2012 (Edet,2013:61) .On the other hand; there is the state of knowledge explosion with commensurate increasing specialization, increased student–teacher ratio and increase in the workload of teachers' means that Classroom instruction alone cannot bring out the desired goals from the teaching and learning process.Thus, invoking the need to ponder on what better pedagogic techniques to adopt in order to remedy these problems. Problems that have permeated the secondary school sector of our educational system.

This study attempts to remedy some of the foregoing problems by exploring the impact of Computer Assisted Instructional Basic Technology Package (CABATEP) designed and developed by the researcher could have on the performance of Junior Secondary School Students in Basic Technology in Sokoto State.

1.2 Statement of the problem

The 21st Century philosophy of teaching and learning is 'child-centred' as such; Computer Technology is deployed to compliment the teacher whose role is that of a'guide on the side not a sage on the stage'(Yusuf, 2010:6) as it was the practice. However, most teachers in Nigeria are used to the traditional (chalk-talk) method of teaching which renders students passive listeners and make teaching ineffective, consequently affecting the students' performance in Basic Technology especially.

On the other hand, the state of knowledge explosion with increasing specialization, increase in student-teacher ratio and increase in workload of teachers, classroom instruction alone does not in most cases bring out the desired goals from the teaching and learning process, this causes some drawbacks in student performance in Basic Technology. Again, the situation in most classrooms in Nigeria is the prevalence of authoritarian and didactic approaches to teaching/learning that does not prepare students for 21st century challenges; against the realisation of the objectives of the National Policy on Education 2004. (Annulobi, 2012)these outmoded and didactic approaches has only produced poor performances in External Examinations overtime. One of which is Basic Technology.

An investigation into the average performance of JSS students that offered Basic Technology in Junior Secondary School Certificate Examination (JSCE) in Sokoto State from 2010 to 2012 academic sessions indicated very poor performance. (See table 1.1 above)These records indicate that students performed very badly in deed and raised serious cause for concern considering the huge resources expended by Governments at different levels to improve the standard of education in Nigeria as a whole and Sokoto State in particular. The spate of poor return on investment in education by Governments across the country in terms of paying the examination fees and other sundry expenditure in secondary education .The critical importance of basic technology to the development of science and technology in Nigeria and Sokoto state in particular makes it necessary to explore available strategies to improve teaching and learn of basic technology. Since learning can be contextualized, CAI may be the medium to facilitate students better learning of basic technology.

1.3 Objectives of the study

Objectives of this study wereto:

1. Find out the Effect of Computer Assisted Instruction on the performance of students in Basic Technology

2. Determine influence of gender on the performance of students exposed to Computer Assisted Instruction (CAI).

3. Ascertain difference in performance in Basic Technology between secondary school students in day school and students in boarding school.

4. Ascertain difference in Performance in Basic Technology between secondary school students in a rural school location and students in urban school location.

1.4 Research Questions

The Questions for this study were as follows:

1. What is the Effect of the computer assisted instruction on the performance of students in Basic Technology**?**

2. What is the difference between the performance of male and female students taught Basic Technology with CAI with those taught Basic Technology with Traditional method**?**

3. Whatis the difference in performance of students in Basic Technology, between secondary school students in Day school and those in boarding school taught with CAI and Traditional method who were taught using CAI**?**

4. How different is the performance of students in Basic Technology between secondary school students in a rural school location and students in urban school location**?**

1.5 Hypotheses

The following hypotheses were formulated to guide the study:

Ho_1: There is no significant difference on the impact of CAI on performance of students between those taught Basic Technology using CAI and students taught using traditional method.

Ho_2: There is no significant difference in performances of male and female students taught Basic Technology with CAI and Traditional method.

Ho_3: There is no significant difference in performance of students in Basic Technology between secondary school students in day school with students in boarding school.

Ho_4: There is no significant difference on the performance of students in Basic Technology between secondary school students in rural school location and students in urban school location.

1.6 Basic Assumptions of the study

This study is predicated on the following assumptions:

1. CAI could enhance student performance in basic technology.
2. Students in a boarding school system would have higher academic performance than those in a Day school system when they are taught using CAI.
3. School location has impact on the academic performance of students when they are taught using CAI.
4. Processes and products of technology can help improve instructional effectiveness.

1.7 Significance of the study

The significance of this study is as follows:

- Students will benefit from CAI package for basic technology. These benefits include; better and comfortable learning, since they learn at their own pace and convenience; opportunities to work with vastly superior materials and more sophisticated problems; personalized tutoring; and automatic measurement of progress.
- Teachers will gain from CAI package for basic technology, as they experience less drudgery and repetition, greater ease in updating instructional materials, more accurate appraisal and documentation of student progress, and more time to work directly with students (Kulik, Bangert, & Williams, 1985).
- Fundamentally, the study would serve as a reference material for further studies in the application of computer to teaching and learning. Especially in science and technology, educational software developers could mass produce Computer Assisted Basic Technology Package (CABATEP) for use by Junior Secondary

Schools, Teachers and Students to enhance the teaching and learning of Basic Technology in junior secondary schools.

1.8 Scope of the study

Sokoto State secondary education is structured into six educational zones namely: Bodinga, Goronyo, Gwadabawa, Sokoto-North, Sokoto-South and Yabo respectively. This study was limited to Junior Secondary Schools in Sokoto State. And delimited to the JSS II students of Government Secondary School Kware and Government Day Secondary School Dange because the Junior secondary school basic technology curriculum stipulates that the topics (Lines, Angles, Triangles, Quadrilaterals, Energy conversion devices etc) be taught at that level. The Schools were purposively Selected because they are among the few schools in which the Nigeria Communication Commission (NCC) Installed solar powered computers.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

2.1. Introduction

In this chapter an account of the concepts of computer assisted instruction, computer application in education,and the concept of blended learning were discussed, as well as the diverse views of other related studies and concepts.These task come under the following headings:

- Conceptual Framework:
- Computer application in education:
- Brief history of Computer in Nigeria educational system;
- Basic Technology Concept and Objectives
- Concept of Academic Performance;
- Instructional Design Concept, Theories and Models.
- Empirical studies on the effect of CAI.
- Influence of gender on academic performance.
- CAI, School type, School location and Academic performance.
- Summary of the review of related literature

2.2 Conceptual Framework

Different authors and educational technologists have variedly invented concepts around Computer Assisted Instruction (CAI). For instance Ash (2004) defined computer Assisted Instruction as an educational medium by which a computer delivers instructional content or activities. The Association for Educational Communications and Technology defined Educational Technology which encompasses Computer assisted Instruction as “the study and ethical practices of facilitating learning and improving

performance by creating, using and managing appropriate technological processes and resources"(Januszewski and Molenda (cited in Yusuf 2012).

The level that computer assists learning process varies among programmes. For instance; students learn by interacting with the computer while using computer-assisted instruction (Parr, 2003). The computer analyses the students' responses and supplies proper feedback to the students.Other advanced software packages adjust the level and direction of the instruction to best suit the individual user's needs. The general belief among educationists, parents, and other critical stake holders is that computer technology allows educators more options for communicating, facilitating the lesson, and enhancing teaching and learning. Proponents claim that computer technology makes learning easier, more efficient, and more motivating (Schacter & Fagnano, 1999).

These beliefs are supported by research that has found that learning with computer-assisted instruction compared to the traditional teaching methods produces a higher level of academic achievement than traditional teaching methods only (Fletcher-Flinn & Gravatt, 1995).

2.2.1. Computer Application in Education

Overlapping terms related to the uses of computer and associated technologies in science education are categorized into three by Bybee, Powell, and Trowbridge (2008) as follows: Learning about computers, learning with computers and learning through computers.

1. Learning about computers involves the knowledge of computers at various levels such as knowing the uses of the computer and the names of the various parts, knowing how to use the keyboard and computer packages and so on (Owusu et al., 2010). According to Tabassum (2004), the knowledge of

Computers may be thought of as a continuum which ranges from skills in and awareness of computers at lower level to programming at higher level.

2. Learning with computers, students use computers as a tool in data acquisition, analysis, communication with other people, information retrieval and myriad other ways (Owusu et al., 2010). Learners use computers to get information and do their homework.

3. The term 'learning through computers' involves the use of computer as an aid for the teacher to do his/her presentations, and / or to get the learners to practice and drill. Computers are used to enhance interactive activities, to provide immediate feedback, to facilitate the retention and to enable the learners at diverse levels to work at their own pace. This broad and extensive classification of the application and use of computer in education as aptly captured by Serin (2011) underscores the focus of the study; learning through Computer using the Blended learning theory forms the basis for this study.

Goldberg and Sherwood (cited in Kyaw, Koki, & Chang,2000) identified the following approaches as the most far reaching:

- Learning about computers,
- Learning from computers, and
- Learning about thinking with computers.

Learning from or with computers encompasses approaches to CAI in which the computer is used as a means for transmitting specific subject matter, such as reading. The flow of information is basically from the computer to the student, with the computer presenting learning material or activities for student responses. The computer retains records of the student's progress through the course of study under the guidance

of the teacher or instructor.Computer Assisted Basic Technology Package (CABATEP) is designed to function in form of drill and practice.

2.2.2. Advantages and Disadvantages of Computer Assisted Instruction (CAI)

There are conflicting perceptions about the benefits of using CAI,while some educators sees CAI as the solutions to challenges of classroom teaching; others perceive CAI as the implementation of an archaic teaching technique for acquiring knowledge without use of information processing skills. (Moosavi, 2009). Nonetheless, the following are the inherent benefits and drawbacks of CAI.

Computer assisted instruction reduces time spent by instructors and teachers by one third.(Kulik & Kulik, 1985)

Institutions can save costs of replacing materials and reduce the cost of test administration through computer based system.

A computer based curriculum instruction can meet the diverse needs of students thus,expanding and increasing their enrolment.

CAI stimulates and improves attitude towards instruction, computers, and examination scores.It has high flexibility and convenience and immediate feedback which self-paced instruction provides without the embarrassment which traditional classroom might cause.

The axiom that Computer Assisted Instruction (CAI) packages are veritable innovative tools for extending the frontiers of knowledge in the classroom cannot be over stressed, However, the various forms of application of computer in education were clearly drawn by Pilli (2008) she stated thus,"Computer assisted instruction (CAI) is the representative application of computers as an instructional device in instruction "accordingly, Kulik, Kulik, and Bangert-Drowns (1985) identified the terminologies used by educators and researchers. Such as; "computer-assisted instruction, computer-based education,

computer-based instruction, computer-enriched instruction, computer-managed instruction" that can easily become puzzled by educators.

The following concepts were drawn as forms of computer application in education: ***Computer-Based Education (CBE) and Computer-Based Instruction (CBI):***are the broadest terms and can refer to virtually any kind of computer use in educational settings, including drill and practice, tutorials, simulations, instructional management, supplementary exercises, programming, database development, writing using word processors, and other applications. These terms may refer either to standalone computer learning activities or to computer activities which reinforce material introduced and taught by teachers. Computer-assisted instruction (CAI) is a narrower term and most often refers to drill and-practice, tutorial, or simulation activities offered either by themselves or as supplements to traditional, teacher directed instruction.

In a traditional approach one can say that Computer Assisted Instruction (CAI) is an expression of any subject matter by using computers, or in general sense it is an acquisition of knowledge in a more simple way to the student by the learning-teaching activities with the help of computers.(Pilli,2008) Computer-Managed Instruction (CMI) can refer either to the use of computers by school staff to organize student data and make instructional decisions or to activities in which the computer evaluates students' test performance, guides them to appropriate instructional resources, and keeps records of their progress.

Computer-Enriched Instruction (CEI) is defined as learning activities in which computers:

- Generate data at the students' request to illustrate relationships in models of social or physical reality,
- Execute programs developed by the students, or

- Provide general enrichment in relatively unstructured exercises designed to stimulate and motivate students.

In another perspective, there are associative concepts on the utilisation of Computer in teaching and learning (Owusu, Monney, Appiah, & Wilmot; 2010, Serin, 2011). The overlapping terms related to the uses of computer and associated technologies in science education are categorized into three by Bybee, Powell, and Trowbridge (2008) as follows: Learning about computers, learning with computers and learning through computers.

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The limitations of CAI include:

CAI has tendencies for less rigorous and watered down subject course contents, which could worsen the problem of poor performance in that subject area.CAI may not be equally accessible to all students at all times. (Tukur,2012).and it may fail technically thus causing frustration. Students background with computers can make a difference but can scare off students who do not have familiarity with computer consequently increasing their apathy towards the subject matter such as Basic Technology.The self-paced component of CAI could be the downfall for some students who need the motivation from a specific class meeting to keep their learning schedule on

track,computer assisted instruction is costly and requires continuous maintenance and support personnel.

2.3. Brief history of Computer in Nigerian educational System

The desire, aspiration and focus of the national educational policy in Nigeria is geared towards Industrialization and economic advancement. Basic Technology as a subject is at the threshold of achieving this lofty objective. However, the teaching of the subject matter overtime has been through the traditional mode which has become outmoded, several studies overtime identified causes of low performance of students in science and technology subjects at the different strata of our education to be among others the pedagogical method. Other mitigating factors listed as responsible for poor performance in school subjects include; Poor teacher quality, overcrowded classroom, lack of suitable and adequate science equipment among others Abdullahi, Bajah, Kareem, Ogunniyi,(as cited in Yusuf & Afolabi,2010).The pervasiveness of ICT in all spheres most especially in teaching and learning created the imperative for computer in instructional techniques, lately studies have indicated that teaching through or with computer has improved teaching and learning.

The integration of computer in education universally created the needed impetus for the Federal Government of Nigeria to come up with national policy on computer literacy in 1988. This policy addresses the integration of computer at all levels of education i.e. Primary, Post-Primary and Tertiary.Accordingly Abimbade (1999) identified the following as the central policy and educational objectives to the intent of the government:

- To bring about a computer literate society in Nigeria by the middle 1990s

- To enable the present generation of school children at different levels of education appreciate the potentials of the computer and be able to utilize the computer in various aspects of life and later experience.

However, the main educational objectives include:

- Ability to use and program computers;
- Knowledge and ability to use and develop software packages;
- Understanding of the structure and the operation of the computer;
- Knowledge about the history of computers;
- Appreciation of the psychological, economic and social impact of the computer and
- The use of the computer in problem –solving. (p160)

In order to achieve these lofty objectives the Federal Government outlined the following strategies:

- Training teachers and associated personnel
- Hardware facilities
- Curriculum development
- Software developments and evaluation
- Maintenance of hardware and peripherals (Chukwuka, 2012)

Prior to the policy on computer Literacy, there were efforts to incorporate computer in to education. Particularly, The concept of programmed instruction which was an entirely new phenomenon in Nigeria. Until 1963 when the United Nations Educational, Scientific and Cultural Organisation (UNESCO)identified the need to introduce new methods and techniques to teaching by prevailing on member nations which Nigeria happen to be one to embrace programmed learning, methods and application. This effort

culminated in the establishment of Programmed Instructions Research Centre at the Institute of Education of the University of Ibadan (Okoruntifa, 1968) in Abimbade (1999).At this centre; many programmes were designed and tried out in sciences, especially in mathematics and biology (Abimbade, 1999). However, the history of computer in education in other climes particularly in the United States of America has its roots in the early computer-assisted instructional software developed by Patrick Suppes at Stanford University during the 1960s. Dr, Suppes systematically analysed arithmetic courses and other subject courses. He designed highly structured computer systems that allowed for learner feedback, branching of the material, and student record keeping (Coburn et al. 1982) in Ash (2004).Before the early 1980s, computers were too expensive to be used in K-12 education in United States of America. According to Ash (2004) the principal use of computers in school was record keeping. The emergence of computer-assisted instruction and incorporation of technology into all aspects of the curriculum began in the early 1990s. The Internet led to a quick proliferation of computers in the homes. Students were more comfortable using computers allowing for a greater integration into their day. Computer-assisted instruction moved beyond simple drill and practice. Software became more effective by being more adaptive to each individual student's needs (Christman & Badgett, 2000). The increased emphasis on the individual student and their learning requirements caused a greater interest in computer-assisted instruction. Researches in human learning revealed that; students benefit more in learning environments with computer as the central medium; the essence of using computer for learning is to ensure quality of the learning content and delivery. Ash (2004) lent his support for this assertion thus; the focus of computer use in the classroom shifted to quality of learning. Product based learning became more prevalent in the educational arena.computers in education dates back to over sixty years ago, it

started with the manufacture of the mainframe computers in the 1960s, and evolved into minicomputers in the early 1970s and microcomputers in the late 1970s (Simonson & Thompson, 1997). Today, there are countless kinds and models of computers generally called Information and Communication Technology (ICT).

Computer Assisted Instruction (CAI) it is the use of a computer to provide course content instruction in the form of drill and practice, tutorials, and simulations. The term is used synonymously with Computer-Based Learning (CBL), Computer-Based Instruction (CBI), and Computer-Assisted Learning (CAL) (Kyaw, Koki, & Chang, 2000).Computer-Assisted Instruction (CAI) was first used in education and training in the United States of America during the 1950s. It thereafter witnessed rapid growth in the 1960s. The U.S. government in order to determine the effectiveness of computer-assisted instruction increased funding for research and development in education and industrial laboratories which culminated in the development of two competing companies, (Control Data Corporation and Mitre Corporation) who came up with the Programmed Language and Automatic Teaching Operations (PLATO) and Trees Into Cartoon,Cartoon Into Trees (TICCIT) projects.PLATO eventually enabled computer-based instruction to integrate text and graphics, and provided one of the first programming environments for instructors to develop CAI (Saettler, 1990; Alessi & Trollip, 1991), there are different approaches to the use of computers in educational practices.

2.4. Concept of Academic Performance

There are diverse definition offered by different scholars and educationists, Academic performance may be defined as the outcome of teaching and learning it is the extent to which a student, teacher or institution has achieved their educational goals. Academic performance is commonly measured by examinations or continuous assessment but

there is no general agreement on how it is best tested or which aspects are most important it includes procedural knowledge such as skills or declarative knowledge such as facts (cognitive domain) (Kanter, 2012).

In similar vein; Bell (2012) defined Academic performance as the ways or strategies students use to deal with their studies and how they cope with or accomplish different tasks given to them by their teachers. Academic performance is the ability to study and remember facts and be able to communicate knowledge verbally or on paper. In educational institutions, success is measured by academic performance, or how well a student meets standards set out by local government and the institution itself. As career competition grows ever fiercer in the working world, the importance of students doing well in school has caught the attention of parents, legislators and government education departments alike. (p2.).

2.5. Basic Technology, Objectives and features

Basic technology is an amalgamation of science and vocational subjects taught at the junior secondary school level (referred to as basic level 1-3). It was introduced as a pre-vocational subject with varied components that includes Technical drawing, Metal work, Wood work, Electrical Electronics, Auto mechanics, Building technology, Basic Applied mechanics and Food preservation. The national policy on education (FRN, 2004) outlined the following as the cardinal objectives of the subject:

i. Provision of pre-vocational orientation for further training in technology.
ii. Provision of basic technological literacy for everyday living and
iii. Stimulation of creativity.

To achieve these objectives requires teachers that have competencies enough to manage students to achieve technology education that would usher in science and technology

development in Nigeria. Essentially the subject is practical based, most of the components of the subject require practical activity to fully galvanise the theoretical knowledge. Computer Assisted Instruction (CAI) is an aspect of programmed instruction designed to address aspects of challenges in teaching and learning, particularly subjects with some level of difficulty such as basic technology. It is believed that the power of CAI to convey instruction in large volume and in different perspective would improve students' performance in basic technology examination.

2.5.1. Concept of Blended learning

As the name implies, Blended Learning is an emerging concept that propagates the mixing of principles, models, theories, techniques in a teaching and learning environment to facilitate the attainment of the instructional objectives with special consideration for the learning needs and characteristics of the learner. In other words, it is blend of learning theories and approaches combined to optimize teaching and learning opportunities. Blended learning is relevant in the context of comparing the impact of Computer Assisted Instruction with traditional mode of instruction in that it is argued that in computer mediated teaching and learning environment a lot of factors come to play in a way that No one single theory, model or technique is enough, hence the choice of blended learning principle may suffice.

Blended learning evolved from the belief that humans are not "Single -Method Learners", the key proponent of this theory is e-learning expert Elliot Masie; who described human beings as "Blended learning species". It is believed that individuals perform better when there are a mix of modalities and learning methods.

Blended learning theories have been supported by a wide range of authors and educationists as the most pragmatic instructional learning theory that addresses the

diverse needs of learners. It combines face to face classroom methods with computer-mediated activities to form an integrated instructional approach.

University of Pennsylvania (2009) observed that;

> In the past, digital materials have served in a supplementary role, helping to support face to face instruction. For example, a blended approach to a traditional, face to face course might mean that the class meets once per week instead of the usual three-session format. Learning activities that otherwise would have taken place during classroom time can be moved online (p3.)

Zemke (2002) states that the situation is dependent upon "the people you serve, the nature of the skills they must master and the context in which they are to perform." For this study, the subjects would be drawn from schools located at the outskirt of the state capital as such the students are affected by wide range of factors, environmental, economic, social, etc. therefore to make the curriculum objectives achievable the need for a blend of diverse teaching method and techniques is imperative; more so that Computer technology is at the heart of the study.

Rosset (2002) in support of Zemke's position assert that, "Learning theories aren't like religion," "You don't have to pick Catholic or Baptist or Muslim, and shun the others. The goal is to have the right theory for the right situation."(p3.) This in effect that there should be no stereotyping in approaches to teaching, rather the concept of system approach to instruction should be considered following instructional process.

The foregoing assertion reinforces the choice of Blended Learning theory as the basis for this study, it is relevant in that; there will be face to face contacts with the learners in the control group as well as with the experimental group with CABATEP as the medium, this requires employing different pedagogic techniques if the stated objectives is to be realised. It is important to note the eclectic nature of instructional design requires an eclectic approach.

Features of Blended Learning: Zemke, (2002) identified five components/elements of blended learning which include:

- Live Events:Synchronous, instructor-led learning events in which all learners participate at the same time, such as in a live "virtual classroom."
- Self-Paced Learning:Learning experiences that the learner completes individually, at his own speed and on his own time, such as interactive, Internet-based or CD-ROM training.
- Collaboration: Environments in which learners communicate with others, for example, e-mail, threaded discussions or online chat.
- Assessment:A measure of learners' knowledge. Pre-assessments can come before live or self-paced events, to determine prior knowledge, and post-assessments can occur following live or self-paced learning events, to measure learning transfer.
- Performance Support Materials: On-the-job reference materials that enhance learning retention and transfer, including PDA downloads, and printable references, summaries, and job aids.(p.2)

The features outlined above, forms the basis and justification for computer assisted instruction using self-paced learning features. Today, the emerging alternative theoretical perspectives in education, is the shift from cognitivist theory and behaviourist theory to constructivist views which posit that knowledge is better acquired when learners are allowed to make up their own perspective of the world to construct knowledge for themselves. According to Reigeluth (1999)' more recent developments are due to Constructivist learning theories, Instructional designers no longer depend on any one theory. They draw upon and incorporate from different learning theories, Mix those with other information and apply the results to meet human

needs' this is quite relevant to this study. This research leverages on blended learning principle to facilitate the achievement of the study outcomes.

2.6. Instructional design Theories and Models

Seels and Richey (Gustafson,2002) defines "Instructional System Design ISD) which is another name for Instructional Development as (an organised procedure that includes the steps of analysing, designing, developing, implementing and evaluating instruction" (p.31) Instructional development consist of atleast five major activities these are:

1. Analysis of setting and learner needs.
2. Design of set of specifications for effective, efficient and relevant learner environment.
3. Development of all learner and management materials.
4. Implementation of the resulting instruction and,
5. Formative and summative evaluation of the results of the development.

"All instructional designs evolved from human learning theories" (Tukur, 2011:8) Therefore, for any instructional activity to be effective and valid, it must be predicated on a learning theory. The achievement of any learning objective is guided by clearly articulated, constructive and responsible instructional design.There are several learning theories that underpin the use of computer and engagement of technology in teaching and learning processes. The most prominent of these'technology mediated theories' are based on human psychological theories of learning rooted in the traditional method of teaching. The emergence of technology spurred attempts at matching learning theories with technology to improve learning outcomes. Theories such as connectionism conceived and promoted by Edward Thorndike, Richard Atkinson, Robert Gagne, David Ausubel, Leslie Briggs, David Merrill and others define *Learning as a series of*

connections of concepts and contents from simple to complex.(Jonnasen,Peck,& Wilson, 1999).

Cognitivism,school of thought championed by Jerome Bruner, Jean Piaget,John Dewey, Lev Vygotsky, Howard Gardener and others,while Operant conditioning paradigm was promoted by B.F. Skinner,and Classical conditioning by Ivan Pavlov, provided the foundation for computer-based instructional design.they assert that learning should be organized from very simple to very complex events .other contributors to Behaviourist learning principle led by John Watson emphasised that psychology should not dwell into issues of memory and mind; rather attention should only be paid to observable changes in behaviour. These theorists belief that humans and animals adjust and adapt to their environments by heredity and habit. These principles guided and continue to guide teaching and learning in various contexts. According to Simonson and Thompson (1997) 'despite the shift in paradigm, learning theories share some common grounds especially as applicable to computer assisted instruction; feedback, learners assessment, and individualized instruction. Among the Cognitivists, Robert Gagne's who is re-known for his contribution to systematic approach to learning made effort at defining learning from a real world or practical setting is pertinent (Jonnasen, Peck & Wilson,1999). Gagne's perspective is that learning is cumulative,since human intellectual development is the accumulation of complex structures of human capabilities that in turn enable the individual to be a functioning member of his society. And that learning is the different capabilities of the individual required from the stimulation from the environment and the cognitive processing undertaken by the learner. Consequently, Gagne identified five categories of learning that may be influenced by internal and external conditions of learning.The internal state required in the learner to acquire new skills is the internal conditions, while the stimuli

or action required to support the internal processes are the external conditions of learning. These are;Verbal information; this refers to retrieval and storage of information,Intellectual skills; these are those mental operations that enable an individual to respond to what he/she perceive from the environment,Cognitive strategies;this is how the learner organises his thinking and learning processes,Attitude is the predisposition that affects a person's choice of action and Motor Skills; is the ability to perform sequence of required movements.Gagne posit that instructional events do not produce learning but support the learners internal process,these theories have had positive influence on the evolution of the system approach to design of instruction.(Gredler, 1997).However, an emerging and most recent principle of learning that guides distance and open education and is pertinent to this study as the theoretical basis is *Blended Learning theory.*

Instructional Design (ID) is the act of planning, organising and the implementation of instructional contents in teaching and learning context. According to Sara McNeill in Edutechwiki (2013) Instructional design is that branch of knowledge concerned with research and theory about strategies and the process for developing and implementing those strategies. It is a systematic process for understanding human learning needs and performance problem, identifying what to do about it and then doing something about it. Instructional Design is a pedagogic or teaching device that makes instruction as well as the instructional material more engaging, effective and efficient.

Smith (2003) aptly describes instructional design as the systematic process of translating learning principles and instruction into plans for instructional materials and activities. It follows then that in whatever setting; traditional or technology laden, teaching and learning activities must be logically and responsibly structured to achieve the desirable learning objectives. Reigeluth (1999) asserted that Instructional design is

akin to engineering where 'Architects engineer space, Doctors engineer health',Instructional designers engineer human performance this, underscores the significance of designing instruction. Instructional designs are built on relevant learning principles or theories, in other words, instructional design is the manifestation of learning theories.

Instructional design theory is the quest to plan and implement instruction for learning to be achieved. It is usually drawn from learning theories.

Instructional design model is a method, a general design rule or principles on how to teach or bring to learn. Instructional design model is usually restricted to a specific target, audience or subjects and contexts and centrally focused on a learning theory. (Edu-techwiki, 2013). There are varied types of instructional models. The choice of any ID model depends on the needs and characteristics of the learner, the learning objectives, method, materials and competency of the instructor. Reigeluth (1999) posits that all instructional models have the following basic components as a common feature:

- Identify and analyse the instructional objectives,
- Plan and design solutions to the instructional objectives,
- Implement the solutions, and
- Evaluate and revise objectives, strategies, etc.

Models offer means of comprehending an incomprehensible problem by giving structure and meaning to instructional design problems giving designers the leverage to break the problems into discrete manageable units, the value of a specific model is determined within the context of usage (Smith,2003). Different instructional models are available for different instructional purposes; the most prominent models of instructional design in a technology mediated instruction such as CAI are rooted in the system approach to instruction. These models include: ADDIE model, ASSURE model,

Dick and Carey model, Hannafin & Peck model, Knirk & Gustafson model, Jerrold Kemp model, Gerlach Ely Model,Gagnes Model, etc. However, for the purpose of this study, Hannafin and Peck and Knirk & Gustafson Models are considered relevant to the goals and content of this study for their simplicity, relevance and flexibility to learning theories.

*Hannafin & Peck Model (1987):*This instructional design model as depicted in figure 2.1 below is a three phase process. In the first phase, a needs assessment is performed. This phase is followed by a design phase. In the third phase, instruction is developed and implemented. In this model, all of the phases involve a process of evaluation and revision. The Hannafin & Peck's design model is simple but elegant in the way in which all three phases are connected to "evaluate and revise". This may not be a model designed for a novice, but its focus on constraints in relation to quality and complexity is appealing. (Qureshi, 2004)

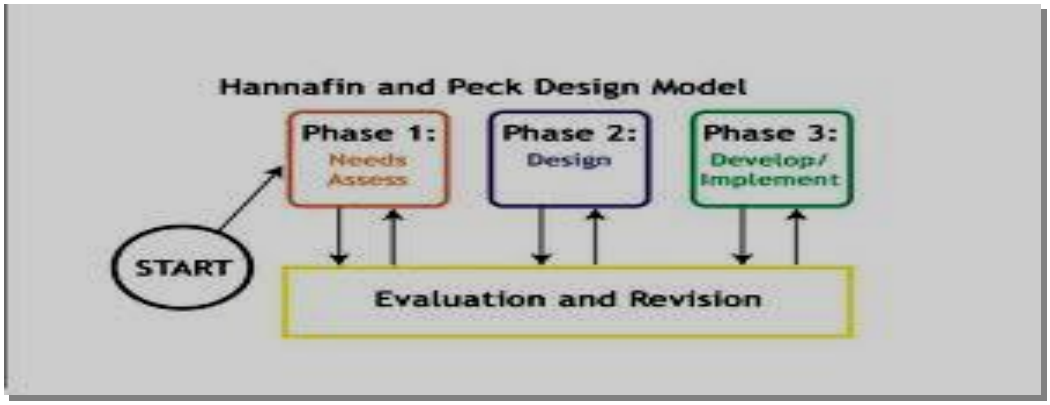


Figure 2.1. Hannafin & Peck Model of Instructional Design*Source:* *Smith (2003)*

Knirk &Gustafson Model (1986)*:* Like the Hannafin & Peck instructional design model, The Knirk & Gustafson model (figure 2.2 below) is a three stage process which includes problem determination, design and development. The problem determination stage is concerned with identifying the problem and setting instructional goals. While the design

stage deals with developing objectives and specifying strategies, the development stage is the final stage, it is the point at which materials are developed.

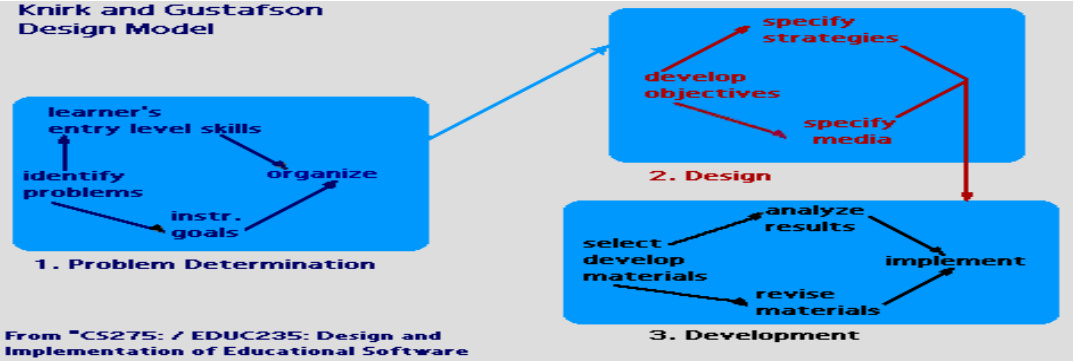


Figure 2.2 Knirk & Gustafson Instructional Design modelSource: *Smith (2003).*

2.7. Empirical studies on the impact of Computer-Assisted Instruction

The drive for technological and industrial development and the integration of computer in education in recent time has deepened the challenge for educators and learners in the quest for functional teaching and learning. Studies on computers in education started in the 1960s.

Skinner (1965) stated that using computers to teach could build "confidence in education" (p.19). Several large-scale studies of computer-assisted instruction were conducted in the late 1960s and 1970s mostly outside Nigeria. These studies reported a gain of from one to eight months over students in control groups that received traditional instruction. Computer and related technologies or what is today known as Information and Communication technology (ICT) in Nigerian educational system is just evolving. The Federal Government of Nigeria, through the National Policy of Education (FRN, 2004) recommended that innovative media should be developed in schools to help students learn effectively and efficiently, for this to happen, the resources must be made available through either purchase and/or supply to the schools or through creative design and development particularly, ICT software tools such as the computer package.In furtherance of the Federal Governments policy, the NERDC (2007) encourages basic technology teachers in Nigeria to facilitate the teaching and learning of various topics in basic technology subject using ICT and other audio-visual Instructional packages. Literature from diverse studies has shown inconsistent results in the use of Computer-Assisted Instruction (CAI). Teachers continue to use lectures as a commonplace mode for the delivery of information. Instructional experts suggest that a lecture format is not as effective as other formats due to the passive involvement of the learner, while the usefulness of computer-based instruction appears to be highly promising. Empirical studies on the use and effect of CAI are few and far in-between especially in Introductory Technology (basic technology).Most of the researches conducted were outside Nigeria, records have shown that for those carried out in Nigeria were more in the area of mathematics,Biology,Language and were concentrated in the southern part of Nigeria.

Yusuf and Afolabi (2010) asserted that, the use of computer has enhanced student learning. This has made the need for computer as a medium of instruction indispensable most especially with the design and development of web or internet based resources. These are readily available online.Researchers have identified defective teaching strategies as one of the reasons for poor performance of students in Science and technology subjects. As a result, use of instructional technology, such as Computer Assisted Instruction (CAI) has become a part and parcel of teaching-learning process; Investigations have proved the effectiveness of CAI in various subject areas.

However, results of empirical studies on the effectiveness and relevance of CAI (Morrell, 1992, Cotton, 1997, Ezenwa, 2005,Gambari, 2009, Rajasekar, 2010, Yaki, 2011, Achuonye, 2011) concluded, that the use of CAI as a supplement to conventional instruction produces higher achievement than the use of conventional instruction alone. Research is inconclusive regarding the comparative effectiveness of conventional instruction alone and CAI alone, and that computer-based education (CAI and other computer applications) produce higher achievement than conventional instruction alone.Furthermore, researches in science and technology education revealed that Computer Assisted Instruction has led to better academic achievement by the students (Bello, 2012).In their study on the effect of CAI on students' academic performance in Biology, Yusuf and Afolabi (2010) found out that individually and cooperatively the students performed better with CAI than conventionally, they also found no significant difference in the performance of male and female, this study was conducted in Oyo a cosmopolitan town in south-western Nigeria, In similar studies within and outside Nigeria, the findings were supportive of each other, However, the location of the study could be a factor as most of the studies were carried out in schools located within the city were the student are familiar with computer and other social amenities that could

enhance their ability to assimilate easily.(Serin, 2011, Basturk, 2005, Achuonye, 2011, Ash, 2004, Kaur, R Sharma, S & Tyor 2012) posited that CAI produced improved academic performance of the students and revealed no significant difference on the divide between male and female.

Bello (2012) studying the effect of computer assisted instructional Package on secondary School students academic performance in Minna, Niger state, found no significant difference in the male and female performance with CAI and improved performance over traditional or conventional method of instruction, and on collective performance, Onasanya, Fakomogbon, Shehu, and Soetan, (2010) investigated the performance of students taught with researcher designed ICT tool and conventional method in introductory technology in Ilorin, the result revealed significant difference in those taught with CAI over traditional method, there was no gender comparison in their research. In addition, Adeyemi (2012) carried out similar studies on the effect of CAI on student's performance over conventional method in Social studies in junior secondary school in Osun state. The findings revealed better performance with CAI and No significant difference on student's interactive effect on their ability.

2.7.1. Genderand students' academic performance

Achuonye, (2011). Investigated gender as a factor in academic achievement of students in Port-Harcourt, River state; CAI was used to teach photosynthesis in Biology. She found that gender had no significant effect on the student's achievement. However; the study indicated better academic performance on students taught with CAI over those taught traditionally. Most studies in CAI that addressed gender globally concluded that there was no significant difference between the performance of male and female, according to Yusuf and Afolabi (2010) Gender issues too have been linked with performance of students in academic tasks in several studies but without any definite

conclusion. Furthermore, there is a general conception that imbalance exist in computer use, access, career and attitude. Outcome of studies in recent time shows gender imbalance in technology, it then follows that the role technology will play in the future should be a concern for men and women, practitioners, policy makers and parents. However, some studies revealed that male students perform better than the females in physics, chemistry, and biology Danmole, (1998); Novak & Mosunda, (1991); Okeke & Ochuba, (1986) (cited in Yusuf and Afolabi 2010) while others revealed that female students are better off than males, Bello (1990) did not find any form of influence being exerted by gender on students' academic performance in the sciences. Gender factor on the use of CAI has also been of interest to researchers. Collazos, Guerrero, Llana, and Oetzel(n.d.) examined gender influence on collaborative use of computer based communication. They found that group with minority women had low index of collaboration compared to homogenous group and group with majority women. Cotton (1997) concluded that the use of CAI as a supplement to conventional instruction produces higher achievement than the use of conventional instruction alone; research is inconclusive regarding the comparative effectiveness of conventional instruction alone and CAI alone.

2.7.2. CAI, School type, and School location on students' performance

Investigating the Effect of school location and school type on student's academic performance, Owoeye and Yara (2011). Studied students results of the West African School Certificate Examinations (WASCE) conducted between 1990 and 1997 in 50 secondary schools in both rural and urban areas of Ekiti state, Nigeria. The results showed that there was a significant difference between students' academic achievement of rural and urban secondary schools in senior school certificate examinations. It proved that students in urban areas had better academic achievement than their rural

counterpart. In a similar study on school location and academic performance, Adeyemi (2011) carried out a comparative study on student's academic performance in public examinations between secondary schools in ondo and Ekiti state, Nigeria the study population comprised all the 281secondary schools in Ondo State and the 171 secondary schools in Ekiti State, Nigeria. Out of this population, a sample of 240 secondary schools in Ondo State and 146 secondary schools in Ekiti State was taken using stratified random sampling technique. It was found that the performance of student in the Junior Secondary Certificate (JSC) and the Senior Secondary Certificate (SSC) examinations was low. Suggesting that the entire secondary education system need to be re-examined in terms of teacher's strengths and competencies, availability of instructional facilities and pedagogic and general instructional delivery techniques.

In another study by Xu (2009) on school location, academic achievement and home work management by middle school students in the United States of America, 633 Grade 8 rural and urban students participated in the study. Compared with low-achieving students, high-achieving students reported more frequently working to manage their workspace, budget time, handle distraction, monitor motivation, and control emotion while doing homework. Urban middle school students, compared with their rural counterparts, reported being more self-motivated during homework.

The studies reviewed so far on the efficacy of CAI in Nigerian schools were done with focus on interactive, collaborative setting, and Gender as the variables (Onasanya,e.tal, 2010; Yusuf and Afolabi, 2010; Achuonye, 2011; Adeyemi, 2012) As pointed out earlier, these studies were mostly carried out in the southern part of the country, consequently these earlier studies leaves much to be desired and space for further research as the interest and performance of students in external examination suggest educators must strive to integrate, explore and deploy varied strategies to improve and

create learning opportunities for enhanced student performance.It is noteworthy however, that as computer continues to make inroads in the instructional arena; it is prudent to study CAI as it relates to subject content areas and instructional applications, as well as the design of software. According to Doolittle, Hicks and Lee (2002) in Coyle (2004), those involved in the learning process acquire 'multiple perspectives' on issues when technology is used to enhance social interaction with other learners, learners in remote locations, and experts.They summarised their view as follows:"Technology must be used to create authentic experiences that link new knowledge to prior knowledge, in a socially interactive environment where questions being pursued are relevant to the student (learner)"

There's no gain saying therefore that; Computer assisted instruction is barely emerging in Nigerian educational system, making room wide open for more genuine research efforts in that regards. Yusuf and Afolabi (2010) submitted that little is known about the use of computer assisted instructional package in the Nigerian education system particularly in cooperative learning setting. Especially on the use of CAI in Biology instruction, there are very few empirical studies. Thus; much remain to be empirically studied on the effect of CAI in Biology education, in Nigeria (p.63).It must be emphasized that lack of empirical studies on the use of CAI is not peculiar to biology as a subject alone but almost all the subjects of study at secondary and tertiary levels. Emphatically, Yusuf (2012), states that ICT application is at best at the second level and hence advocates re-thinking, re-envisioning and re-imagining change in pedagogic approaches through ICT use by educators. The study strived to contribute to the expansion of the frontiers of knowledge by exploring the effect of Computer Assisted Instruction in Basic Technology in Sokoto State using two schools from two educational zones of the state; Dange-Shuni and Kware respectively.

2.8. Summary of the review of related literature

The chapter presented parts of broad spectrum of literatures that were reviewed, it provided insight in to general, theoretical, and conceptual background on the use and application of computer and its effectiveness in the field of education particularly in Basic Technology teaching and learning. Technology has effect on every dimension of human life. Education is just one of the areas where computers were introduced as a teaching tool for the enrichment and support of subject matters. With the help of computers, students are expected to improve their understanding, creativity, problem solving skills, and retention.Thus, they will have a chance to be more active learners. The literature provided considerably much more positive empirical findings about the effectiveness of computers over conventional mode of teaching in the classrooms. the national and international studies strongly suggest positive relationship between the use of computer-assisted instruction and student performance.Unlike the broad evidence in worldwide context, there is not much of such scientific study to have investigated the integration of computers in education in Nigeria.The few works identified in this review where mostly carried out in the south-south,south-west and north-central geopolitical zones of the country,they centred around the effect of computer assisted instruction in cooperative,collaborative and individualized learning environment with gender as avariable,and mostly in Biology,Mathematics and General science. The studies suggested further studies in other settings and geographical locations,Therefore,it is not out of place that this study tests the impact of computer assisted instruction on performance of secondary students in basic technology in Sokoto state, on the basis of gender, school location and school mode in a core Northern Nigerian educational environment.

CHAPTER THREE

METHODOLOGY

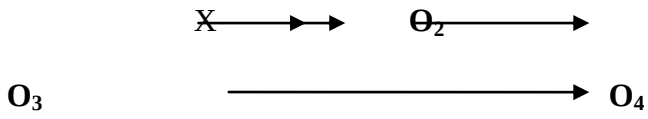
3.1 Introduction

This chapter presents the methodology of the study, organized under the following sub-headings:

Research Design, population, sample and sampling technique, instrumentation, pilot testing, validity of the instrument, reliability of the instrument, procedure for data collection and procedure for data Analysis.

3.2 Research design

This study adopted quasi-experimental design, using the pre-test/post-test,on-randomized, non-equivalent control group design. Quasi-experimental research is a type of design whereby the researcher analyses the effect of independent variable on one or more dependent variables, it is quasi because the schools and subjects for the study were not randomly sampled or selected into groups. In this study, the independent variable is the treatment involving the use of computer assisted instruction package, while the dependent variable is students' academic performance. The design for this study may be graphically represented as follows:



R, stands for random assignment of subjects, but in this study the subjects would be purposively assigned. **O** stands for observation or test, and **X,** stand for the treatment. O1, O3 is the pre-test before and after treatment, while O2, O4 is the Post-test before and after treatment.

3.3 Population of the Study

The target population for this study is the Junior Secondary School Students in Sokoto State, especially the JSS II students, this class is the most suitable for this study because they are a consistent middle class in the JSS stream, they have less tendency for distraction because they have only the terminal examination ahead of them and have covered the most of the Basic Technology syllabus. The JSS IIIs are examination classes, therefore inappropriate for this study. The JSS II in Sokoto state has a population of 18,625 students.

3.4 Sample and Sampling Technique

The sample for this study was determined by purposive selection of two intact classes (i.e the actual number of students met in the classes at the time of the study constitute the sample) from the JSSII stream of the two schools purposively selected for this study.

These schools were purposively selected because they benefited from the Nigerian Communications Commission's (NCC) Secondary schools ICT project fully equipped with solar facilities, impliedly the students have some level of computer appreciation.

Table 3.3.1: Distribution of JSS II student's population among the six Education zones

SN.	***Education zones***	***No of male students***	***No of female students***	***Total***
1,	*Bodinga*	*1,610*	*515*	*2,125*
2.	*Goronyo*	*2,750*	*631*	*3,381*
3.	*Gwadabawa*	*1,945*	*439*	*2,384*
4	*Sokoto-North*	*1,430*	*1, 305*	*2,735*
5	*Sokoto-South*	*3,960*	*1, 781*	*5,741*
6.	*Yabo*	*1,791*	*468*	*2,259*
	Total :	***13,486***	***5,139***	***18,625***

Source:*Sokoto State Ministry of Education, (2013)*

From the population of the study which is 584, therefore, using the Research advisors (2006) recommended sample size for the population with confidence level of 95% and degree of accuracy(margin of error) of 5% would be 321. This served as benchmark (See, Appendix D). However, peculiarities such as inadequate space and computers in the schools compelled the use of two intact classes from the two schools purposively selected for the study,for GSS Kware two JSS 2 classes (A and B) were selected with a total student population of 77 students served as the control group while, another two intact classes of 54 Male students and 55 female students (with a combine total of 109 students) was purposively selected as the experimental group in Government Secondary School Dange which is a co-educational school. The total sample for the study was one hundred and seventy (170) students.

3.5 Instrumentation

The instruments used for this study are:

(a) The treatment instrument A researcher developed computer assisted basic technology package (CABTEP)

(b) A Performance Test, named Basic Technology Performance Test (BATPET)

Computer Assisted Basic Technology Package (CABATEP):Computer Assisted Basic Technology Package is a teacher-directed interactive instructional package which contains lessons structured in accordance with JSSII, Basic Technology syllabus particularly for 2nd term. Computer Assisted Basic Technology Package contain the following topics: Lines, Angles, Quadrilaterals, Polygons, Metal work hand tools, Energy and Power conversion devices, in conformity with the Nigerian Basic Secondary School curriculum. It was developed by the researcher, with the assistance of professional Computer Programme developers using programming tools such as Dream Weaver, Structural Query Language (MySQL), Hypertext Processor (php), Wamp Server, and Microsoft words. It is designed to be covered within the period of 7weeks at the rate of at least 2hrs per week. It is structured into four modules; for the purpose of this study each module contains two topics per week except the 8th week which was used to administer the test. Module one contains Technical drawing aspect (Lines, Angles, Triangles, Quadrilaterals, and Polygons), The second module contains Metal work aspects of the syllabus namely, Metal Work hand tools, Marking and Measuring tools, Cutting tools, Driving tools and Metal Work Holding devices. The third Module contains Energy Conversion Appliances namely; Electrical energy devices, e. g Electric iron, water heater etc. chemical energy; e.g. charcoal, gas cooker, kerosene, etc. The fourth Module contains Mechanical/Electrical engineering aspects namely; Motors and

generators, Magnet and Magnetismand electromagnetism. week eight was used to administer the test instrument.

Basic Technology Performance Test (BATPET):BATPET is the Test instrument that was used for the study. It is a 30-item, Multiple-choice objective test instrument with five options a-e, to which the students responded to before (i.e. as a pre-test) and after treatment (using CABATEP).BATPET was designed to measure specific learning out comes related to the contents of the study as contained in CABATEP and the syllabus. The structure of the instrument is shown in Table 3.5.2.1.

Table 3.5.1:Distribution of questions in BATPET based on JSSII syllabus

SN	*Contents*	*Number of questions*
	Part A: Technical Drawing	
1.	*Lines*	*5*
2.	*Angles*	*5*
3.	*Quadrilaterals*	*5*
4.	*Polygons*	*5*
	Part B: Metal Work& Energy Conversion	
5.	*Metalwork hand tools*	*5*
6.	*Energy and Power Conversion devices*	*5*
Total:		***30 Questions***

3.5.1 Validity of the instrument

Basic Technology Performance Test (BATPET) was validated by experts in measurement and evaluation; lecturers in the department of Science Education in Usmanu Danfodiyo University, Sokoto and experienced teachers of Basic Technology in the two Schools i.e. GSS Kware and GDSS Dange.They made a number of observations, which were effected by the researcher, after which the instrument was accepted as appropriate for the purpose it was meant, as it was considered free of ambiguities, could measure what it was supposed to measure and thus, satisfied both face and content validity.

3.5.2. Pilot Testing

The study instrument, Basic Technology Performance Test (BATPET).Was administered30 randomly selected JSS II Students of Usmanu Danfodiyo University Model Secondary School, Sokoto. The students were made-up of 15 male and 15 female they were selected using Simple Random Sampling procedure by the researcher with the assistance of the subject teacher in the school.

3.5.3. Reliability of the Instrument.

The reliability of BATPET was established through the analysis of the data obtained from the administration of the 30-item multiple-choice questions on the randomly selected students of Usmanu Danfodiyo Model Secondary School. A reliability coefficient *(r)*of 0.76**.**Was recorded on the SPSS package this alpha level confirms BATPET as having a good and acceptable level of internal consistency.

3.6 Procedure for Data collection.

The process of gathering the required data for this study commenced with collection of letter of introduction from the office of the head of department of curriculum studies and educational foundations, Ahmadu Bello University,Zaria for onward transmission to the Ministry of education,Sokoto and the schools under the study for permission to have access to relevant data for the study and the use of the students and relevant facilities in the schools. The permission was granted,the researcher was thereafter introduced to the basic technology teachers, and the affected students in the schools.

Data for this study was collected from a pre-test conducted after a week of the introduction in the schools to determine the homogeneity of the sample, that is before treatment, also as a post-test after teaching both groups(control and experimental) for seven weeks each. Students of GSS Kware were the control group while the students of GDSS Dange were the experimental group.The groups were taught the aspects of Basic

Technology in Technical Drawing, Metal work hand tools and electrical energy conversion appliances using traditional method of teaching,as well as using CAI for the experimental group. The test instrument (BATPET) was thereafter administered on the groups.Scores from the tests were recorded and analysed accordingly.

3.7 Procedure for Data Analysis

Descriptive statistics (mean and standard deviation) and t-test of independent samples were the statistical tool used to analyse the data obtained from the respondents while,to test at a significant level of 0.0.5 using SPSS version16 The level of significance was the basis for which the hypotheses were accepted or rejected.

CHAPTER FOUR

DATA PRESENTATIONAND ANALYSES

4.1. Introduction

This chapter presents the analysis, data collected from the field.

4.2. Demographic data

The distribution of the data were presented as follows:.

Table 4.2.1.Distribution of respondents by Gender

Gender	***Number***	***Percentage (%)***
Male	*115*	*67.6*
Female	*55*	*32.4*
Total:	***170***	***100%***

Table 4.2.1 above shows that a total of 170 students were used for this study,The total number of male respondents in the study were 115,while their female counterpart were 55,out of the 115 male students 61 students were from Government Secondary School(GSS) Kware,while 54 were from Government Day Secondary School (GDSS) Dange.all the 55 female student were in GDSS,Dange.

Table 4.2.2. Distribution of respondents by School location.

School location	***Number***	***Percentage (%)***
Urban school	*109*	*64.1*
Rural school	*61*	*35.9*
Total:	***170***	***100%***

Table 4.2.2 .indicate that out of the 170 students selected for the study,109 of them were in urban school location while 61 of the students were in rural school location.The urban school was GDSS Dange,while the rural school was GSS,Kware in Sokoto state.

Table 4.2.3.Distribution of respondents by school type.

School type	***Number***	***Percentage (%)***
Dayschool	*109*	*64.1*
Boarding school	*61*	*35.9*
Total:	***170***	***100%***

Table 4.2.3.shows that out of the 170 students that participated in the study, 109 of them were in Day school i.e. GDSS,Dange while the other 61 students were in boarding school.i.e. GSS,Kware.

4.3 Research questions

4.3.1. Research question one

What is the impact of computer assisted instruction on performanceof students in basic technology examination?

To determine the impact of CAI on performance of students in basic technology,the basic technology performance test was administered as pre-test and post-test,descriptive statistics that is; mean and standard deviation obtained were used to answer the research questions as follows:

Table 4.3.1. Mean scores and Standard deviation of respondents in experimental and control group.

	Control Group				***Experimental group***			
	N	***X***	***Sd***	***Md***	***N***	***X***	***Sd***	***M d***
Pre-test	*61*	*7.13*	*2.88*	*2.80*	*109*	*7.15*	*3.70*	*2.35*
Post-test	*61*	*9.93*	*3.00*		*109*	*9.50*	*3.44*	
High mean gain in favour of post -test.					***High mean gain in favour of post -test.***			

N: Number of respondents, X: Mean. S D: Standard deviation., Md:Mean difference.

Table 4.3.1. Shows that at pre-test;the control group had a mean score of 7.13 and standard deviation of 2.88,while at post-test a mean of 9.93 and standard deviation of 3.00 was recorded this indicate a marginal increase of 2.80.The experimental group had a mean score of 7.15 and standard deviation of 3.70 at pretest,and a mean score of 9.50 and standard deviation of 3.44 at post-test, the experimental group has a 2.45 mean difference.However,the difference between the mean scores of the control and experimental group is 0.35 in favour of the control group.Impliedly CAI has not hadeffect on the performance of the experimental group in Basic Technology.This may be either because they are familiar with computer and therefore computer could not stimulate much of their interest and improve their performance or the intervention of computer was overwhelming to them,or probably more time was needed to meet up with the intellectual skills and cognitive ability of the respondents.

4.3.2. Research question two

What is the difference between the performance of the male students and female students taught basic technology with CAI and traditional method?

To find out the difference between the performance of male and female respondents, the mean score and standard deviation obtained by the control group and experimental group is presented in Table 4.3.2 below:

Table 4.3.2. Mean scores and Standard deviation of respondents based on Gender.

Gender		N	%	X	SD
Pre-test	***Male***	*115*	*68*	*6.71*	*2.84*
	Female	*55*	*32*	*8.04*	*4.28*
Post-test	***Male***	*115*	*68*	*9.40*	*3.11*
	Female	*55*	*32*	*10.20*	*3.57*
Total:		***170***	***100***	------	------

Gender, N: Number of respondents, X: Mean., SD: Standard deviation. Md:Mean difference.

Table 4.3.2. Shows that the male students obtained a mean score of 9.40 and standard deviation 3.11, while the female students has a mean score of 10.20 with standard deviation of 3.57 the difference of mean is 0.80 and standard deviation of 0.46 in favour of the female students suggesting the female are better,the level of significance of the difference was determined by the testing the corresponding hypothesis.

4.3.3. Research question three

What is the difference in performance of students in basic technology between secondary school students in day school and those in boarding school?

To answer this research question,the results obtained by the students is interpreted using descriptive statistics as follows:

Table 4.3.3. Mean scores and Standard deviation of respondents in experimental and control group according to School Type.

	Control Group				*Experimental group*			
	Sch.Typ.	***N***	***X***	***SD***	***Sch.Typ***	***N***	***X***	***SD***
Pre-test	*Boarding*	*61*	*7.15*	*2.88*	*Day*	*109*	*7.15*	*3.70*
Post-test	*Boarding*	*61*	*9.93*	*3.00*	Day	109	9.50	3.44

N:Number of respondents, x: Mean., SD: Standard deviation.

Table 4.3.3. Indicate that at pre-test,boarding school students obtained a mean score of 7.13 and standard deviation of 2.88, while at post-test they scored a mean of 9.93 and standard deviation of 3.00 representing a rise of 2.80 after treatment.The experimental group has a mean of 7.15 and standard deviation of 3.70 at pre-test and mean of 9.50 and standard deviation of 3.44 at post-test. Resulting in a mean difference of 2.35 and standard deviation of 0.70 however, the difference in mean of 0.45 is in favour of the boarding school students. The level of significance is determined by the test of the corresponding hypothesis.

4.3.4. Researchquestions four.

How different is the performance of students in Basic Technology between secondary school students in rural school location and students in urban school location**?**

To ascertain the difference in performance of students in basic technology between students in urban based school and those in rural based school the descriptive statistics of their performance is presented as follows:

Table 4.3.4. Mean scores and Standard deviation of respondents in experimental and control group according to School location.

	Control Group				***Experimental group***			
	Sch.location.	***N***	***X***	***SD***	***Sch.location.***	***N***	***X***	***SD***
Pre-test	*Rural*	*61*	*7.13*	*2.88*	*Urban*	*109*	*7.15*	*3.70*
Post-test	*Rural*	*61*	*9.93*	*3.00*	*Urban*	*109*	*9.50*	*3.44*

N:Number of respondents, X: Mean.,SD: Standard deviation.

The results in Table 4.3.4 shows that the control group obtained a mean score difference of 2.80 and difference in standard deviation of 0.22 while the experimental group has a mean difference 2.35 and standard deviation of -0.36.However,the mean difference of the two groups is +0.45 in favour of the school located in the rural area,consequently the level of significance of the difference is determined by test of the corresponding hypothesis.

4.4 Test of Hypotheses

Four hypotheses were formulated to guide the study, the independent sample t-test of independent samples was used to test the hypotheses the results of the statistical analyses relating to the Hypotheses are hereby presented:

4.4.1 Hypothesis one Ho_1: There is no significant difference the impact of CAI on performance of students between those taught Basic Technology using CAI and students taught using traditional method.

This hypothesis was tested using independent t-test statistics as follows:

Table 4.4.1: ***Difference between students taught Basic technology with CAI and students taught Basic technology with traditional method.***

	Groups	*N*	*X*	*SD.*	df	t	*p<0.05*	Significance
Pre-test	*Experimental*	*109*	*7.15*	*3.69*	*168*	***0.031***	*0.97(**Not significant)***	
	Control	*61*	*7.13*	*2.87*				
Post-test	*Experimental*	*109*	*9.51*	*3.44*	*168*	***-0.854***		
	Control	*61*	*9.93*	*2.97*				

Table 4.4.1. Indicate that The experimental group,which is also a day school and located in the urban centre,hada significantly lower score (mean=9.51,SD=3.44) at the end of treatment compared to the control group (mean= 9.93;SD= 2.97)**t (168)** = 0.854.Therefore, there is statistically no significant difference between the academic performance of students taught with CAI and those taught using traditional method of teaching after treatment,consequently the hypothesis which says that: There is no significant difference on the Effect of CAI on performance of students between those taught Basic Technology using CAI and students taught using traditional method.is retained.

4.4.2.Hypothesis two Ho_2: There is no significant difference in performance of male and female students taught Basic Technology with CAI and Traditional method.

This hypothesis was tested using independent t-test statistics as follows:

Table 4.4.2.Difference in performance based on Gender

	Gender	***N***	***X***	***SD.***	**df**	**t**	***p<0.05***	**Significance**
Pre-test	*Male*	*54*	*6.24*	*2.8*	*107*	***-2.60***	*0.97*	***(Not significant)***
	Female	*55*	*8.04*	*4.3*				
Post-test	*Male*	*54*	*8.80*	*3.20*	*168*	***-2.17***		
	Female	*55*	*10.20*	*3.57*				

Table 4.4.2. Shows that the female group had a statistically significantly higher score (mean= 10.20, SD = 3.57) at the end of treatment compared to male students taught basic technology using CAI (mean= 8.80; SD= 3.20)t (107) = -2.17**,** *p=0.05* Therefore the Hypotheses which says that there is no significant difference between the performance of female students taught basic technology using CAI with their male counterpart is rejected.

4.4.3. Hypothesis three Ho_3: There is no significant difference on performance of students inBasic Technology between secondary school students in day school and boarding school.

To test this hypothesis the independent t-test statistics was used as follows:

Table 4.4.3. Difference in Basic Technology performance with CAI and Traditional teaching based on School type

	School type	*N*	*X*	*SD.*	**df**	**t**	*p<0.05***Significance**
Pre-test	*Day*	*109*	*7.15*	*3.70*	*168*	***0.031***	*0.97* ***(Not significant)***
	Boarding	*61*	*7.13*	*2.90*			
Post-test	*Day*	*109*	*9.51*	*3.44*	*168*	***-0.85***	
	Boarding	*61*	*9.93*	*3.00*			

Table 4.4.3. Indicate that the Hypothesis which states that:There is no significant difference on performance of students inBasic Technology between secondary school students in day school with students in boarding school taught using CAI and Traditional methodis upheld because,the result shows thatday students had a statistically significantly Lower scores (mean = 9.51, SD = 3.44) At the end of treatment compared to boarding students (mean = 9.93,SD = 3.00), t (168) = -0.85,p < 0.05.

4.4.4. Hypothesis four Ho_4: There is no significant difference in the performance of students in Basic Technology between secondary school students in rural school location and students in urban school location taught using CAI and Traditional method. This hypothesis was tested using independent t-test; the result is presented as follows:

Table 4.4.4. Difference in Basic Technology performance with CAI and Traditional teaching based on school location.

	School location	*N*	*X*	*SD.*	**df**	**t**	*p<0.05***Significance**
Pre-test	*Urban*	*109*	*7.15*	*3.70*	*168*	***0.031***	*0.97****(Not significant)***
	Rural	*61*	*7.13*	*2.90*			
Post-test	*Urban*	*109*	*9.51*	*3.44*	*168*	***-0.85***	
	Rural	*61*	*9.93*	*3.00*			

Table 4.4.4. Shows that the urban school has a statistically significantly lower scores (mean=9.51, SD= 3.44) at the end of the treatment compared to the rural school's (mean= 9.93, SD= 3.00) t (168) =-0.85 $p < 0.05$. Consequently the Hypothesis which states that: There is no significant difference on the performance of students in Basic Technology between secondary school students in rural school location and students in urban school location is therefore sustained.

4.5. Summary of major findings.

The major findings of this research were as follows:

1. The study revealed no significant difference between the performance of junior secondary school students taught basic technology with CAI and those taught with traditional method.

2. The study revealed significant difference between performance of male and female students taught Basic technology with CAI.

3. The study revealed that school type,whether day school or boarding school has no significance on the performance of junior secondary school students taught basic technology with CAI and Traditional method.

4. There was no evidence to establish a significant difference between the mean score of secondary school students in basic technology in urban and rural school in Sokoto state.

5. There was no evidence from the study to establish that computer assisted instruction has significant impact on academic performance of secondary school students in Sokoto state.

4.6. Discussion of Findings

The fact that teaching and learning of basic technology is critical to the scientific and technological development of the nation makes research into the field an imperative. This study examined the impact of computer assisted instruction on academic performance of secondary school students in basic technology examination in Sokoto state with a view to finding out whether the use of CAI can better improve students' performance, and to encourage basic technology teachers to embrace the use of technology in teaching and learning in alignment with current global practices.

Research question one sought to find out the impact of computer assisted instruction on performance of secondary students in basic technology examination, Evidence from the study shows that computer assisted instruction had noEffect on students' performance in basic technology,the table shows that the control group has a higher improvement in their mean score than the experimental group after the tests.This outcome lends itself with the position that CAI is considered as effective as conventional teaching method (Jenks & Springer,2002) and is inconsistent with other findings Gambari, (2009), Yaki, (2011), and Bello, (2012).The implication of this finding is that teaching and learning will be devoid of technology with the consequence of being uninteresting,boring and less motivating.

Research question two sought to find out differences in performance between male and female students taught basic technology with CAI The study revealed that the female students have a higher gain in their mean score and standard deviation. This finding is consistent with similar studies Tunde, (2006), Achuonye, (2011),Yusuf and Afolabi, (2010).They found out in their studies that there was no significant difference on academic performance based on gender. However, the implication of the finding suggest the need for sustained campaign for Girl-child education in Sokoto state in

particular and Nigeria as a whole, it shows that female can perform as well as the male if given the opportunity and provided with the necessary materials and tools for learning. Especially in enrolmentinto science and technology based subjects.

Research question three and four sought to determine differences in performance of students taught basic technology with computer assisted instruction and those taught basic technology with traditional method based on school type that is day and boarding school as well as school location i.e. urban school and rural school,It revealed that the boarding school which is located in rural area and is the control group in the study has a higher mean gain than the day school,this finding is inconsistent with other research findings Xu,(2009); Owoeye and Yara,(2011), Basturk, (2005) and Serin, (2011),but in congruence with findings by Adeyemi,(2011),The implication of this finding supports the view that the day school system,though has its advantages is bedevilled by factors of distraction,absenteeism and other negative factors that has the potential to negatively affect students' academic performance. However, Tunde,(2006) found no significant difference in the academic achievement of secondary school students in introductory technology and integrated science in urban and rural schools in Benue state.

Studies by; Yusuf and Afolabi, (2010); Onasanya, Fakomogbon, Shehu, and Soetan,(2010); Adeyemi,(2011); Pilli,(2008); Parr,(2003); Schacter and Fagnano,(1999) and Fletcher-Flinn & Gravatt (1995). Revealed that learning with computer assisted instruction compared with traditional teaching methods produces higher level of academic performance.The negative outcome of the study may be ascribed to students familiarity with computer hence, its introduction in the classroom could not stimulate their interest, it could also be that the use of computer to teach the subject matter of basic technology overwhelmed the students and hence could not positively influence their performance in Basic technology examination,It could perhaps be the time

invested (Seven weeks, precisely) to teach the students was not enough to foster knowledge and understanding of the Basic Technology contents.However,the performance of the students may be placed on absence of certain conditions of learning,that is required for effective teaching and learning; these conditions which are both internal and external (Gredler, 1997) include; learners cognitive strategies, intellectual skills and factual or verbal information.

As a major finding, this study revealed that most of the students could not write, read, and understand. Thismay account for the low scores obtained from the examination,ability to write, read, comprehend and assimilate is an integral learning condition without which learning goals is not attainable.This position is supported by the outcome of a study conducted by the United State Agency for International Development (USAID) in 2011,they studied the reading ability of junior secondary school students and reading ability of primary school pupils, in some selected junior secondary and primary schools in Sokoto state their results revealed that; 73% of the pupils could not read words correctly either in Hausa or English. Another factor that may have influenced the outcome of this study may be that most of the learners are not new to computer,they may have been manipulating computers,and therefore the use of computer for this study may not make significant impact on them.This result raises some questions with regards to research methodology, the learning environment (study setting), learner's characteristics/intellectual ability, instrument and duration of treatment for both groups. This concern is borne out of the fact that several similar studies were in favour of computer assisted instruction over traditional instruction, However, O.I.W. Jagusah, (personal communication, 06-02-2014). Posits that; 'Not all research outcome is positive and not all learning outcome is repeated if they are bad'. Although studies have shown that the use of Computer in instruction promotes learning,

this study revealed otherwise; that the use of computer alone cannot deliver, without satisfying other conditions for learning such as the learners' intellectual skills which include ability to read, comprehend and respond to questions relevant to the contents.

Gagne (Gredler,1997) refers to this skill as 'correct application of knowledge learned' and cognitive strategy that is preparing the learner into new learning situation to be able to make new learning worthwhile. The result from the test of hypothesis two which says 'there is significant difference between students taught basic technology with CAI and those taught traditionally', is upheld. This outcome is inconsistent with findings from similar studies for instance Yusuf and Afolabi (2010) reported no significant difference in the students' performance on gender variable both with CAI and conventional method. Similarly, Achuonye (2011) investigated gender as a factor in academic achievement of students in Port-Harcourt, River state; CAI was used to teach photosynthesis in Biology. She found that gender had no significant effect on student's achievement. Although gender has been linked to academic performance, Yusuf and Afolabi (2010) posit that 'there is no clear and definite conclusion as to which gender is better. However, some studies revealed that male students perform better than the females in physics, chemistry, and biology', the general conception that imbalance exist in computer use, access, career and attitude., makes it imperative that the role technology plays now and in the future should be of concern to men and women, practitioners, policy makers and parents.

Hypothesis three and four were tested for differences in performance of students in day and boarding, where the day school is located in the urban area and the boarding school is located in the rural area the results showed no significant differences thereby retaining the hypotheses, The outcome of the tests implies that the school type i.e. whether a school is day or boarding, or located in urban or rural area has less or no

impact on the performance of learners, This finding is peculiar to the study because of the feature, structure and composition of the schools under the study. In comparison with studies that reported significant differences, For example a boarding/rural school in Ondo, Osun or Oyo state in south-west Nigeria when compared with the urban school in this study carried out in Sokoto; a core northern state of Nigeria could be a rural school in that respect,(that is to say urban and rural setting is relative in terms of level of development, structurally and educationally, Even though there are few studies on the impact of school type and location on performance of students, in Nigeria, the result of the study seems to contend with the positions that favours urban location and boarding to rural location and day school type,for instance; In a study on school location and academic performance, Adeyemi (2011) carried out a comparative study on student's academic performance in public examinations between secondary schools in ondo and Ekiti state, Nigeria. It was found that the performance of student in the Junior Secondary Certificate Examinations(JSCE) and the Senior Secondary Certificate(SSCE) examinations was low. Suggesting that the entire secondary education system need to be re-examined in terms of teacher's strengths, competencies, availability of instructional facilities and pedagogic and general instructional delivery technique. In another study by Xu (2009) on school location, academic achievement and home work management by middle school students in the United States of America, 633 Grade 8 rural and urban students participated in the study. Compared with low-achieving students, high-achieving students reported more frequently working to manage their workspace, budget time, handle distraction, monitor motivation, and control emotion while doing homework. Urban middle school students, compared to their rural counterparts, reported being more self-motivated during homework.

The studies highlighted so far on the efficacy and superiority of CAI in Nigerian schools

was done with focus on interactive, collaborative, and gender as the variables Onasanya, et. al, (2010); Yusuf and Afolabi,(2010); Achuonye,(2011); Adeyemi, (2012) . These studies were mostly carried out in the southern part of Nigeria;perhaps the results are reflections of the learning environment over there as such; the outcome of this study may be reflection of the level of computer appreciation and integration in to the education system in Sokoto state. Hicks and Lee (2002) in Coyle (2004), concurred with this position thus; 'Technology must be used to create authentic experiences that link new knowledge to prior knowledge, in a socially interactive environment where questions being pursued are relevant to the student (learner)'. In support of these finding is the report of Jenks and Springer (n.d), In their review of the efficacy of CAI over conventional method of instruction, they posit that though there are wide range of findings on the overriding success of CAI over traditional mode of instruction ,they observed that with potential shortcomings in past research comparing CAI to conventional Instruction CAI should be considered to be at least as Effective as conventional instruction, they conclude that new studies are needed to clarify the effects of CAI in contemporary student/computer environment. They also observed that how CAI is delivered can impact its effectiveness. Also Christmann and Badgett (2000) corroborated the outcome of this study, they made very strong case for further research, arguing that 'despite the accolades heralding CAI as the effective teaching methodology, there is still no documented evidence verifying its perceived superiority'(p.92) Jenks and Springer advanced the fact that CAI can be an effective mode of instruction in the education environment but is not offered to prove the superiority of CAI. Rather CAI should be seen as supplementing the activities in teaching and learning.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATION

5.0 Introduction

This chapter is the summary of the study, conclusions were drawn, as well as insightful recommendations and suggestions for further studies were made.

5.1 Summary of the study

This study was prompted by the prevailing conditions of teaching and learning as well as academic performance of junior secondary school students in basic technology in Sokoto state, Teaching and learning process is largely teacher dominated and passive learners with consequences of ineffective teaching and learning while poor academic performance in Basic technology is the practice. This study explored the impact of computer assisted instruction on academic performance of junior secondary school students in Basic Technology in Sokoto state.

To give purpose, direction and focus to the study, four research questions and four hypotheses were formulated to guide the study,specifically the objectives of the study were to find out the effect of computer assisted instruction on performance of students in basic technology examination in Sokoto state,the study was to determine differences in performance of secondary school students in basic technology examination according to gender, school type, that is Day school versus boarding school and school location that is Urban school and rural school.The research questions were answered by comparing the mean scores and differences between the mean scores,while the hypotheses were tested by the use of t-test of independent samples to analyse the data obtained for the study. The study involved 170 Junior Secondary School two (JSSII) students comprising 55 females and 115 males, purposively drawn from

GovernmentSecondary School Kware and Government Day Secondary school Dange respectively.

Quasi-experimental design with control and experimental groups/pre-test post-test was adopted for the study, while two instruments were deployed; a researcher developed Computer Assisted Basic Technology Package (CABATEP) was used to deliver learning contents in basic technology in line with the basic technology syllabus as well as teaching using Traditional (conventional) mode, while Basic technology Performance Test (BATPET) was administered thereafter to measure the effect of CABATEP in comparison with traditional type on the performance of the students in Basic Technology. BATPET was pilot tested at Usmanu Danfodiyo University Model Secondary School,Sokoto.A reliability coefficient of 0.76 was obtainedon the SPSS package (Version 16).The data collected were analysed; Mean,and Standard Deviation was used for descriptive analysis of the research questions while,independent t-test statistical analysis was used to test and interpret the five hypotheses stated in chapter one.

The study revealed no significant differences in the performance of students taught basic technology with computer assisted instruction and those taught basic technology with traditional method at pre-test, and post-test.The study revealed significant differences in performance of female students in basic technology over the male students, but could not establish statistically significant difference on their performance in basic technology based onschool type, and school location.The negative outcome of the study is ascribed to certain learning conditions that determine the outcome of teaching and learning activities such as factual information, learner's cognitive strategies and intellectual skills.It also identified the learner's inability to read,write and understand contents of the research instrument as largely responsible for their poor

academic performance in the examination, the implication is that technology does not enhance learning until it is supported by those conditions of learning. And recommended training and retraining through workshops, seminars, conferences e.t.c. of English language and communication skills teachers to ensure quality delivery at all levels of basic and secondary education.

5.2Conclusion

This study examined the impact of computer assisted instruction on performance of students in Basic technology examination in Sokoto state-Nigeria,From the discussion and findings of this study,the following conclusion were drawn.

Researcher's believe and general perception of the impact of computer in teaching and learning in general and basic technology in particular seems to be proved wrong by the outcome of the study.based on the data collected,the results from the analysis of the data suggest that computer does not improve learning, this is a departure from the position and global trends of the 21st century which in general parlance is referred to as the 'Digital age' most outcomes of similar studies,and current trends in education advocate the use of technology in education because of its 'imposingly dynamic' ability to facilitate teaching and learning. The negative outcome of the study may be ascribed to certain confounding variables that are central to the success of such study,this variables are the learners intellectual skills that is ability to read,write,recall past experience and relate to new information,learners cognitive style and the longevity of the treatment thus,seven weeks was used for this study. However,the researchers substantive believe and position remain as there is no better intervention for poor performance in schools than technology,it offer greater opportunities to achieve learning objectives whether in short term or long term.

As a major finding of this study, technology alone does not optimize and actualize teaching and learning unless learning conditions such as good learning environment,willingness and readiness to learn, time/duration of teaching and learning process, learner's intellectual skills,and learner's cognitive styles are adequately secured.

5.2.1 Implications of the findings

Based on the analysis of the data presented in chapter four, and the results obtained therefrom,the implications of the findings are hereby presented:

Familiarity with technology particularly computer assisted instruction (CAI) does not improve academic performance until the internal and external conditions of learning are satisfied for effective learning outcome to be achieved,Technology stimulates interest,attracts and captures more attention but the ability to recall and relate previous information with new information or skill to be learned is central to actualizing the learning opportunities provided by the CAI,Gender is not a factor in teaching and learning provided adequate condition and the right environment for teaching and learning is in place,School location (that iswhether school is located in urban or rural centre) has little or no impact on teaching and learning outcomes, provided the condition for effective teaching and learning are satisfied and the learners intellectual ability and cognitive style (that is ability to write,read,comprehend/assimilate and interpret) is good. School type (that is day school and boarding school) has little or no impact on learning outcome, with or without technology depending on the learning environment, the cognitive and intellectual skills of the learners.

5.3 Recommendations

Based on the findings of this study,the following recommendations were

1. Computer if used adequately and wisely, supplement teaching; make learning more interesting,real,and motivating.Therefore, Nigeria Educational Development andResearch Council (NEDRC) should research how to develop and create subject based instructional software for all subjects to encourage the use of computer technology in education.

2.Governments at all tiers must ensure continuous capacity building of teachers andeducators across disciplines most specially in appreciation of current trends and issues in Information and Communication Technology (ICT) in education.

3. Government at all levels must continue to encourage and intensify campaigns on girl-child education, and provide necessary teaching /learningresources in secondary schools to enhance learning opportunities for the girl-child particularly and everyone as a whole. several studies including this one has shown that female students can academically perform as well as their male counterparts both in computer mediated educational environment and traditional teaching/learning setting.

4.Government at all levels especially states and local government should invest more in education by sponsoring development of educational software like the researcher developed Basic technology package (CABATEP),or go further by emulating the Osun state government that developed a knowledge based ‘Tablet’ *''Opon Imo''* for its citizens,(*Opon Imo* comprise 28 subjects).

5.4 Suggestions for further studies

The following areas are suggested to future researchers who may do more justice to topics related to the study.

1. The results of this study raises some questions on actual variables against perceptual variables, in research,the task ahead in further studies is to identify clearly and reassess these variables in order to have clearly defined variables for a similar study or any other studies.
2. Comparative studies of impact of computer assisted instruction on academic performance of selected secondary schools in Sokoto, Kebbi and Zamfara States, Nigeria
3. Effect of Computer Assisted Instruction, on the Attitude and Academic performance of the students in Basic Technology.
4. Teachers perception and utilisation of ICT resources for teaching Basic science and Technology subjects in some selected secondary schools in Sokoto, Kebbi and Zamfara

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APPENDIX A

BASIC TECHNOLOGY PERFORMANCE TEST (BATPET)

MULTIPLE-CHOICE QUESTIONS

FOR STUDY ON COMPUTER ASISTED INSTRUCTION

Instructions: From the Options A-E provided choose the statement that best suits the preceding sentence and /or clause. All questions carry equal marks

Time Allowed: 1hr, 30mins.

1. A line may be defined as:
   a. measurement of distances
   b. the use of pencil to draw
   c. A narrow path between two [points on a surface
   d. Meeting of points
   e. None of the above

2. One of the following is NOT a type of line
   a. Continuous thin lines
   b. Continuous thick line
   c. Continuous wave dashes
   d. Short line with dashes
   e. Thick long chain line

3. _____ is used for all visible outlines
   a. Thick long-chain line
   b. Ruled line with zigzags
   c. Short dashes
   d. Continuous thick line
   e. Thin long chain line

figure 2.0



4. The line drawn above is

   a. Thick long chain line
   b. Ruled line with Zigzag
   c. thick continuous wavy line
   d. Continuous thin line
   e. Thick snaky line

5.

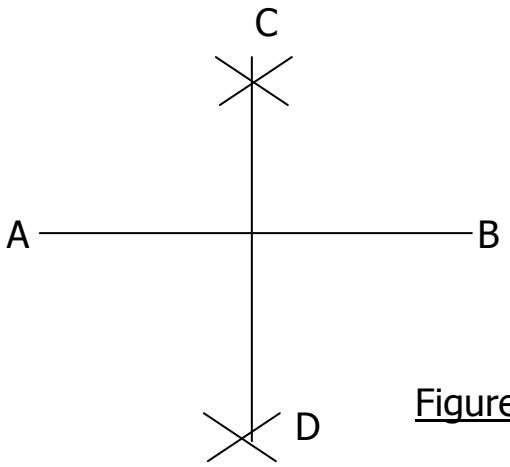


Figure 2.1

5. The line marked CD in the figure is called

a. Bisector
b. Horizontal line
c. Vertical line
d. Line CD
e. Complementary line

6. Bisection of a line means

a. To divide a line into many parts
b. Drawing an angle to a line
c. measuring the length of a line
d. creating a line
e. To divide a line into two equal parts by construction using compass.

7. The arms of an angle meet at a point to form the _____

a. Height
b. Optima
c. vertex
d. Complement
e. Supplement

8. Angle that add up to form 90^0 are called

a. Supplementary angle
b. Obtuse angle
c. Reflex angle
d. Complimentary angle
e. Acute Angle

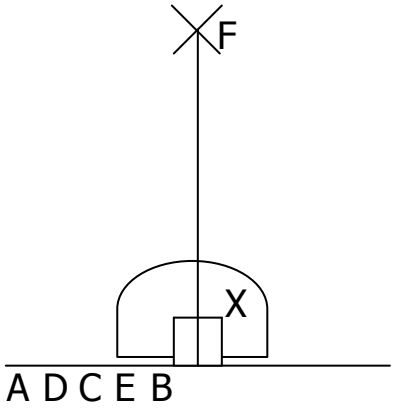


Figure 2.2

9. The angle marked X above is: _____

   a. 60^0
   b. 45^0
   c. 30^0
   d. 35^0
   e. 90^0

10. The area of a circle bounded by an arc and a straight line is called

   a. Chord
   b. Diameter
   c. Segment
   d. Quadrant
   e. Tangent

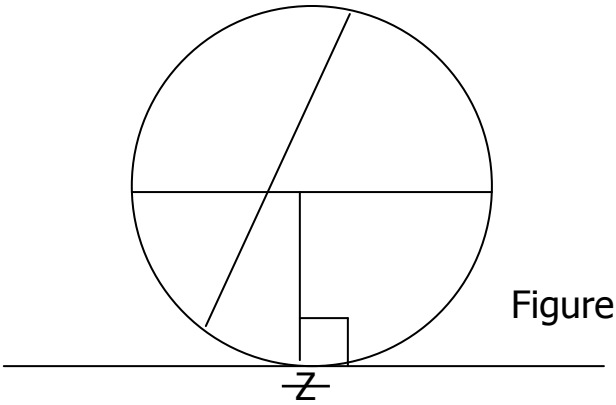


Figure 2.3

11. The part lettered Z in the figure above is:_____

   a. Tangent

   b. Segment

   c. Quadrant

d. Diameter

e. Chord

12._____ are plane figures bounded by three straight lines

a. Rectangle

b. Triangle

c. Circle

d. Polygon

e. Base

13. The lines drawn within a quadrilateral such that it join two opposite corners of an angles is called:_____

a. Diagonal

b. Vertex

c. Splinting Height

d. Hypotenuse

e. apex.

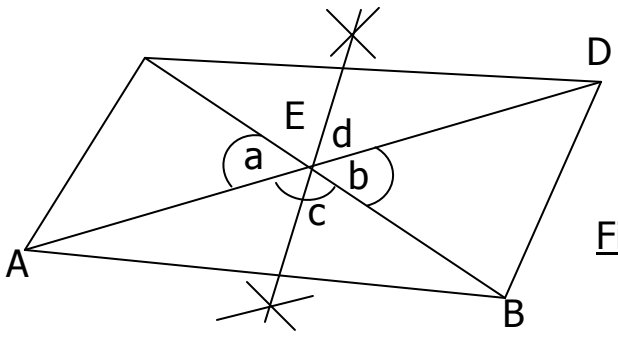


Figure 2.4

14. The figure above is a

aTriangle

b.Rectangle

c.Rhombus

d.Parallelogram

e.Square

15. A quadrilateral with only two parallel sides is known as ___

a. Rhombus
b. Parallelogram
c. Rectangle
d. Square
e. Trapezium

16. A polygon that has all its sides and angles equal is called:_____

a. A regular Polygon

b. A heptagon
c. An Irregular polygon
d. A pentagon
e. None of the above

17Marking out tools are hand tools used for :_____

a. Drilling holes on metal
b. Cutting metals
c. Marking lines out checking alignment on metals
d. Joining metal pieces
e. bending metals

18.

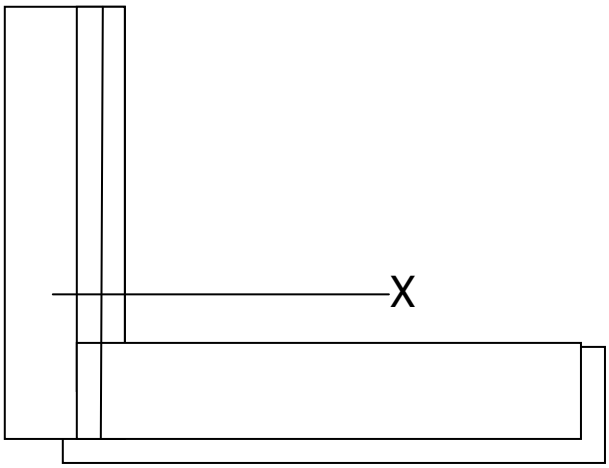


Figure 2.5

The part of the try-square named x above is the _____

a. Blade

b. Handle

c. Teeth

d. edge

e. Stock

19. A micrometer is used to/for:_____

a. Providing heavy conical dent on the surface of a metal

b.Used for marking outlines at eight angles

c. for marking parallel lines on around

d. for making precision measurements

e. used for testing the flatness of surface

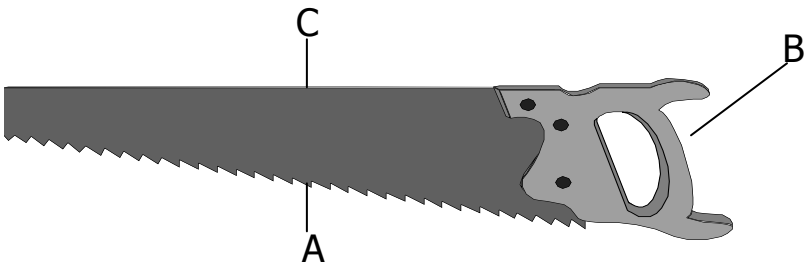


Figure 2.6

20. The part of the saw named C above is_____

a. Adjustable frame
b. Handle
c. Tension Screw
d. Blade
e. wing-nut

21.The following are the grade cut of files EXCEPT:_____

a. Life grade
b. Rough grade
c. Bastard grade
d. Second cut grade
e. Dead smooth cut

22._____ are tools used for moving objects into metals through hammering, punching or screw driving

a. Marking out tools
b. Doting tools
c. Driving tools
d. Screwing tools
e. Buttressing tools

23._____ is NOT a holding device

a. Ratchet screw drives
b. Bench vice
c. Long nose plier
d. G-clamp
e. Leg-vice

24._____ Does not convert Electrical energy to heat energy

a. Electric pressing Iron
b. Electric Blending Machine
c. +Immersion heater
d. Electric Kettle
e. Bread toaster

25. Electro mechanical Appliances are devices that:_____

a. Convert electrical energy to mechanical energy
b. convert electrical energy to sound energy
c. convert electrical energy to heat energy
d. convert electrical energy to light energy
e. convert electrical energy to chemical energy

26. Area around a magnet in which magnetism can be felt is_____

a. Electromagnetic induction
b. electrical filed
c. Magnetic filed
d. Air field
e. Magnetic lines of forces

27. One of the following is NOT part of an electric Iron

a. Power plug
b. Alarm switch
c. Heating element made of mudroom and wound on a mica
d. An Asbestos Pad
e. A bi-metallic thermostat.

28. An Air conditioner may be described as a/an:

a. Mechanical device
b. Electrical mechanism
c. electro Mechanical device
d. Chemical device
e. Electro chemical device

29. The combination of oxygen and fuel to generate heat is known as _____

a. Combustion
b. Explosion
c. ignition
d. Diffusion
e. Electrocution

30. _____ is not an electro-mechanical appliance

a. Crushing machine
b. Cassava grinders
c. Seed-shelling machine
d. Fruit blenders
e. Electric Oven

Appendix B.

Required Sample Size†

Population Size	Confidence = 95% Margin of Error				Confidence = 99% Margin of Error			
	5.0%	3.5%	2.5%	1.0%	5.0%	3.5%	2.5%	1.0%
10	10	10	10	10	10	10	10	10
20	19	20	20	20	19	20	20	20
30	28	29	29	30	29	29	30	30
50	44	47	48	50	47	48	49	50
75	63	69	72	74	67	71	73	75
100	80	89	94	99	87	93	96	99
150	108	126	137	148	122	135	142	149
200	132	160	177	196	154	174	186	198
250	152	190	215	244	182	211	229	246
300	169	217	251	291	207	246	270	295
400	196	265	318	384	250	309	348	391
500	217	306	377	475	285	365	421	485
600	234	340	432	565	315	416	490	579
700	248	370	481	653	341	462	554	672
800	260	396	526	739	363	503	615	763
1,000	278	440	606	906	399	575	727	943
1,200	291	474	674	1067	427	636	827	1119
1,500	306	515	759	1297	460	712	959	1376
2,000	322	563	869	1655	498	808	1141	1785
2,500	333	597	952	1984	524	879	1288	2173
3,500	346	641	1068	2565	558	977	1510	2890
5,000	357	678	1176	3288	586	1066	1734	3842
7,500	365	710	1275	4211	610	1147	1960	5165
10,000	370	727	1332	4899	622	1193	2098	6239
25,000	378	760	1448	6939	646	1285	2399	9972
50,000	381	772	1491	8056	655	1318	2520	12455
75,000	382	776	1506	8514	658	1330	2563	13583
100,000	383	778	1513	8762	659	1336	2585	14227
250,000	384	782	1527	9248	662	1347	2626	15555
500,000	384	783	1532	9423	663	1350	2640	16055
1,000,000	384	783	1534	9512	663	1352	2647	16317
2,500,000	384	784	1536	9567	663	1353	2651	16478
10,000,000	384	784	1536	9594	663	1354	2653	16560
100,000,000	384	784	1537	9603	663	1354	2654	16584
300,000,000	384	784	1537	9603	663	1354	2654	16586

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