EFFECT OF COMPUTER ASSISTED INSTRUCTION (CAI) ON STUDENTS' PERFORMANCE IN ECONOMICS IN SENIOR SECONDARY SCHOOLS IN EKITI STATE, NIGERIA

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BY

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A THESIS SUBMITTED TO THE SCHOOL OF POSTGRADUATE STUDIES, AHMADU BELLO UNIVERSITY, ZARIA, IN PARTIAL FULFILLMENT OF THE REQUIRMENTS FOR THE AWARD OF MASTERS DEGREE IN CURRICULUM AND INSTRUCTION, DEPARTMENT OF EDUCATIONAL FOUNDATIONS AND CURRICULUM, FACULTY OF EDUCATION AHMADU BELLO UNIVERSITY, ZARIA, NIGERIA

MARCH, 2015

DECLARATION

I hereby declare that the work in the Thesis titled "Effect of Computer Assisted Instruction (CAI) on Students' Performance in Economics in Senior Secondary Schools in Ekiti State, Nigeria" was performed by me in the Department of Educational Foundations and Curriculum, under the supervision of Dr. (Mrs) H. O. Yusuf and Dr. A. F. Mohammed. The Information derived from the literature has been duly acknowledged in the text and a list of references provided. No part of this Thesis has been previously presented for another degree or diploma at any institution.

_____ _____

Oluwaseyi Emmanuel ALASOLUYI Date

CERTIFICATION

This Thesis titled Effect of Computer Assisted Instruction (CAI) on Students' Performance in Economics in Senior Secondary Schools in Ekiti State, Nigeria, meets the regulations governing the award of the degree of Masters in Curriculum and Instruction of the Ahmadu Bello University, and is approved for its contribution to knowledge and literary presentation.

Dr. (Mrs) H. O. Yusuf Chairman, Supervisory Committee	Date
Dr. A. F. Mohammed Member, Supervisory Committee	Date
Dr. B. Maina Head of Department, Educational Foundations and Curriculum	Date
Prof. A. Z. Hassan Dean, School of Postgraduate Studies	Date

DEDICATION

This work is dedicated to Almighty God and to my Parent, Chief & Mrs. T. Ajeigbe Alasoluyi whom God used to support me and my siblings for their kind assistance and for always believing in me, your unconditional love, and for your constant prayers.

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ABSTRACT

This study examined the Effect of Computer Assisted Instruction (CAI) on Students' Performance in Economics in Senior Secondary Schools in Ekiti State, Nigeria. The study was conducted with four research objectives and four research questions were asked while four null hypotheses were formulated and tested at $p < 0.05$. Literatures that are related to the study were also reviewed. This study was conducted in the public Senior Secondary Schools in Ekiti State. Specifically, students of SSS II in Government Science College Iyin-Ekiti, Community High School Iyemero-Ekiti, Government College Oye-Ekiti, and Ijaloke Grammar School Emure-Ekiti with a population of 195, using quasi-experimental design. The bio-data of the respondents was analyzed with the use of frequency and percentage while mean and standard deviation was used to answer the four research questions. All the four null hypotheses were tested at 0.05% level of significance using t-test. A t-test of independent sample was used to compare the performance of students taught using Computer Assisted Instruction (CAI) method with the performance of the group taught using only traditional method. The findings of the study among others revealed a significant difference in the post-test performance scores of students taught Economics with the use of computer assisted instruction when compared with those taught using the traditional method of instruction; that there was no significant difference in the performance of male and female students taught Economics with the use of computer assisted instruction. The first, third and fourth null hypotheses were rejected because the t-value was more than the p-value and the second null-hypotheses were retained as the t-value was less than the p-value. The study concluded that students perform better and score higher in Economics given test when taught using CAI enhanced method. Based on the conclusion, the study recommended that teachers and students in the Senior Secondary School as well as other levels of education should imbibe the use of CAI method of teaching since it enhances students' performance in courses of study. Also the study recommended that CAI drill and practice software as well as CAI Experts and CAI resources (financial, infrastructure, computers and power generation sources) should be made available by respective Ministries of Education at the Federal and State levels, as well philanthropists who are interested to encourage educational development throughout the country.

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ABBREVIATIONS

CAI: Computer Assisted Instruction
CI: Conventional Instruction
CAL: Computer Assisted Learning

CBI: Computer Based Instruction

CSCL: Computer-Supported Collaborative Learning. Area of work that focuses on socially oriented theories of learning using computer technologies to support collaborative methods of instruction.
CAI: Computer Aided Instruction
CBE: Computer Based Education

CEI: Computer Enriched Instruction

CMI: Computer Managed Instruction

ILS: Integrated Learning System A network that combines instructional and management software and usually offers a variety of instructional resources on several topics.

ISDN: Integrated Services Digital Network. A digital phone line that can transmit data, video and voice.

IT: Information Technology.

K-12: Kindergarten through the twelfth grade (secondary education).

LAN: Local Area Network. The linkage of computers and/or peripherals (e.g. printer) confined to a limited area that may consist of a room, building or campus that allows users to communicate and share information.

OPTACON: Optical to Tactile CONverter

RAM: Random Access Memory. The space in the computer on which information is temporarily stored while the computer is on.

ROM : Read Only Memory. A permanently stored memory that is read and not altered in the operation.

SITE: Society for Information Technology and Teacher Education

OPERATIONAL DEFINITION OF TERMS

Active Learning: The learner interacts with the teacher, author, or the learning programme to construct his/her own meaning. It is the child's individual or meta-cognitive act of observation, hypothesis generation and testing, and reflection.

Computer Assisted Instruction: It is an interactive instructional technique whereby a computer is used to present the instructional material and monitor the learning that takes place or it is the use of computer as a tool to facilitate and improve instruction.

Collaborative Learning or Cooperative Learning: Students of varying abilities and interests work together in small groups to solve a problem, complete a project, or achieve a common goal.

Computer-based Instruction: Computer programs that teach or reinforce concepts and skills.

Computer Managed Instruction: An instructional strategy whereby the computer is used to provide learning objectives, learning resources, record keeping, progress tracking, and assessment of learner performance.

Drill and Practice: An instructional software program that presents items for students to work (usually one at a time) and gives feedback on correctness; designed to help users remember isolated facts or concepts and recall them quickly.

Educational Technology: The combination of instructional, learning, developmental, managerial, and other technologies as applied to the solution of educational problems.

Hardware: The computer equipment used to do the work (i.e., operate Software programs). It consists of the items you can touch, such as the computer case and the peripherals (e.g., monitor, keyboard, mouse) that are attached to the computer.

Information and Communication Technology: Technologies such as computers and the Internet which are enabling tools for educational change and reform. ICTs help expand access to education, strengthen the relevance of education to the increasingly digital workplace, and raise educational quality by, among others, helping make teaching easier.

Instructional Design: The systematic and reflective process of translating principles of learning and instruction into plans for instructional materials, activities, information resources, and evaluation.

Instructional Software: The computer programs that allow students to learn new content, practice using content already learned, and/or be Evaluated on how much they know. These programs allow teachers and students to demonstrate concepts, do simulations, and record and analyze data. Often administrative applications like database programs and spreadsheets are used within the instructional context to help analyze and present information.

Instructional Technology: The systemic and systematic application of strategies and techniques derived from behaviour and physical sciences concepts and other knowledge to the solution of instructional problems.

Learner-Centred Classroom: Students are encouraged to choose their own learning goals and or projects, based on the belief that people have a natural inclination to learn; learn better when they work on authentic tasks; benefit from interacting with diverse groups of people; and learn best when teachers understand and value difference in how each student learns.

OPTACON: **(**Optical to Tactile CONverter). Is an electromechanical device that enables blind people to read printed material that has not been transcribed into Braille.

Self-paced Learning: Education in which the learner is on their own, studying without interaction with others. Sometimes used to refer to asynchronous modes of delivery. CBT has been the most common form of self- paced learning, but web-based asynchronous systems are catching up quickly.

Simulation: Software that enables the user to experience a realistic reproduction of an actual situation. Computer-based simulations often substitute for situations that are very costly or high risk.

Software: Stored digital information on magnetic disks or tapes or as electronic information in the computer's memory that determines what the computer does. Software can be divided into two groups, operating system software and application software.

Technical Support Staff: Those who support and maintain the technology solution once it is implemented.

Tutorial: Refers to activities which include both the presentation of information and its extension into different forms of work, including drill and practice, games and simulation.

Technology Resources: The hardware, software, networks and networking capability, staff, funding and context which together can be used in the implementation of a technology solution.

User friendly: Refers to anything that makes it easier for novices to use a computer. Menu-driven programs, for example, are considered more user-friendly than command-driven systems. Graphical user interfaces (GUIs) are also considered user-friendly. Online help systems are another feature of user-friendly programs.

CHAPTER ONE
INTRODUCTION

1.1 Background to the Study

Teaching methods and instructional techniques in the classrooms have been changing and this is influenced by technological advancements. Technology has changed the whole pattern of human life. The greatest contribution of cyber age technology is the development of Computer and its use in all walks of life. Computer according to Pritchard (2005) is a general purpose machine, commonly consisting of digital circuitry, that accepts (inputs), stores, manipulates, and generates (outputs) data as numbers, text, graphics, voice, video files, or electrical signals, in accordance with instructions called a programme. The two principal characteristics of a computer are: it responds to a specific set of instructions in a well-defined manner and it can execute a prerecorded list of instructions (a programme). Importantly, it is also concerned with the way these different uses can work with each other to enhance teaching and learning and to better the standard of living of people the world over (Pritchard, 2005).

Instruction is a statement or explanation of something that must be done, often given by someone in authority. Pratt (2008) views Instruction, as the activities of educating or instructing; activities that impart knowledge or skill written or spoken directions for carrying out a procedure or performing a task. Effective instructions often include visual elements (such as pictures, diagrams, and flowcharts) that illustrate and clarify the text. Computer-assisted instruction (CAI) is the process by which written and visual information is presented in a logical sequence to a learner through a computer. The student learns by reading the text material presented or by observing the graphic information displayed. Some of the programmes provide audio-visual presentation with an option to the student to select audio presentation in addition to the visual media. Each segment of text is followed by questions,

for student's response. Feedback on response is indicated immediately (Locatis & Atkinson, 1984; Wang & Sleeman, 1993). CAI can be characterized as interactive and individualized learning as it usually involves a dialogue between one student and a computer programme, and a student can learn at his own pace and time frame (Curtis & Howard, 1990). There may be one student or several in a class, the students can be young or old, bright or below average intelligence, "normal" or physically challenged, highly motivated or "turned off," rich or poor, male or female. The subject can be easy and straightforward or difficult and complex. The teacher may not be physically present, as with televised or computer-assisted instruction (CAI). Instruction takes place somewhere, in some specific context. The institution may be highly selective, or "open door" in its admissions policies. The climate for learning may be favourable or destructive, supportive or frustrating. The resources, both physical and human, may be lavish or meager. Instruction involves a teacher trying to teach someone something somewhere.

The artistic aspect of teaching has been likened to the activity of a symphony conductor (Eisner, 2004). The teacher, like the conductor, draws upon a repertoire of skills and orchestrates a highly complex process. Teaching, Eisner (2004) argues, is much more like the work of the artist than the scientist. Teaching involves complex judgments that unfold during the course of instruction. Teachers must deal creatively with the unexpected. Furthermore, the most important goals of teaching are those events (for instance; critical thinking, analytical reasoning and written/oral communication) that occur during the process. The outcomes are often embedded in the learning process itself.

Educational systems around the world are making efforts for the effective use of computer to teach students the knowledge and skills they need in the 21st century which will enhance students' learning of subject matter very fast and convenient to both the teachers and learners.

The impact computer assisted instruction (CAI) has on traditional teaching and learning has been described as; it predicted the transformation of the teaching-learning process and the way teachers and learners gain access to knowledge and information. With the emerging new technologies, the teaching profession is evolving from an emphasis on teacher-centred, lecture-based instruction to student-centred, interactive learning environments (UNESCO, 1998 World Education Report).

The designing and implementing a successful computer assisted instruction into teacher education programmes, is the key to fundamental, wide-range educational reforms (UNESCO, 1998). The use of computer is gradually taking roots in the educational system, especially in the pedagogical aspect; this has not left the economics education aspect out. CAI is being used as an instructional strategy at all grade levels from pre-primary to higher education. Children are also learning 3Rs (Reading, wRiting, aRithmetic) through CAI. Chauhan (1994) mentions that CAI system has been utilized at all levels of education ranging from elementary school, secondary school, teachers training college, undergraduate, post graduate studies and on the job training in almost all subjects. Developed countries (for example; USA, Brazil, Japan, France, Germany, *et cetera*) have been using CAI for more than three or four decades. A lot of research on various aspects of CAI has been conducted (such is that of Shlechter, 1991) which studied the effect of using Computer technology in economics classes and found that traditional teaching are important for transmitting information about economic theory, but CAI holds the potential to enhance dramatically students' learning of economic theory) in these countries. They have refined this mode of instruction in the light of findings of researches and are still looking for better use of it. Developing countries (for instance; Bangladesh, South Africa, Nigeria, Malaysia, Botswana, Zimbabwe, Namibia *et cetera*) are also introducing CAI to their education systems. They have planned and are making efforts for the effective use of this innovative application.

Computer-assisted instruction provides a good base for students to work at their own pace with immediate feedback (Carlson and Schodt, 1995, p.24). Animated graphs and flow-charts help the students to better understand the shift of the curves or the relationship between different sectors of the economy (Welford 1986, p.132). Therefore, computer assisted instruction (CAI) provides rich opportunities for helping students to move beyond being "problem-set smart" toward 'thinking like economists'. The actual use of computer technology in economics education is still limited due to obstacles related to teaching staff members and students, technical potentials and available financial resources. Also, arts and social science students have not been applying Computer skills with their teaching learning process which is at the core, to enhance the teaching process, which can be a stepping stone in developing and equipping the learners with skills in Computer applications in their future endeavours, with little or no assistance.

This study is out to establish the effects of CAI on students' performance in Economics in the Senior Secondary Schools. It is against this background that the study seeks to establish if Computer and application software are appropriate to enhance the teaching and learning of Economics in the Senior Secondary Schools. Students from various senior secondary schools are supposed to be at the fore front of applying Computer skills in their daily contact with the equipment and also looking at the nature of the subjects; which is geared towards preparing them for the place of work and also the classroom. The present research intends to investigate whether or not the teaching of Economics subject can be enhanced by the use of CAI in the public senior secondary Schools in Ekiti State.

1.2 Statement of the Problem

The ability to use Computer is necessary just as formal education; as reading, writing, and arithmetic. As jobs become increasingly oriented towards the use of Computer, society demands and rewards individuals who know how to use Computer systems, by giving them

special preference over those who doesn't know how to use computer. Learning any skill without the necessary equipment and facilities negates Aristotle's saying that *one learns to be a good flute player by filing the flute*.

From the researcher's observation in the Ekiti State public senior secondary school students who are furthering their studies in higher institutions of learning (in Ekiti State University, Ado-Ekiti to be precise) are unable to carry out simple operations on a computer such as using the computer software for econometrics, simple browsing and word processing, caught the researcher attention. The researcher became curious to carry out an investigation on why these students are unable to carry out such simple computer operations. Also, the researcher's interaction with most students from various Senior Secondary Schools, especially in the three Senatorial District of the state, where teaching learning takes place, are lacking skills in computer application and usage, they cannot browse and can't surf the 'net' effectively without assistance.

There seems to be poor or non-existence internet connectivity, inadequate learning resources in most secondary schools in the country, including related educational tools, and other learning materials. Also, there seems to be a missing link between the practical applications of Computer in teaching of Economics in Senior Secondary schools in Ekiti State. It is on the basis of this problem that this study will be carried out. This study seeks to determine the effect of computer assisted instruction (CAI) on students' performance in Economics in senior secondary schools in Ekiti State, Nigeria.

1.3 Objectives of the Study

This study was set out to achieve the following objectives:

1. to determine the effects of CAI on students' performance in Economics as compared to the traditional method of instruction in senior secondary schools in Ekiti State.

2. to determine the performance of male and female Economics students when exposed to computer assisted instruction in senior secondary schools in Ekiti State.
3. to determine the effects of computer aided instruction (CAI) on the pre-test and post-test mean performance scores of the experimental group of students in senior secondary schools in Ekiti State.
4. to determine the relationship between students' performance in Economics and CAI drill and practice in senior secondary schools in Ekiti State.

1.4 Research Questions

In view of the above, the following research questions were formulated to guide the conduct of the study:

1. What are the effects of CAI on students' performance in Economics as compared to the traditional method of instruction in senior secondary schools in Ekiti State, Nigeria?
2. What is the performance of male and female Economics students when exposed to computer assisted instruction in senior secondary schools in Ekiti State?
3. What is the effect of computer aided instruction (CAI) on the pre-test and post-test mean performance scores of the experimental group of students in senior secondary schools in Ekiti State?
4. What is the relationship between students' performance in Economics and CAI drill and practice in senior secondary schools in Ekiti state?

1.5 Research Hypotheses

The following Null hypotheses were postulated for this study:

Ho_1 There is no significant difference in the performance of students in Economics when they are exposed to computer assisted instruction, and traditional method of instruction in senior secondary schools in Ekiti State.

Ho_2 There is no significant difference in the performance of male and female Economics students when exposed to computer assisted instruction.

Ho_3 There is no significant difference in the effect of computer aided instruction (CAI) on the pre-test and post-test mean performance scores of the experimental group in Economics in senior secondary schools in Ekiti State.

Ho_4 There is no significant relationship between students' performance in Economics and CAI drill and practice in senior secondary schools in Ekiti State.

1.6 Basic Assumptions of the Study

This study was conducted with the assumptions that:

1. all the students and teachers of economics in senior secondary schools are computer literate.
2. there is availability of computer experts and facilities in all senior secondary schools where economics is offered.

1.7 Significance of the Study

This study will be very useful to teachers of Arts and Social Science Education (especially Economics) in senior secondary schools in Ekiti State, who know the importance of computer in their pedagogical applications, since it is gradually taking over the place of the traditional method of teaching. Furthermore, it will give them insight into the various pedagogical knowledge related to CAI.

The study will be of great significance to computer programmers and school administrations of secondary schools in the sense that, this study will give an insight of what is expected of them in planning for the students and teachers in the future, if they want to turn out trained teachers for the 21st century classroom and labour market. Also, the design, planning and developing of software will reflect the principles and practical application of

CAI with the classroom context and help them to provide for individualized instruction to meet special needs.

The study will be of great significance to the Ministry of Education, as well as Ministry of Science and Technology, as they are the principal determinants in the pedagogic aspect of computer and secondary school education in Nigeria. The findings of the study will enable them to understand the situation and position of CAI towards quality of education as it will offer students various degrees of control over their own learning, enable instruction to be tailored according to individual student's needs, and enable the ministry to get feedback on student performance and store it for further reference. This study will further provide the needed frame work in the full implementation of CAI in teaching and learning; and thereby enhancing the quality of learning in students.

The study will be of great significance to the Curriculum Planner as it will afford them the opportunity of streamlining many educational tasks. It will provide them with the vision to plan for a wide range of fields, including all the main disciplines in elementary, secondary and tertiary institutions. More so, the findings will help the curriculum planner to integrate and enhance the skills of search and development of in-class activity into the curriculum content. The study will help them to easily plan for a higher order thinking skills, critical thinking skills, and problem solving skills. Also, the inculcation of CAI into education system will be of great value to the curriculum planners in the sense that it will equip them with the innovative skill of planning for people with physical limitations, learning disabilities and language limitations.

The findings of this research will prompt WAEC and other examination bodies to review its assessment strategy and provide them with the needed framework in the full implementation of CAI in assessing the students' performance without any delay just as the deputy director, quality assurance department of the Joint Admissions and Matriculations

Board (JAMB), while delivering a speech at the 2014 national workshop on the use of computer-based test for final year pupils of secondary schools in Ado-Ekiti, the state capital said “no candidate wishing to gain admission into a university, polytechnic or college of education would have the option of writing the Unified Tertiary Matriculation Examination (UTME) by the usual paper-based option come 2015”. The JAMB director further states that there was “nowhere in the world today where public examinations, such as the UTME, are written with pencils or biros, he added that the benefits of the computer-based test will include release of result not lasting over 72 hours, absence of familiar examination malpractices, zero result seizure as well as absence of external influences”.

Also, the study will be of great benefits to the students in the sense that it will increase students’ motivation to learning and bring about personal satisfaction and facilitate students’ engagement. It will also be of great significance to the students as it will offer the students to maintain a dialogue of information between the computer and a learner without dependence upon normal vision. This is possible because there are several media alternatives for information input to the learner. These alternatives include large print (visual), braille (tactile), the OPTACON reading system (tactile), and auditing (auditory). Consequently, it will provide the students with interactive involvement with instructional materials.

Furthermore, it is hoped that the result from this research would be of great significance to other researchers who may embark on similar or related field of study. The findings will enable them to know the extent studies have been carried out in this field and also this study will serve as a point of reference to them and source of literature review. Researchers will be fed with the latest information about CAI and its application in teaching process.

Economics Educators will find the study very relevant in the sense that the findings will reveal the place of CAI in Economics Education and other related fields of study. It will

help them learn to navigate through large amounts of information, to analyze and make decisions; and to master new knowledge domains in an increasingly technological society. Economics educators will need to be lifelong learners, collaborating with others in accomplishing complex tasks, and effectively using different systems for representing and communicating knowledge to others.

1.8 Scope of the study

This research was delimited to the effect of CAI on students' performance in Economics in senior secondary schools in Ekiti State. Specifically, students of SSS II in Government Science College Iyin-Ekiti, Community High School Iyemero-Ekiti, Government College Oye-Ekiti and Ijaloke Grammar School Emure-Ekiti State. However, the study was also delimited to the use of computer application software which is user friendly and also good for teaching and learning of Economics. The software in Economics will enable the students to be conversant with what is obtainable in the place of work or in their future Economic application.

CHAPTER TWO
REVIEW OF RELATED LITERATURE

2.1 Introduction

Computer-assisted instruction can be a great asset to the classroom and curriculum as long as they are not overused. Too much of any mode of teaching can lead to boredom and frustration in the students (Kim, and Axelrod, 2005). An attempt will be made in this chapter to review related literature on aspects of Computer application in education. Thus, the review was presented under the following sub headings: Theoretical Framework, Conceptual framework: Nature of Computer Assisted Instruction, Mechanism of CAI Drill and Practice, Characteristics of Computer-Assisted Instruction, Economics as a Subject, Computer Assisted Instruction and Senior Secondary School Male and Female, Students' Performance in Economics, Rationale for CAI in Teacher Education, Classroom Trainer Resistance to CAI (E-Learning), Work roles, Practice and Beliefs about Teaching, Beliefs about Quality of E-learning, Personality Factors, Visions into the future by Teachers, Types of Technology and their Educational Applications, Obstacles to the use of CAI in Nigerian School, Cost of computer hardware and software, Weak Infrastructure, Lack of skills, Lack of relevant Software, Limited access to the internet, Empirical Studies, and Summary.

2.2 Theoretical Framework

The theoretical framework that informs this study is the Engagement theory, this is because it is a theory which has relevance with application of technology and development of skills and knowledge of learners. This was first propounded by Kearsley, and Shneiderman, (1999) stating that:

> *Engagement theory is a schema for building learning activities that evoke engaged learning. Engaged learning occurs when active cognitive processes, such as problem-solving, decision-making and evaluating, are involved. Engagement theory's focus on the learner as constructor allies with those in the*

> *Constructivist domain; and by championing experiential learning and self-direction (pg5).*

The fundamental idea underlying engagement theory is that students must be meaningfully engaged in learning activities through interaction with others and worthwhile tasks. While in principle, such engagement could occur without the use of technology, we believe that technology can facilitate engagement in ways which are difficult to achieve otherwise. So engagement theory is intended to be a framework for technology-based learning and teaching. Shneiderman, (1994) asserted that:

> *Although not directly derived from other theoretical frameworks for learning, it has much in common with many such frameworks. For example, with its emphasis on meaningful learning, it is very consistent with constructivist approaches. Because it emphasizes collaboration among peers and a community of learners, it can be aligned with situated learning theories. Because its focuses on experiential and self-directed learning, it is similar in nature to theories of adult learning (pg8).*

By engaged learning, we mean that all students activities involve active cognitive processes such as creating, problem-solving, reasoning, decision-making, and evaluation. In addition, students are intrinsically motivated to learn due to the meaningful nature of the learning environment and activities. Engagement theory is based upon the idea of creating successful collaborative teams that work on ambitious projects that are meaningful to someone outside the classroom.

The three components, of the engagement theory according to Shneiderman, (1994) as summarized by *Relate-Create-Donate*, imply that learning activities: occur in a group context (that is, collaborative teams); are project-based; have an outside (authentic) focus.

The first principle (the "Relate" component) emphasizes team efforts that involve communication, planning, management and social skills. The modern workplace demands proficiency in these skills, yet historically students has been taught to work and learn on their own. Research on collaborative learning suggests that in the process of collaboration, students

are forced to clarify and verbalize their problems, thereby facilitating solutions. Collaboration also increases the motivation of students to learn, a significant consideration in settings with high drop-out rates (for example, teen-agers, distance learners). Furthermore, when students work in teams, they often have the opportunity to work with others from quite different backgrounds and this facilitates an understanding of diversity and multiple perspectives (Shneiderman, 1994).

Shneiderman (1994) explained the second principle (the "Create" component) which makes learning a creative, purposeful activity. Students have to define the project (problem domain) and focus their efforts on application of ideas to a specific context. Conducting their own projects is much more interesting to students than answering sterile textbook problems. And because they get to define the nature of the project (even if they don't choose the topic), they have a sense of control over their learning which is absent in traditional classroom instruction. According to Barrows and Tamblyn (1980), project orientation is the essence of Problem-Based Learning (PBL) approaches which are often used in medical and other types of professional education.

The third principle (the "Donate" component) stresses the value of making a useful contribution while learning. Ideally each project has an outside "customer" that the project is being conducted for. The customer could be a campus group, community organization, school, church, library, museum, government agency, local business, or needy individual. In many cases, the projects can be work-related, that is, an activity that fits into a team's occupational or career interests. The authentic learning context of the project increases student motivation and satisfaction. This principle according to Jacoby and Associates, (1996) is consistent with the emphasis on school-to-work programs in many schools systems and colleges, as well as the "service" philosophy of contemporary corporate training efforts.

Engagement theory is different from many older models of computer-based learning in which the emphasis was on individualized instruction and interactivity. Engagement theory does promote interaction, but human interaction in the context of group activities, not individual interaction with an instructional program. The latter form of interaction tended to be measured by single responses (for instance, key presses or mouse clicks) whereas engagement requires assessment of larger units of work (for example; reports, programs, user satisfaction). The difference between engagement and interactivity reflects the shift in thinking about computers in education as communication tools rather than some form of media delivery devices. Furthermore, Shneiderman (1994), stated that engagement theory places a great deal of emphasis on providing an authentic (that is, meaningful) setting for learning, something not present in previous models.

This study is mainly geared towards the application of technology in teaching and as such the engagement theory is very relevant to this study in the sense that students will be engaged in learning practical skills and also will be engaged in worthwhile tasks which are some of the core values of the engagement theory.

2.3 Conceptual Framework: Nature of Computer Assisted Instruction

Computers are already in use in Nigeria, in banks, large firms, transport companies, the armed forces and elsewhere. Either owing to excessive compartmentalization of administrative departments or to the relative order of political priorities, it appears that the Ministry of Education was not involved at higher levels of decision-making. With the growing use of computers in education and instruction, computer training for teachers and teacher-educators is being considered a prime objective for the advancement of educational technology (Aubineau, 1986).

The use of computers in schools may conveniently be divided into learning about computers and learning *with, from or through* computers. Knowledge of computers may be

thought of as a continuum, ranging from skills and awareness of computers as learning and educational tools at one end of the continuum, through programming in higher and lower level languages, and to solid-state physics at the other end of the continuum.

The terminology concerning computers as a learning medium varies widely and there are no universally agreed-upon definitions among those frequently encountered are: (a) Computer-assisted instruction (CAI) where computer acts as teaching new skills or concepts or providing practice for learners. Software in this mode is often referred to as drill practice; and tutorials. (b) Computer-based learning (CBL) or computer-assisted learning (CAL) which includes various categories such as simulations and modeling, instructional games, problem-solving, information handling, and demonstrations (Anderson, 1986).

According to Fourie (1999), CAI is an interactive instructional technique whereby a computer is used to present the instructional material and monitor the learning that takes place. It is also known as computer-assisted learning (CAL), computer-based education (CBE), and computer-based training (CBT). CBT allows the students to direct their own progress.

CAI learning uses a combination of text, graphics, sound and video in learning process. It is especially useful in distance learning situations. The explosion of the Internet as well as the demand for distance learning has generated great interest and expansion of computer-assisted instruction. The first university formed to provide degrees entirely through Internet courses was Jones International University in 1993. It received full accreditation by the North Central Association of Colleges and School (NCA) on March 5, 1999. Currently, there are more and more colleges and universities offering web-bases courses and programs (Helfer, 1999).

The computer has many purposes in the classroom, and it can be utilized to help a student in all areas of the curriculum. CAI refers to the use of the computer as a tool to facilitate and improve instruction. CAI programs use tutorials, drill and practice, simulation, and problem solving approaches to present topics, and they test the student's understanding. These programs let students progress at their own pace, assisting them in learning the material. The subject matter taught through CAI can range from basic math facts to more complex concepts in math, introductory statistics in economics to more complex economics application, history, science, social studies and language arts (Sharp, 1996).

Many educational software programmes follow the same design as programmed instruction. Students receive some instructional material, followed by a "probe" (a small test); if they respond correctly, they move on to the next lesson; if they do not, they repeat the lesson or receive a different lesson covering the same material. This approach is called Computer Assisted Instruction (CAI).

Thomas (1997) quoted Lepper and Gurtner (1989); and Roblyer, et al (1988) as "CAI suffers from some of the same problem as programmed instruction. It is often repetitive, and it reduces learning to discrete units that sometimes obscure the relationship between ideas. CAI is better suited for drill and practice than for building concepts and promoting comprehension. Research has shown that when used in addition to regular instruction, CAI improves students' attitudes, motivation and academic achievement".

Walberg (1991) examined 377 research studies, selected according to criteria for quality of research designs that had compared Computer Assisted Instruction with conventional classroom instruction. Seeking to compare educational methods for difference in effects on learning, he found in all cases that Computer Assisted Instruction combined with classroom teaching was superior to classroom instruction without computer assistance. The

computer was found to be particularly effective with the handicapped, elementary students, and secondary students.

The use of computers in education is still in its infancy. However, the computer is bringing some exciting innovations to education. The following are the areas in which computers are helping the educators: Computers take over the most of the drudgery of schooling like classifying children according to abilities, preparing timetable, schedules, and so on, Computers allocate learning resources to individuals and groups, Computers maintain progress cards and preserve them confidentially, They provide easy access to files of information for reference and guidance, They provide direct interaction between student and the subject-matter to be learned, and They engage the students in tutorial interaction and dialogue.

The most exciting innovation in the educational technology is Computer-Assisted Instruction (CAI). Though it is still in the experimental stage, the day is not far off when it will revolutionize the whole process of instruction. Before discussing in some detail *computer-assisted instruction or CAI*, which appeals most to the teacher practitioner, it is relevant to refer to two other modes of computer-based instruction. One is *Computer-managed instruction* and another is *computer-based instructional simulation*. Each of these techniques makes use of the computer in a different role in instruction. In computer-managed instruction, the role of the computer is mainly record keeping and it does not prove any direct instruction to the learner. This type of instruction helps to assess the learner's present level of knowledge, weaknesses or gaps in his learning and remedial action possible. Whereas computer-assisted instruction is directly involved in tutorial work, drill and practice, and is of greater help in instruction. In the use of CAI, different programmes, one for new instruction and another for drill and practice may be needed. The third type *computer-based instruction simulation* (CBIS) is the most powerful application of computers in instruction as it provides

realistic substitutes for real life experiences that might be otherwise impractical, time-consuming or even dangerous. CBIS creates a model situation, which imitates some aspects of reality and the simulation model may be static or dynamic, in which conditions are changed as a result of feedback of pupil's actions and responses (Sampath et al, 1990).

Computer-assisted instruction (CAI) is relatively new field in which the pioneer efforts occurred around 1960 following the introduction of computers into higher education. A number of large-scale, heavily funded CAI projects have been conducted since then, with their results having implications for the future use of CAI as a classroom tool.

Two major types of CAI are identified as *adjunct* (first used by Victor Bunderson (Kearsley, 1982) and *primary*. **Adjunc**t CAI encompasses materials that supplement or enrich the learning situation. For example: short (half-to one-hour) CAI programs that support or illustrate concepts discussed in the regular classroom. **Primary** CAI materials, conversely, provide instruction of a substitute or stand-alone variety and are usually of longer duration (Chambers and Sprecher, 1983).

2.3.1 Mechanism of CAI Drill and Practice

There are two models for designing interactive educational programs. The first instructional system design (ISD), the traditional model, determines a goal, sets objectives, delivers instruction, formulates test questions, evaluates learning. The second, hypermedia design (HDM) focuses on the student's goal and how the student chooses to access information. While ISD is concerned with design goals. HDM focuses on the user's goals. Selection of CAI or web-based design should be based on whether the program is well designed and meets the needs of the intended users (Dewald, 1999).

There are many design models for CAI available today. One model, developed by Ina Fourie in 1994 consisted of seven phases: Determination of the need and situation analysis,

Formulation of aims and performance objectives and development of items for evaluation, Design of study material, including development of a teaching strategy and media selection and integration (for example; the inclusion of sound and video), Development and preparation including story boarding and programming, Implementation and use, Assessment of student progress, and Formative and summative evaluation on a continuous basis.

After each phase is completed. It must be evaluated before moving to the next phase. CAI design projects should consist of several members including a project manager, subject experts, advisors, evaluators, programmers, and graphic artists. The CAI must meet the needs of its users to be effective. Also, computer literacy can be a major problem. Students without technology skills will have to master basic computer knowledge before using the CAI successfully.

Good web-based instruction asks students to interact in some way and not just to memorize information. It must be flexible and allow for differences in learning abilities. It should encourage deep learning and not merely surface learning. Students must understand concepts and how they fit into the whole, be able to integrate parts, apply the information particularly, and receive feedback. Web-based instruction provides opportunities for interactivity to make it meaningful for the student (Dewald, 1999).

Computer-assisted instruction (CAI) is defined as the use of computer to provide course content instruction in the form of drill and practice, tutorials, and simulations. Drill and practice is a common CAI form in which a type of repetitive, or "flash card," approach emphasizes rote memory. It is used extensively at all educational levels (Chambers and Sprecher, 1983).

Although a computer can be used in many ways in the educational programmes, the following are some of the areas where it proves to be effective in the instructional process.

The student sits at a specially designed electric typewriter, which is connected to a computer by telephonic lines. He identifies himself by a code number and his name. The machine types out the first question and the student responds. Soon the lesson is underway. The computer keeps track of each student's work whenever the teacher wants it. Depending upon the programme, the student might be referred to a branching type of remedial exercise. As in programmed instruction, the student moves at his own pace, gets immediate feedback and receives individual tutoring. Drill and practice software differs from tutorial software in a keyway: It helps students remember and utilize skills they have previously been taught, whereas a tutorial teaches new material. Students must be familiar with certain concepts prior to working drill and practice programs in order to understand the content. The typical drill and practice program design includes four steps: (1) the computer screen presents the student with questions to respond to or problems to solve; (2) the student responds; (3) the computer informs the student whether the answer is correct; (4) if the student is right, he or she is given another problem to solve, but if the student responds with wrong answer, he or she is corrected by the computer (Sharp, 1996).

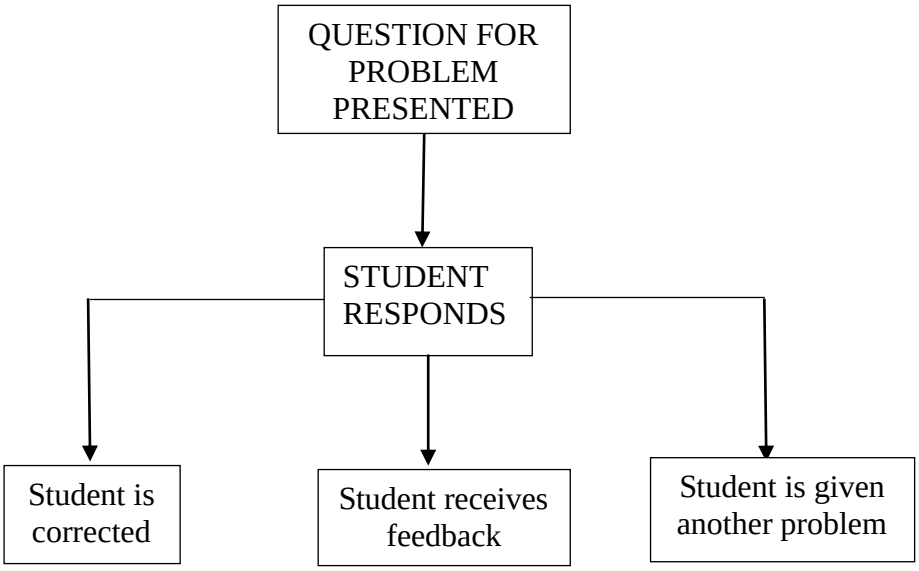

Figure 1: CAI Drill and Practice program steps.

Tutorials use the computer in a higher-level mode in which question-and-answer, dialogue-type learning in the traditional tutor mode is emphasized. Like drill and practice, it is used extensively at all educational levels. The subject-matter is literally taught by the computer programme. Explanations are given orally through audio-tape and needed visuals presented in cathode ray tube as in television. The student responds on a typewriter keyboard or by pointing on the screen with a light pen. The computer reacts to student's response by 'talking' to him. Student makes further response. A kind of dialogue takes place between student and machine. CAI tutorials are based on the principles of programmed learning: The student responds to each bit of information presented by answering questions about the material and then gets immediate feedback on each response. Each tutorial lesson has a series of frames. Each frame poses a question to the student. If the student answers correctly, the next frame appears on screen. There is disagreement among educators on how these frames should be arranged. Some educators are proponents of the linear tutorials, while others prefer the branching tutorials. The *linear tutorial* presents the student with a series of frames, each of which supplies new information or reinforces the information learned in previous frames. The student has to respond to every frame in the exact order presented, and there is no deviation from this presentation, but the student does have the freedom to work through the material at his/her own speed. The *branching tutorial* allows more flexibility in the way the material is covered. The computer decides what material to present to each student. The pupil's responses to the questions determine whether the computer will review the previous material or skip to more advanced work (Sharp, 1996).

The next program discussed also makes use of various features of the computer to present material. The screen shown in Figure 2 is from a program titled supply and demand model prepared by Classroom Consortia Media, Inc. This program uses a variety of methods to present information. The mixed and graphics of Figure 2 highlight key terms of the topic

presented. Simulations of actual experiments showing the shift in the supply and demand model under various conditions. After both informational and simulation screens have been completed, the students can check their knowledge of the concept by quiz.

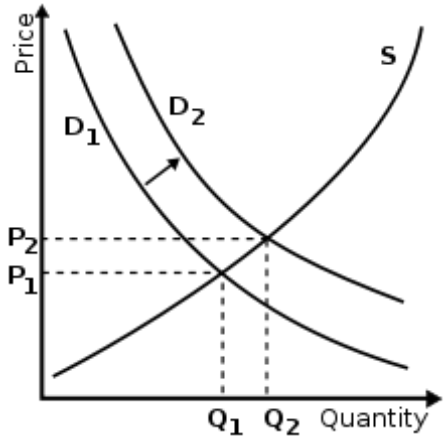

Figure 2: Shift in supply and demand model.

The supply and demand model describes how prices vary as a result of a balance between product availability and demand. The graph depicts an increase (that is, right-shift) in demand from D_1 to D_2 along with the consequent increase in price and quantity required to reach a new equilibrium point on the supply curve (S).

While it is easy to say that tutorial programs should be highly graphic, branched, and interactive, it is not an easy task to produce such software. The process of creating branches, alternative instructional sets for students of varying ability levels, is extremely time consuming. Student misconceptions and difficulties must be predicted and appropriate instruction developed to assist the student.

Hence, Simulation provides a model in which the student plays a role and interacts with the computer. Simulations have been used most often in higher education to model scientific processes. They are applicable to any field, however, and can be of significant help in illustrating concepts, in helping students to develop problem-solving techniques, or in allowing students to explore complex interactions. Educational simulation and games like all other well-organized learning experiences must be carefully designed with clearly specified

objectives. The most obvious use of simulation is in extending the experience of pupils and in stimulating their interests. Simulation and gaming increases motivation and self-confidence and can accommodate students of different ages and levels of maturity. They approximate reality far more closely than conventional class methods. But some of these take considerable time and demand too much from the teacher. In simulation programs, students take risks as if they were confronted with real life situations without having to suffer the consequences of failure. In education, simulations have become increasingly popular, especially in science, mathematics, economics, and the social sciences. Simulation gives students the chance to experience situations not normally available in classroom settings.

These three categories-drill and practice, tutorials, and simulations- make up what has become known in the United States as computer-assisted instruction (CAI), computer-based instruction (CBI), or computer-based education (CBE). In Europe and elsewhere, these activities are usually referred to as computer-assisted learning (CAL).

2.3.2 Characteristics of Computer-Assisted Instruction

A computer is programmed with linear or branching programmes. It acts like a super teaching machine catering to the needs of a number of students at the same time. The characteristic aspect of CAI is its capacity to initiate flexible interactions with the students that is not possible in the teaching machine. There are a number of ways in which this can be brought about. The computer is able to record and store all the responses of all the students. It can use the information in deciding what information to give the student next. It can branch not just in terms of one answer but also in terms of a whole series of previous answers. It can also record the time taken to answer a question and the degree of correctness of the student's response. It uses the information in planning to determine which branch to take (Sampath *et al*, 1990).

A typical CAI installation consists of individual learning booths, each with a console. The student is seated. Facing him on the console is a television screen for displaying information. Before he starts a programme, the student checks in with the computer by displaying his identity number. This connects him with his part of the learning programme. A complete package of information stored in the system is presented sequentially. This information could take the form of video-tape recordings, slides, motion picture films, filmstrips, etc. the student may question the computer and feed answers into it by means of a typewriter keyboard. The computer responds by printing out comments, answers and questions. Sometimes, the student may write directly on the cathode ray tube display screen with a 'light pen'. His answer will be picked by the computer and evaluated. When he has finished, the computer assigns him the next program, records his progress and prints out a report for his teacher (Sampath *et al*, 1990).

The CAI starts by identifying the way a student seems to learn best. It reviews his past history of learning and then presents a programme built on his strength. Sometimes the computer stores all the information gained from all students who have taken the computer course previously. This information may be re-analyzed and much of the teaching strategies, which were not effective, may be rejected and strategies which have succeeded may be continued (Sampath *et al*, 1990).

Computer-assisted instruction is, therefore, not merely a sophisticated type of programmed instruction but it also uses electronic data processing, data communication, concepts of audio-visual and medial theory, communication theory, systems theory and learning theory. In contrast to CAI, computer-managed instruction (CMI) analyses the relationship between various factors pertaining to a pupil and suggests activities appropriate to individual students. This includes PLAN (Programme for Learning in Accordance with

Needs) and IPI (Individual presented Instruction). In general, students learn well with CAI in considerably less time (Sampath *et al*, 1990).

Computer-assisted instruction makes use of multimedia software in the learning process including text, video technology, graphics, sound and Internet technology. Computer-assisted instruction is heavily used in the growing field of distance education. Traditionally, computer-assisted instruction, like programmed instruction, has been linear in nature. Web-based instruction on the other hand is nonlinear (Lawson, 1999).

There are numerous unique features of CAI which make it an exciting field. One of the most useful is its adaptability for distance learning. Before the dominance of microcomputers, distance learning was mostly accomplished through programmed instruction or mail system supplemented by telephone contact. On the contrary, CAI provides regular and timely interaction with the instructor and current feedback. Students can repeat tutorials as often as needed and work at their own pace. CAI also can be used with greater numbers of students than a traditional classroom would hold. CAI and web-based instruction have opened avenues of access to individuals with disabilities that were not previously possible.

Intelligent computer-assisted instruction (CAI) is programmed so that the CAI adapts to the student's individual needs. It acquires information about the student's current knowledge of a subject and his/her goal in learning the subject and then creates a user profile based on this knowledge. It can then adjust itself to the individual student. Wed-based instruction is unique in that student and/or instructor can communicate with each other anywhere in the world within seconds via the Internet. Feedback from the instructor can be obtained immediately (Moursund, 1998).

2.4. Economics as a Subject

Economics is the social science that analyzes the production, distribution, and consumption of goods and services. The term *economics* according to Harper (2001) comes from the Ancient Greek oikovouia (*oikonomia*, "management of a household, administration") from oikoc (*oikos*, "house") + vouoc (*nomos*, "custom" or "law"), hence "rules of the house(hold)". Political economy was the earlier name for the subject, but economists in the late 19th century suggested "economics" as a shorter term for "economic science" that also avoided a narrow *political-interest* connotation and as similar in form to "mathematics", "ethics", and so forth (Jevons Stanley in Wikipedia, 2012).

A focus of the subject is how economic agents behave or interact and how economies work. Consistent with this, a primary distinction is between microeconomics and macroeconomics. Microeconomics examines the behaviour of basic elements in the economy, including individual agents (such as households and firms or as buyers and sellers) and markets, and their interactions. Macroeconomics analyzes the entire economy and issues affecting it, including unemployment, inflation, economic growth, and monetary and fiscal policy.

Other broad distinctions include those between positive economics (describing "what is") and normative economics (advocating "what ought to be"); between economic theory and applied economics; between rational and behaviour economics; and between mainstream economics (more "orthodox" and dealing with the "rationality-individualism-equilibrium nexus") and heterodox economics (more "radical" and dealing with the "institutions-history-social structure nexus") (Andrew and Andrew, 2008; Davis, 2006).

Economic analysis may be applied throughout society, as *in* business, finance, health, care, and government, but also *to* such diverse subjects as crime, education, the family, law,

politics, religion, social institutions, war, and science. At the turn of the 21st century, the expanding domain of economics in the social sciences has been described as economic imperialism. An increasing number of economists have called for increased emphasis on environmental sustainability; this area of research is known as Ecological economics (Friedman, 2002; The World Bank, 2007; Iannaccone, 1998; William, 2002; Arthur, 2008; Edward, 2000).

There are a variety of modern definitions of economics. Some of the differences may reflect evolving views of the subject or different views among economists. The philosopher Adam Smith (as cited in Wikipedia, 2012) defined what was then called political economy as "an inquiry into the nature and causes of the wealth of nations", in particular as: a branch of the science of a statesman or legislator (with the twofold objectives of providing) a plentiful revenue or subsistence for the people (and) to supply the state or commonwealth with a revenue for the public services.

Jean cited in Wikipedia (2012), distinguishing the subject from its public-policy uses, defines it as the science *of* production, distribution, and consumption of wealth.

Alfred Marshall provides a still widely-cited definition in his textbook *Principles of Economics* that extends analysis beyond wealth and from the societal to the microeconomic level: Economics is a study of man in the ordinary business of life. It enquires how he gets his income and how he uses it. Thus, it is on the one side, the study of wealth and on the other and more important side, a part of the study of man (Wikipedia, 2012).

Economics according to Lionel Robbins (1932) (as cited in Wikipedia, 2012) has been termed "perhaps the most commonly accepted current definition of the subject": As a science which studies human behaviour as a relationship between ends and scarce means which have alternative uses. Robbins describes the definition as not *classificatory* in "picking out certain

kinds of behaviour" but rather *analytical* in "focusing attention on a particular *aspect* of behaviour, the form imposed by the influence of scarcity".

Some subsequent comments criticized the definition as overly broad in failing to limit its subject matter to analysis of markets. From the 1960s, however, such comments abated as the economic theory of maximizing behavior and rational-choice modeling expanded the domain of the subject to areas previously treated in other fields. There are other criticisms as well, such as in scarcity not accounting for the macroeconomics of high unemployment (Mark, 2007).

2.5 Computer Assisted Instruction and Senior Secondary School Male and Female Students' Performance in Economics

Many studies have been carried out on computer-assisted instruction and the student's performance in Economics. Such is that of Shlechter (1991) which studied the effect of using Computer technology in economics classes and found that traditional teaching are important for transmitting information about economic theory, but CAI holds the potential to enhance dramatically students' learning of economic theory. Macrosimulations, such as Running the British Economy and Be Your Own Chancellor, provide the students with experiences faced by policy-makers. Students are forced to put their understanding of macroeconomics to work in trying to solve these problems. CAI help students to see that the real world is far less organized than what the textbooks have presented, and that exact relationships do not exist. Computer-assisted instruction provides a good base for students to work at their own pace with immediate feedback (Carlson and Schodt, 1995, p.24). Animated graphs and flow-charts help the students to better understand the shift of the curves or the relationship between different sectors of the economy (Welford 1986, p.132). Therefore, CBL provides rich opportunities for helping students to move beyond being "problem-set smart" toward 'thinking like economists'. The actual use of computer technology in economics education is

still limited due to obstacles related to teaching staff members and students, technical potentials and available financial resources. The study recommended that the use of computer technology in education has many advantages that supports quality assurance of economics education and increases its effectiveness.

Hunley et al. (2005) investigate how economics students' attitudes toward class presentation and the instructors were affected by three independent variables and their interactions: gender, presentation mode, and use of mental imagery. In a related study, Hunley et al. (2005) investigated the effect of using PowerPoint in lectures on students' attitude. They found out that those who use mental imagery did better in quizzes if they were in the PowerPoint group. Stanley and Edwards (2005) developed an interactive, multimedia CD for use in a computerized economics systems and analysis class. They reported the results of student evaluations of teaching and of focus groups, concluding that students benefited from the use of the CD.

These led Gratton-Lavoie and Stanley (2009) to explore the possibilities of using a new Economics educational software, WinEcon (available since 1995), and the worldwide networks of the Internet to enhance the achievement of students' in Economics.

Lumsden and Scott (1986) survey 292 on-campus undergraduate students enrolled in an introductory Economics class regarding the use of WinEcon. The results showed that student satisfaction with virtual learning environment was significantly associated with providing lecture notes online, use of a bulletin board, online assessment, and other tools such as chat or video.

Marriott, Selwyn and Marriott (2004) studied the use of computer assisted instruction (CAI) by undergraduate economics students and their views regarding Internet use in their programs. The results showed a significant increase in Internet and email usage over the period of the study; use of CAI differed depending on the institution studied; and males

reported higher word processing, Economics applications, Economics analysis, and overall computer use.

Haugland (1997) and Monem, (2007) state that previous research on students' achievement in economics courses has identified several factors that determine success in economics courses and sensitize to the use of computer technology in teaching economics courses, while only a few studies examine the relation between the issue of providing students with tutorial solutions in PowerPoint form on students' achievement in economics courses. Haugland (1997) examines two economics courses where computer instructional technology was used to present course material to students. Microsoft PowerPoint and Word were selected to present materials in the classroom, and course web pages were developed to make PowerPoint slides accessible to the students. The study described the procedures used by the teacher and the reactions of students enrolled in the two courses. The results indicate the use of computer instructional technology and course web pages enhance student's learning, students are more motivated to attend and participate in class, students' retention of information is increased, students are able to integrate information, concepts and course materials, leading to a greater understanding of class content and ultimately improved grades, and students gain confidence in utilizing these resources themselves, which enables them to make more effective and professional presentations in the future. The educational effectiveness of CAI depends on how they are used and for what purpose. And like any other educational tool or mode of educational delivery, CAI do not work for everyone, everywhere in the same way.

In his research, Fouts (2002) suggests that the use of computers, the Internet, and related technologies, given adequate teacher training and support, can indeed facilitate the transformation of the learning environment into a learner-centred one. But this study is criticized for being mostly exploratory and descriptive in nature and lacking in empirical

rigor. What does exist are qualitative data based on observations and analysis of student and teacher perceptions that suggest a positive impact on learning. Russell, (1999), claims that there is “no significant difference” between the test scores of learners taking Computer based distance learning courses and those receiving face-to-face instruction.

However, Merisotis, Jamie and Ronald (1999) claim that such generalizations are inconclusive, pointing out that the large number of articles on computer based distance learning does not include original experimental research or case studies. Other critics argue that dropout rates are much higher when instruction is delivered at a distance via CBL. Commenting on access to CBL, Potashnik and Capper (1998) stated that it is difficult to quantify the degree to which CAIs has helped expand access to basic education since most of the interventions for this purpose have been small-scale and under-reported. One exception is the television-based project Telesecundaria, which in 1997-98 was serving over 750,000 junior secondary students in 12,000 centres in Mexico. In Asia and Africa, assessments of distance learning projects at the junior secondary level using a combination of print, taped, and broadcast technologies have been less conclusive, while at the primary level there is little evidence that CAI-based models have thrived.

In higher education and adult training, there is some evidence that educational opportunities are being opened to individuals and groups who are constrained from attending traditional universities. Each of the 11 so-called mega-universities, the biggest and most well-established open and distance institutions in the world (which include the Open University of the United Kingdom, the Indira Gandhi National Open University of India, the China TV University System, the Universitas Terbuka of Indonesia, and the University of South Africa, among others) has an annual enrolment of more than 100,000, and together they serve approximately 2.8 million. Compare that with the 14 million combined enrolments of the 3,500 colleges and universities in the United States.

The impact of educational radio and television broadcasts on the quality of basic education remains an under-researched area, but what little research there is suggests that these interventions are as effective as traditional classroom instruction. Hannafin and Savenye (1993) after their investigation asserted that of the many educational broadcast projects, the Interactive Radio Instruction project has been the most comprehensively analyzed. Findings provide strong evidence of the project's effectiveness in raising the quality of education as demonstrated by increased scores on standardized tests as well as improved attendance.

There have also been many studies that seem to support the claim that the use of computers enhances and amplifies existing curricula, as measured through standardized testing. Specifically, research showed that the use of computers as tutors, for drill and practice, and for instructional delivery, combined with traditional instruction, results in increases in learning in the traditional curriculum and basic skills areas, as well as higher test scores in some subjects compared to traditional instruction alone. Students also learn more quickly, demonstrate greater retention, and are better motivated to learn when they work with computers. But there are those who claim that these represent modest gains and, in any case, much of the researches on which these claims are based are methodologically flawed.

One of the most critical problems in trying to assess the effectiveness of CAI as transformational tools is that standardized tests cannot capture the kinds of benefits that are expected to be gained in a learner-centred environment. There is ample evidence for effectiveness of CAI in various subject areas and at various grade levels. Yusuf and Afolabi (2010) found CAI as an effective mode of instruction for teaching Biology to secondary school students both in individualized and cooperative settings. Singh (2010) demonstrated that simulation mode is more effective than tutorial and drill and practice modes of CAI for teaching science to 9^{th} grade students. Barad (2010) found science teaching through CAI more effective for high IQ students than low IQ students of 9^{th} grade. Kumar (2010) tested the

effectiveness of CAI for teaching general science at secondary level and found positive results in favour of CAI as compared with conventional method. Hancer and Tuzemen (2008) found CAI more effective as compared to traditional method for teaching science at primary school level. Raninga (2010) proved CAI as an effective method for teaching mathematics to 7^{th} grade students as compared with traditional method. Ragasa (2008) and Basturk (2005) found CAI more effective than traditional lecture method for teaching introductory economics statistics to students.

Poole (1997) have exemplified some successful computer assisted instruction programs and projects and cited findings of research studies as an evidence for the effectiveness of CAI in 'reading', 'writing', 'Arithmetic and problem solving', 'science', and 'social studies', at all grade levels that is, from primary to K-12.

Cotton (2001) reviewed fifty nine research studies exploring effectiveness of CAI and concluded that the CAI utilized as a supplement to the teacher directed instruction resulted in superior students' achievement. Christmann, Badgett & Lucking (1997) conducted a metaanalysis of the studies comparing CAI, Traditional methods of Instruction and Traditional method of instruction plus CAI. It was found that students receiving Traditional method of instruction supplemented with CAI attained higher academic achievement than those receiving only traditional instruction or CAI.

Moreover, since technology use is fully integrated into the larger learning system, it is very difficult to isolate the technology variable and determine whether any observed gains are due to technology use or to some other factor or combination of factors. Regarding the impact of CAI on students' achievement in Economics, Watson, Apostolou, Hassell, and Webber (2003) argued that the use of computer in the assessment of student learning remains an important area for future economics education research.

Results from experiments with the use of various forms of educational technology in teaching economics courses seem to indicate that economics students have a positive attitude towards the use of computer and that using computer technology, at the minimum, will not harm their academic performance (Basile and D'Aquila, 2002; Dowling, Godfrey, and Gyles 2003; De Lange, Suwardy, and Mavondo 2003; Fry and Love, 2004; and Kalbers and Rosner, 2003).

Fry and Love, (2004) however, stated that there is a need for the economics instructors to reflect on their teaching strategies when using a Virtual Learning Environment (VLE) if the benefits expected are to be realized In addition, the real benefits of integrating modern technology in teaching may not be easy to measure over the short term (Kalbers and Rosner, 2003). On the integration of CAI techniques with technology, Rainsbury and Malcolm's (2003) analysis revealed that students' reactions were positive.

Improving the quality of education and training is a critical issue, particularly at a time of educational expansion. Tinio (2002) observes that CAI can enhance the quality of education in several ways: by increasing learner motivation and engagement, by facilitating the acquisition of basic skills, and by enhancing teacher training. CAI are also transformational tools which, when used appropriately, can promote the shift to a learner-centered environment.

According to Tinio (2002) further to states some of the ways CAI has improved teaching/learning in Educational system which include: Motivating to learn: CAI, such as videos, television and multimedia computer software that combine text, sound, and colorful, moving images can be used to provide challenging and authentic content that will engage the student in the learning process. Digital Age Literacy which is functional literacy; ability to decipher meaning and express ideas in a range of media; Inventive Thinking: Adaptability Ability to adapt and manage in a complex, interdependent world Curiosity Desire to know

Creativity Ability to use imagination to create new things Risk-taking Ability to take risks. Higher-Order Thinking: Creative problem-solving and logical thinking that result in sound judgments. Effective Communication: Teaming ability to work in team; collaboration and ability to interact smoothly and work effectively with others interpersonal skills personal and social and be accountable for the way they use computer applications and to learn to use CAI responsibly for the public good; facilitating the acquisition of basic skills: the transmission of basic skills and concepts that are the foundation of higher order thinking skills and creativity can be facilitated by CBL through drill and practice. Enhancing teacher training: CAI have also been used to improve access to and the quality of teacher training.

The internet offers many resources and tools for teachers, scholars and students, such as electronic mail, on-line searches of world libraries, curriculum ideas, software, journals, instructional games, weather data and general information on topics such as politics, global issues and other cultures. Barak and Fisher (2001) note that the benefits of internet based educational technology for complementing standard educational practices are numerous. For example, internet based educational materials provide expert instruction to a very large audience. Their flexibility, reusability, and availability on any-where any-time basis make them extremely cost effective. These educational materials can be regularly updated and upgraded to deliver state of the art instruction on a continuous basis. Internet mediated e-learning also enables those who reside in remote locations or who are physically confined to receive these educational programs.

2.6 Rationale for CAI in Teacher Education

CAI is being used at all grade levels from pre-primary to higher education. Children are also learning 3Rs (Reading, wRiting, aRithmetic) through CAI. Chauhan (1994) mentions that CAI system has been utilized at all levels of education ranging from elementary school,

secondary school, teachers training college, post graduate studies and on the job training in almost all subjects. Developed countries have been using CAI for more than three or four decades. A lot of research on various aspects of CAI has been conducted in these countries. They have refined this mode of instruction in the light of findings of researches and are still looking for better use of it. Developing countries are also introducing CAI to their education systems. They have planned and are making efforts for the effective use of this innovative application. The international conference on computer aided instruction and training in developing countries held at Midrand, South Africa on October 10 to 14, 1994 indicates the interest of developing effective CAI teacher education. Participation of delegates from Bangladesh, South Africa, Nigeria, Malaysia, Botswana, Zimbabwe, Namibia, China and many other developing countries in the conference is manifestation of interest of these countries in quality education through the use of CAI (Alexander, 1995). These are:

(a) *CAI should be infused into the entire teacher education programme*.

Throughout their teacher education experience, students should learn about and with technology and how to incorporate it into their own teaching. Restricting CAI experiences to a single course or to a single area of teacher education, such as methods courses, will not prepare students to be technology-using teachers. Pre-service teacher education students should learn about a wide range of educational technologies across their professional preparation, from introductory and foundations courses to student teaching and professional development experiences.

(b) *CAI should be introduced in context*.

Teaching pre-service students' basic computer literacy-the traditional operating system, word processor, and spreadsheet, database, and telecommunications topics is not enough. As with any profession, there is a level of literacy beyond general computer literacy. This more specific or professional literacy involves learning to use technology to foster the educational growth of students. Pre-service students should learn many uses of computer

because they are integrated into their coursework and field experiences. Teacher educators, content specialists, and mentor teachers should expose pre-service teachers to regular and pervasive modeling of technology and provide opportunities for them to teach with the use of computer in K-12 classrooms.

(c) *Students should experience innovative computer-supported learning environments in their teacher education programme.*

Computer can be used to support traditional forms of learning as well as to transform learning. A PowerPoint presentation, for example, can enhance a traditional lecture, but it does not necessarily transform the learning experience. On the other hand, using multimedia cases to teach topics that have previously been addressed through lectures may well be an example of a learning experience transformed by technology. Students should experience both types of uses of computer in their programme; however, the brightest promise of CBL in education is as a support for new, innovative, and creative forms of teaching and learning (SITE, 2002).

While the proposed CAI in teacher education curriculum should aspire to no less, the trajectory of the development for countries, regions, and organizations should be appropriate to the level of resources, including expertise, leadership, and CAI themselves. A widespread approach to reach a scattered population of teachers and organizations that are ready to move a small step forward with very limited resources may be helpful at an early stage. Creating centres of transferable excellent practice that encourages 'reference site' visits, and mentoring teachers in other locations, are also approaches that may be effective. This section will review the stages of teacher education and provide examples of approaches for teacher education in CBL and through CAI.

Approaches to the professional development of teachers must be dependent on context and culture. Since there are a variety of approaches, an overview of the many stages in which

teachers receive teacher education may prove helpful. Professional development to incorporate CAI into teaching and learning is an ongoing process and should not be thought of as one 'injection' of training. Teachers need to update their knowledge and skills as the school curriculum and technologies change. Individuals develop in stages and mature over time. Personal development must be accompanied by organizational development in schools, training centres, and universities. In many regions, teachers engage in preparation before they start teaching in schools, a stage referred to in this document as pre-service teacher education (SITE, 2002).

When pre-service teachers begin to teach they may be given additional support to handle the complexity of their work for the first to third years of their career. This stage of professional development is called induction. The induction stage demands a great deal of effort and commitment, and research in developed countries reveals that around 30% of teachers may drop out during this time. Some teachers do not have the benefit of a preparatory course and must learn while teaching in schools, a condition referred to as on-the-job training. Such training is probably carried out within the school, perhaps with the teacher receiving some release from normal duties. Teacher education is an ongoing process of lifelong learning. The final stage, consisting of additional professional development, is called in-service teacher education.

SITE, (2002) stated that it is important to note that some very strong models of teacher education provide simultaneous professional development for more than one group. For example, pre-service preparation can be aligned with in-service teacher education. A practicing teacher may work with a pre-service teacher education student on an innovative educational project. This not only increases the research potential of the in-service teacher, but the pre-service teacher also experiences role modeling and, as a result, may have an easier transition into teaching.

Professional learning communities allow teachers to support the professional development of colleagues and receive support themselves. CBL have increased the access to and reach of such professional associations. Mentorship can be fostered across geographic distances and supported by synchronous and asynchronous interaction. Professional development may also be enhanced by public or private partnerships with the community. Such partnerships may be particularly appropriate for professional development related to CBL, with financial and technical support contributed by ICT companies, such as the Intel Teach to the Future Programme, or by local communities (SITE, 2002).

The professional development of teacher educators is also essential. Unless teacher educators model effective use of CAI in their own classes, it will not be possible to prepare a new generation of teachers who effectively use the new tools for learning. It is also important to consider the question of who may teach.

With CAI, students often become teachers, using the processes of peer tutoring or reciprocal mentoring. Indeed, a teacher may facilitate learning by reversing the teaching-learning roles, with students acting as expert learners who model the learning process.

CAI provides extensive opportunities for this to occur in ways that can increase the self-esteem, motivation, and engagement of students. Teachers need encouragement to adopt such strategies rather than to feel ashamed to be taught by young learners. Members of the community also may become teachers, or at least invited experts. CAI extends the range of such opportunities and provides access to extensive relevant supporting materials. The teacher's role changes to manager and facilitator in many of these situations as the teacher helps the expert communicate with the learners and scaffolds the learning process. The teacher also acquires professional development by learning from the expert (Bozart, 2006).

The focus of professional development should also be expanded to those who work with teachers: the classroom assistants, school leaders, and members of regional and national

organizations for curriculum and professional development. A common vision for the role of CBL in education is important for its success. Teachers may find it impossible to incorporate CAI into their work without support and encouragement from colleagues, parents, and leaders. To bring this about, these community members may also need professional development, along with the teachers.

2.7 Classroom Trainer Resistance to CAI (E-learning)

Researchers have investigated reasons why teachers resist the application of CAI in their classroom teaching. One amongst several researchers is Bozart (2006) who opined that online workplace training offers many benefits, including reduction of employee time away from work and elimination of travel expenses. Yet industry reports and anecdotal evidence show that many trainers resist using e-learning even when it would ease their own workloads and enhance the effectiveness of their time spent in the classroom. In seeking to understand barriers to change, a number of theorists (Cuban, 1993; Fullan, 1991) have classified them as either first-order or second order. First order barriers refer to those that are extrinsic to the individual, such as organizational support or access to equipment. Second-order barriers involve more emotional, fundamental, personal issues related to personal beliefs and attitudes.

The research regarding those resistant to computer and online learning has been conducted most frequently with academic (Kindergarten—Grade 12) teachers and university faculty. Information regarding second-order barriers falls into several categories: concept of work role, beliefs about practice, beliefs about quality of e-learning, personality factors, and vision of computer as a support tool rather than an enabler and enhancer of learning. Bozart (2006) stated that these areas are explored in detail as:

2.7.1 Work Roles: Work roles performed by teachers are also one of the determining factors to resistance to e-learning. E-learning brings with it a shift from the traditional trainer-learner hierarchy (Berge, 2003). Where the classic view of “teacher” tends to be that of

oracle, authority and expert (Humbert, 2005; Yang, 2005; Gasco, Llopis and Gonzalez, 2004; Berge, 2003; Ertmer, 1999; Zhao and Cziko, 2001), e-learning demands some rearrangement of positions, with trainers moving to the role of guide, and learners to that of explorer. Gasco et al (2004) articulate this as the shift of trainers from "the exclusive owners of a set of knowledge and wisdom to facilitators who see the student as someone who also helps them to learn". Other researchers examined the threats this shift can bring. Ertmer (1999), says, "Many teachers and training practitioners, relishing the thought that they are imparting wisdom, fear the weakening of their professional status and position as 'expert', while Fullan (1991) notes that "there are some deep changes at stake, once we realize that people's basic conceptions of education and skills are involved—that is, their occupational identity, their sense of competence, and their self-concept".

Furthermore, Wallace (2002) described university faculty, some with titles like "Professor", who felt they were being relegated to the roles of production worker, simply typing out content to be put online, and customer service representative, available 24/7 to help students with technical problems. Another role-related issue arose as the faculty, once able to create and deliver their instruction entirely on their own, found themselves dependent on information technologists, graphic designers, and other support staff. The advent of online learning thus found the lines between faculty and support staff beginning to blur—which staff liked, but faculty didn't. Also at issue are feelings of loss: apart from the loss of routine and the 'old way' of doing things are factors associated with the role of expert, particularly efficiency and control. The classroom trainer, once responsible for everything from configuring seating arrangements to deciding what time class will break for lunch, is asked to surrender that independence. Harvey (1999) said, "It is crucial to remember that for every change proposed or achieved, someone loses something".

A final area of concern regarding concept of role rests in the fundamental fear of being replaced by technology. Hodas (1993) comments that:

> *….the notion that it would be possible to be replaced by a machine cuts deeper, to the heart of teachers' identity and self-respect… The suggestion that [tasks] teachers are called upon to perform might be better performed by machines calls this self-image into question in a manner that is painfully direct (pg10).*

There is the general notion that machines are gradually taking over the role of the teacher in the classroom. The teachers who have this fear and believe, is because they are not ready to move with the changes in modern classroom situations.

2.7.2 Practice and Beliefs about Teaching: Different people have different conceptions about teaching. Some people look at it to be mysterious and others regard it as very simple. Researchers like Pederson and Liu, (2003); Zhao and Cziko, (2001); Cuban, (1993); Honey and Moeller, (1990) have shown that instructors regarded as 'high tech', as evidenced by use of computer and online learning approaches, tended to utilize constructivist strategies such as inquiry learning and collaborative work. They additionally tended to plan instruction to meet the needs of individual students, and further discussed wanting to instill in learners a sense of curiosity and desire to learn. As described by Honey and Moeller, "these practitioners downplayed the teaching of facts in favor of an inquiry-based or discovery mode of learning. The goal is not to give out a lot of information but to equip learners with tools to find answers". Additionally, these instructors were more likely to modify their practice in response to student needs, saw practice as changing and evolving over time, and described excitement when trying new methods of instruction (Honey and Moeller (1990); Zhao and Cziko (2001). Vannatta & Fordham, (2004) also stated that, they were more willing to participate in professional development opportunities, including taking graduate courses even without incentive.

Conversely, those most resistant to new approaches and technologies tend to be instructors working from a more teacher-centered perspective (Pederson and Liu, 2003; Honey and Moeller, 1990). Seeing themselves as "the sole source of knowledge" (Zhao and Cziko, 2001), Honey and Moeller (1990) described resistors as "fearful that technology might alter their relationship of control and authority". Where the student-centered instructors utilized more freely-structured lesson plans and discovery learning techniques, those who subscribed to a more instructor-centered approach concentrated on following the textbook and lesson plan, with emphasis on passing a final exam (Honey and Moeller 1990; Pederson and Liu, 2003). Gallant describes this as the "transmission model" of teaching.

Thus the prospect of CAI (e-learning) proffers a wide-reaching disturbance for the trainer operating from this traditional, behaviorist stance. Honey and Moeller (1990) remarked that; "For teachers whose educational beliefs and practices are traditional, there exists a different and much more complicated barrier for technology interpretation; in order to integrate technology into their curricula, as the high-tech teachers have done, the very nature of their practices would have to change". Khitrykh and Nelson (2003) summed it up, perhaps brutally, by saying, "CAI (e-learning) focuses on learners' needs rather than on trainers' abilities".

2.7.3 Beliefs about Quality of E-Learning: Teachers and many instructors have different conceptions about the quality of e-learning. For instructors, the advent of e-learning challenges many basic notions about adult learning and what constitutes 'good' teaching (Ertmer, 1999). Citing Fullan and Stiegelbauer (1991), Ertmer said that implementation of new technologies often "requires challenging one's belief systems and notions regarding what constitutes content and content coverage, what comprises learning and engaged time, and even what behaviours define 'teaching'. Instructors also express concerns that the quality of online education is inferior to that provided in the traditional classroom setting (Yang, 2005;

Butler and Selbom, 2003). As noted by Humbert (2005), concerns here may also be attributed to the fact that many instructors have never experienced a quality online experience and thus have no real standard of comparison.

Additionally, Smith and Bierema (2000) discussed an issue that does not appear in the literature addressing CAI used in the K-12 realm: the need to maintain the integrity of the adult learning program while simultaneously enabling the organization to respond to market conditions. There is a strong business case for the use of e-learning in the workplace, such as reductions in travel, classrooms, and instructor costs, and the reduction of learner time away from the workplace. Smith and Bierema (2000) noted that the importance and quality of the learning experience is maintained and content not simply be dumped into Web pages for the sake of providing it online.

2.7.4 Personality Factors: There is the existence of individual difference and personality perception of things. Researchers such as Maguire, (2005); Vannatta and Fordham, (2004); Wallace, (2002); Zhao and Cziko, (2001); Wolcott and Betts, (1999); Binney and Williams, (1996); Honey and Moeller, (1990) revealed discernable patterns in personality traits and approaches to work relative to the use of technology by instructors. Successful integrators are described as “pioneers”, (Zhao and Cziko, 2001), “explorers” (Binney and Williams, 1996), and “risk-takers” (Honey and Moeller 1990; Vannatta and Fordham, 2004). Going beyond the perhaps best known classification of “early adopter, Roger (1999), in the literature on instructor integration of technology into practice further describes the successful integrator as finding excitement in trying a new way of working and perceiving use of a new approach as an intellectual challenge (Honey and Moeller, 1990; Vannatta and Fordham, 2004). Perhaps more significantly, unlike the resistor’s need to appear in control and competent (Honey and Moeller, 1990; Zhao and Cziko 2001), the successful integrator exhibits a tolerance for ambiguity and willingness to make mistakes. One participant in the Honey and Moeller

(1990) study said, “I’m not so worried that something is glitch-free. We’ll work it out together”.

2.7.5 Vision into the future by teachers: The final area addressed by literature is the presence, among those educators using e-learning, of a vision of a changing future for education and training. Ertmer, Addison, Lane, Ross, and Woods (1999) described instructors with an imagined enhanced curriculum made stronger by the integration of new approaches and technologies. In a 2001 study of teachers making what the authors defined as “exemplary use” of computer in teaching, Ertmer *et al* (2001) reported, “what was most common across teachers was the belief that technology provided a valuable tool for achieving their visions of teaching and learning”. This was in keeping with an earlier report in which Ertmer *et al* (2001) remarked.

Perhaps because these teachers had such strong visions of classroom technology use, they did not appear to be easily frustrated by common implementation barriers. In fact, many of these teachers had achieved high levels of use despite the lack of equipment, training, or time. Teachers tended to approach barriers with no-nonsense attitudes. All of the teachers we interviewed faced barriers, yet none of them permitted the barriers to halt their efforts. Their unwillingness to give up in the face of difficulty allowed them to overcome barriers that typically keep others from proceeding. Ertmer *et al*. (1999) reported that instructors, who viewed computer as a presentation tool, or “add-on”, rather than the means of enhancing practice, were far more likely to report barriers. In a dramatic report of findings, the instructors with a vision of technology as the means to facilitate an emerging, improved curriculum reported *no* second-order barriers. In seeking to understand the reasons for resistance to e-learning on the part of classroom trainers, the existing literature points us toward inquiry across several dimensions.

2.8 Types of Technology and their Educational Applications

Many different types of technology can be used to support and enhance learning. Everything from video content and digital moviemaking to laptop computing and handheld technologies (Marshall, 2002) has been used in classrooms, and new uses of technology such as podcasting are constantly emerging. Various technologies deliver different kinds of content and serve different purposes in the classroom. Becker (1994) cited examples such as word processing and e-mail promote communication skills; database and spreadsheet programs promote organizational skills; and modelling software promotes the understanding of science and math concepts. It is important to consider how these electronic technologies differ and what characteristics make them important as vehicles for education.

Furthermore, another researcher Prensky (2005), stated that technologies available in classrooms today range from simple tool-based applications (such as word processors) to online repositories of scientific data and primary historical documents, to handheld computers, closed-circuit television channels, and two-way distance learning classrooms. Even the cell phones that many students now carry with them can be used to learn. Each technology is likely to play a different role in students' learning. Reeves, (1998); Ringstaff and Kelley, (2002) were of the opinion that rather than trying to describe the impact of all technologies as if they were the same, researchers need to think about what kind of technologies are being used in the classroom and for what purposes. Two general distinctions can be made; students can learn "from" computers—where technology used essentially as tutors and serves to increase students basic skills and knowledge; and can learn "with" computers—where technology is used as a tool that can be applied to a variety of goals in the learning process and can serve as a resource to help develop higher order thinking, creativity and research skills.

The primary form of student learning "from" computers is what Murphy, Penuel, Means, Korbak and Whaley (2001) described as Discrete Educational Software (DES) programs, such as integrated learning systems (ILS), Computer-Assisted Instruction (CAI), and Computer-Based Instruction (CBI). These software applications are also among the most widely available applications of educational technology in schools today, along with word-processing software, and have existed in classrooms for more than 20 years (Becker, Ravitz, and Wong, 1999).

According to Murphy et al, (2001) teachers used DES not only to supplement instruction, as in the past, but also to introduce topics, provide means for self-study, and offer opportunities to learn concepts otherwise inaccessible to students. The software also manifests two key assumptions about how computers can assist learning. First, the user's ability to interact with the software is narrowly defined in ways designed specifically to promote learning with the tools. Second, computers are viewed as a medium for learning, rather than as tools that could support further learning.

While Discrete Educational Software (DES) remained the most commonly used approach to computer use in student learning, in more recent years, use of computers in schools has grown more diversified as educators recognize the potential of learning "with" technology as a means for enhancing students' reasoning and problem-solving abilities. In part, this shift has been driven by the plethora of new information and communication devices now increasingly available to students in school and at home, each of which offers new affordances to teachers and students alike for improving student achievement and for meeting the demand for 21st century skills describe earlier. No longer limited to school labs, school hours and specific devices, technology access is increasingly centred on the learner experience.

Some researchers such as Bruce and Levin (1997), for example, looked at ways in which the tools, techniques, and applications of technology can support integrated, inquiry-based learning to "engage children in exploring, thinking, reading, writing, researching, inventing, problem-solving, and experiencing the world." They developed the idea of technology as media with four different focuses: *media for inquiry* (such as data modelling, spreadsheets, access to online databases, access to online observatories and microscopes, and hypertext), *media for communication* (such as word processing, email, synchronous conferencing, graphics software, simulations, and tutorials), *media for construction* (such as robotics, computer-aided design, and control systems), and *media for expression* (such as interactive video, animation software, and music composition).

In a review of existing evidence of technology's impact on learning, Marshall (2002) found strong evidence that educational technology "complements what a great teacher does naturally," extending their reach and broadening their students' experience beyond the classroom. "With ever-expanding content and technology choices, from video to multimedia to the Internet," Marshall suggests "there's an unprecedented need to understand the recipe for success, which involves the learner, the teacher, the content, and the environment in which technology is used.

2.9 Obstacles to the use of CAI in Nigerian Schools

There are several impediments to the successful use of Computer Assisted Instruction in Nigerian schools. Aduwa-Ogiegbaen, and Iyamu, (2005) summarised these obstacles to include: cost, weak infrastructure, lack of skills, lack of relevant software and limited access to the Internet. Ogiegbaen, and Iyamu, (2005) focused on some of the obstacles which are encountered and hindering the effective use of CAI in Nigerian schools are summarised as follows:

2.9.1 Cost of Computer Hardware and Software: The price of computer hardware and software continues to drop in most developed countries, but in developing countries, such as Nigeria, the cost of computers is several times more expensive. While a personal computer may cost less than a month's wages in the United State, the average Nigeria worker may require more than two years' income to buy one. (Ogiegbaen, and Iyamu, 2005).

Many of the schools lack adequate infrastructure such as classrooms and only few are equipped with television or radio. Apart from the basic computers themselves, other costs associated with peripherals such as printers, monitors, paper, modem, extra disk drives are beyond the reach of most schools in Nigeria. The schools cannot also afford the exorbitant Internet connection fees.

2.9.2 Weak infrastructure

Ogiegbaen, and Iyamu, (2005) found out that in Nigeria, a formidable obstacle to the use of computer assisted instruction is infrastructure deficiencies. Computer equipment was made to function with other infrastructure such as electricity under "controlled conditions". For the past fifteen years Nigeria has been having difficulty providing stable and reliable electricity supply to every nook and cranny of the country without success. Currently, there is no part of the country, which can boast of electricity supply for 24 hours a day except probably areas where government officials live. There have been cases whereby expensive household appliances such as refrigerators, deep freezers and cookers have been damaged by upsurge in electricity supply after a period of power outage.

Electronics equipment such as radio, television, video recorder and even computers has been damaged due to irregular power supply. When electricity supply is not stable and constant, it is difficult to keep high-tech equipment such as computers functioning, especially under extreme weather conditions as obtained in Nigeria. The high levels of dust during the dry season in Nigeria also make electronic equipment to have short live span. In rural Nigeria

most inhabitant do not have access to electricity, thereby denying rural schools opportunity to benefit from the use of electronic equipment such as radio, television, video recorders and computers. The few Internet access available in Nigeria is found in urban centers. These environmental realities are difficult to manage because fans, sealed rooms and stable electricity are lacking in many urban homes and rural areas.

Another obstacle to CAI development in Nigeria is inadequate telecommunication facilities. Though the International Telecommunication Union (ITU) has rated Nigerian's Telecommunication Sector as the fastest growing in Africa, majority of Nigerians have no access to telephone. At the end of 1999, total private investment in telecommunication industry in the country was $50m and there were over 700, 000 lines with 450,000 connected. The government officials and officers acquired more than half the lines connected. On the Global System of Mobile Communication (GSM), Nigeria is also ahead of most African countries with more than 2 million subscribers connected. The telecommunication sector in Nigeria has attracted more direct foreign investment hence the growth rate is faster than any other sector of the economy.

Though Nigerian's telecommunication sector is growing faster than most African countries, the over 3 million landlines and 2 million GSM subscribers are a far cry from the ideal when such figures are meant to serve Nigeria's nearly 124 million population. Again, most of the subscribers to the Global System of Mobile Communication (GSM) and landlines owners are found mostly in urban centers. It is also on record that the connection fees for telecom facilities have reduced drastically over the years, the current rate is still too high for many Nigerians. In 1997, connection fees for telephone lines were about $1,500; today it is about $148. The current rate is too high in a country where the minimum monthly wage is about $51. To change this situation, Nigerian needs to figure out new ways of building necessary infrastructure to support CAI in the country.

2.9.3 Lack of skills: Apart from the above mentioned problems which plague the Nigerian education system, Okebukola, (1997) stated that Nigeria does not only lack information infrastructure, it also lacked the human skills and knowledge to fully integrate CAI into the education system. To use computer assisted instruction in schools in Nigeria, the need for locally trained workers to install, maintain and support these systems cannot be over emphasized. There is acute shortage of trained personnel in application software, operating systems, network administration and local technicians to service and repair computer facilities. Those who are designated to use computers in Nigeria do not receive adequate training, at worst; do not receive any training at all. Also, Yusuf, Maina and Dare (2013) revealed that most school teachers lack the skills to fully utilize technology in curriculum implementation hence the traditional chalk and duster approach still dominates in school pedagogy.

Information transfer using CAI is minimal or non-existence in secondary schools in Nigeria (Anao, 2003). School teachers in Nigeria need to be trained on educational technologies and the integration of computers into classroom teaching. According to Carlson and Firpo (2001), "teachers need effective tools, techniques, and assistance that can help them develop computer based projects and activities especially designed to raise the level of teaching in required subjects and improve student learning.

2.9.4 Lack of relevant software: There is no doubt that the ultimate power of technology is the content and the communication. Though, software developers and publishers in the developed countries have been trying for long to develop software and multimedia that have universal application, due to the differences in education standards and requirements, these products do not integrate into curriculum across countries.

Software that is appropriate and culturally suitable to the Nigerian education system is in short supply. There is a great discrepancy between relevant software supply and demand in developing countries like Nigeria. According to Salomon (1989), there are clear indications from many countries that the supply of relevant and appropriate software is a major bottleneck obstructing wider application of the computer. Even if Nigeria tries to approach this software famine by producing software that would suit its educational philosophies, there are two major problems to be encountered. First, the cost of producing relevant software for the country's educational system is enormous. Second, there is dearth of qualified computer software designers in the country. To overcome this, people need to be trained in instructional design.

2.9.5 Limited access to the Internet: In Nigeria there are few Internet providers that provide Internet gateway services to Nigerians. Such Internet providers are made up of Nigerians who are in partnership with foreign information and communication companies. Many of these companies provide poor services to customers who are often exploited and defrauded.

Salomon (1989) stated that the few reputable companies, which render reliable services, charged high fees thus limiting access to the use of the Internet. The greatest technological challenge in Nigeria is how to establish reliable cost effective Internet connectivity. In a country where only about 0.6% of the populace has home personal computers, the few reliable Internet providers who have invested huge sum of money in the business have a very small clientele. They have to charge high fees in order to recoup their investment in reasonable time. Nigeria has about 500,000 Internets subscribers.

Schools in Nigeria are not given adequate funds to provide furniture, requisite books, laboratories and adequate classrooms let alone being given adequate funds for high-tech equipment (computers) and Internet connectivity. Again, due to the lack of adequate electricity supply, especially in rural areas in Nigeria, schools located in those areas have no

access to the Internet and are perpetually isolated and estranged from the world's information superhighway. Nigeria in lagging behind other African countries such as Uganda, Senegal and South Africa who are already helping school students in those countries to become better information users.

All Internet service providers in Nigeria are based in the urban areas. For many years, the Nigerian government had a monopolistic control of telecom service, which does not allow for the competitive environments that reduce telephony rates. Paltridge (1996) asserted that the penetration of Internet hosts is five times greater than in monopoly markets and that Internet access in countries with telecommunication competition enjoyed a growth rate five times higher than the monopoly environments. All that may change for Nigeria now as the government had invited private participation in the telecom industry and many investors are already in the Nigeria markets but it will take many years to know their full impact on Nigeria education system.

2.10 Empirical Studies

Studies which were carried out by other researchers and are relevant on this present studies were also looked into and these include some of the following:

In a study, carried out by Adeosun (2004) titled: "Accessing the Relationship between CAI Usage and Integration and the Standard of Secondary School Education in a Developing Economy" was focused on the Nigerian Secondary School education. The main purpose of this study was to address CAI in relation to secondary school education and relate it to sustainable development of education in Nigeria. The key assertion of the study was that the effective use of CAI for secondary school education addresses both the problem and solution to computer based learning, seeking synergistic results that benefit students as they graduate and carry out these in their future studies.

The data for the study were gathered through a two page questionnaire, which was administered to 120 respondents who were accessible in two secondary schools. This study was empirical and exploratory in nature as a two-paged structured questionnaire with a 4-point scale; where 1 equal to the lowest and 4 equal to the highest was used to collect data. The questionnaire included two major sections: "A" Demographic profile, and "B" Secondary school education programs emphasis scale. Section "A" required the respondents to check the boxes as it applied to them, which included their gender, age, status, and class. Section "B", the core of the questionnaire required respondents to rate a list of items on CAI usage and integration.

The findings of this study revealed that there are significant relationships between CAI integration and usage and the poor standard of secondary education programs which invariably affected the standard of students performances, the correlation value of $r = 0,511, p < ,000$ obtained brought this to bear. The findings of the survey on Secondary School Education staff perception of the impact of CAI on secondary school student education in Nigeria suggested that the respondents were disgruntled with the sluggish use and integration of CAI in both the states and federal government owned schools in general and into Senior Secondary school education programs in particular. The study used the Statistical Package for Social Sciences (SPSS) software in analyzing the data collected of which this present study will also adopt in analyzing the data collected. Again, this study was relevant to the present study in that, the study dwelled on students' education and had a direct bearing to the present study as the present study is geared towards improving students' education in Nigeria through the application of CAI for better deliverance and understanding by the learners. Although this study is relevant to this present study, the researcher only carried out a survey and did not investigate the effects of CAI on students' performances.

In a study carried out by Roblyer and Edwards (2006) titled: "The Effect of Computer-Assisted Instruction on Students' Attitudes and Performance in Economics Theory in Secondary Schools in Uasin Gishu District, Kenya". This study investigated the perception of students' usage of CAI in Kenya's senior secondary schools. The survey method was applied in the study; the population of the study which consisted of students from three senior secondary schools were 205 students, 105 in Experimental groups and 100 in Control groups participated in the study.117 students were male and 88 were female and the sampling technique used for the study was the cluster random sampling.

Data were analyzed using the analysis of variance (ANOVA). All statistical significance were tested at alpha = 0.05 level. Analyses of the pretest achievement and attitude scores were conducted to establish the homogeneity of subject groups. Result of a 2(treatment) by 2 (Gender) by 3(school type) Factorial ANOVA of achievement revealed no significant difference for the main and interaction effects. These analyses indicated that the subjects were homogeneous in Economics performance and attitude on pretest scores. Eventually, the two treatments (CAI and Conventional instruction) were assigned at random to each of the two schools in each category.

The Economics teacher in each of these classes was assigned to teach their class. Three teachers were trained on how to implement the CAI module.

The results of this study indicated that there was a significant difference in the Economics performance and attitude of Form IV students according to the treatments. These indicate the need for educators to provide opportunities for all students to engage in CAI groups in Economics. It is not suggested here that all Economics content be studied using CAI mode, however, Economics educators are encouraged to recognize the effectiveness and benefits of this alternative approach and to structure more CAI lessons in their classrooms. A possible explanation for the effectiveness of CAI learning in this study involves students'

active involvement in the learning process through frequent and student-machine interaction. However, differences were found according to gender within treatment groups. As a result, there is need for further research to ascertain whether the differences are coincidental or genuine.

With little research having been conducted in Kenya in Economics on CAI, a major contribution of this study is that the CAI approach is more effective than conventional approach for producing performance and attitude gains in such a population. In an effort to meet the needs of increasingly diverse students, CAI provides Economics educators with an effective instructional approach for enhancing the success of the youth in the evolving ICT society.

This study is very relevant to the present study because it is purely educational and on the CAI application in education. Also the study only study the Effect of Computer-Assisted Instruction on Student's Attitudes and Performance in Economics and it did not carry out an investigation of the CAI in their educational applications. This is in line with the present study which was to find out how CAI enhances teaching and learning in education. This study also provided literature which is very vital to this present study.

Ball, Eckel, and Christian (2006) examine the effect of computer wireless handheld devices on students' development of problem solving strategy in undergraduate principles of economics courses by way of a controlled experiment. One group of students (experimental group) were equipped with wireless handheld devices that allows interactive participation with standard economics games, multiple choice tests, and communication with the instructor during class time. The second group (control group) was not given the devices. Course content, assignments, exams, and so on, were identical between both groups. Results show that students in the experimental group earned final grades that were an average of 3.2 points

higher than did the students in the control group. Also, the result shows that increased educational use of computer drill and practice seems to have great effect on students' post-test scores.

In a research carried out by Cher (1996) titled "The Effect of a Computer-Based Learning (CBL) Support Package on the Learning Outcome of Low-Performance Economics Students". The focus of the study is to assess the effectiveness of CBL as a support package in Pacific Junior College (PJC) for the low-performance Economics students. PJC is one of the top junior colleges in Singapore. For the purpose of this study, the researcher defines an effective support package as one that helps these students enhance their learning outcome. Although this research study might not initiate big changes to learning, teaching and the curriculum, it is likely to promote small and local evolutionary adaptations of CBL in schools. The study was made up of the 20 lowest performing students in JC One Economics from 4 classes. They were students who could not manage at least a grade 'E' for the mid-year examination. The students were designated into two groups: the control group (N=11) and the treatment group (N=9).

During the course of the study, the control group (N = 11) underwent the traditional approach of remedial lessons used in PJC while the treatment group (N = 9) were put through the CBL support package. Results from this investigation were explored from several perspectives. The researcher compared the average mid-year letter grade levels to average final grade levels for both treatment and control groups. Differences were investigated between the control and treatment groups with respect to mid-year letter grade and the final letter grade. The analysis was done with 2-samples t-tests with unequal n's to evaluate differences between means for each group. The research study is interested in whether the scores of the treatment group are reliably higher than those of the control group.

According to the findings of this research, it was revealed that three students in the treatment group beginning the program with a failing grade (F) obtained at least an 'A' level pass for their final examination. The other 6 students from the group improved by at least two grade points. In contrast, the students in the control group did not improve as much. To be specific, three students in the control group failed to receive at least an 'A' level pass for the final examination. Two of the students did not show any improvement in their grades. Therefore the results indicate that low-performance students in the CBL support program performed better in Economics as compared to the ones in the traditional remedial program. Hence, this study is very relevant to the current study because it established the effect of a Computer-Based Learning (CBL) Support Package on the Learning Outcome of Low-Performance Economics Students.

Okorie (2010) carried out a study titled "ICT and Educational Performance: The Inter-Relationship of Selected Critical Variables". The study set out to measure the use of the internet as an information and communication tool in promoting educational performance and knowledge of Covenant University undergraduates, and analyze the inter-relationship of selected social and demographic and other relevant variables. A sample size of 378 was derived from a population of 7000 using simple random sampling method. Questionnaire was used as the data collection instrument and the data was analyzed for cross tabulation using chi-square. The hypotheses were tested using the Chi-square Test of Independence at the 5% level of significance (that is, alpha = 0.05).

The Chi-square Test of Independence was chosen because it is a standard measurement test instrument. Secondly, it is used to establish relationship between two variables or establish independence. Chi-square test results were further subjected to the Somers's directional measure and symmetric measures so as to determine the strength and nature of the relationship using a Statistical Package for Social Sciences (SPSS). The first null

hypothesis proposed that there was a significant relationship and correlations between internet usage and the sex of the respondents. The second null hypothesis stated that there was a significant relationship between internet knowledge and the age of the respondents. The third null hypothesis proposed that there was a significant relationship between internet knowledge and the academic performance of the respondents. The last null hypothesis stated that there was a significant relationship between internet usage and the academic performance of the respondents.

The study revealed some interesting correlation among the critical variables. This study is very directly related to this present study as the study applied questionnaire as an instrument for data collection and the responses were cross tabulated and also the study made use of Statistical Package for Social Sciences as a data analysis tool, which this present study intends to fully apply in analysing the obtained data. Also the population for the study comprised of students' application of Information and Communication Technology in teaching and learning in schools, which was significant to this present study because this study is targeting students also. This study investigated the performance of students in ICT but it was a survey which was used in the study and applying questionnaire only give attributes of the population and the sample chosen for the study. The study ought to have carried out an experiment to actually measure the performance of students in education using ICT in their teaching and learning process.

Muhammad and Munawar (2012) carried out a research titled "Effectiveness of Computer-Assisted Instruction in Urdu Language for Secondary School Students' Achievement in Science". This study examined the effectiveness of computer assisted instruction (CAI) on students' achievement in general science as compared with the traditional method of instruction (TMI). This experimental study was conducted in a public secondary school in Lahore, Pakistan. Post-test only control group experimental design was

employed on paired groups matched with respect to intellectual capacity of the students. The CAI program comprising interactive tutorials in Urdu language was used for learning by the experimental group. The control group was taught the same content in the classroom by the teacher through textbook based lecture method, which is the traditional method of teaching in public schools in Pakistan. An achievement test assessing knowledge, comprehension and application components of learning was administered to both the groups after a two month long treatment period. The study revealed that experimental group performed better on all the three components of the achievement test as compared to the control group. The CAI group also scored higher than the TMI group in various content areas of general science.

A sample size of forty students out of the total eighty 9^{th} graders of general science group were selected on the basis of intellectual capacity measured on Raven's Standard Progressive Matrices. As the groups were dependent on intellectual capacity, Paired *t*-test was applied to compare the overall, by cognitive levels and by content area achievements of the experimental and the control groups. Expected scores of the experimental group were also computed through the linear regression equation of the control group data.

This study is related to this present study as it examined the effectiveness of computer assisted instruction (CAI) on students' achievement in general science as compared with the traditional method of instruction (TMI) and also, the study made use of quasi-experimental design which the present study will also use.

Another study carried out by Yusuf and Afolabi (2010) titled "The effects of computer assisted instruction (CAI) on secondary school students' performance in biology"**.** This study was also designed to investigate the influence of gender on the performance of students exposed to CAI in individualized or cooperative learning settings package was examined. The target population of this research was the first year senior secondary biology students in Oyo town and Ibadan city, Nigeria. The sample for the study comprised 120 first year senior

secondary school students (SSSI) sampled from three private secondary schools, in Oyo State, Nigeria. Three null hypotheses were raised and tested at the alpha level of 0.05 significance. The scores of students in the three groups were analyzed using ANCOVA. The results revealed that there was no significant difference in the performance of male and female students exposed to CAI in either individual or cooperative settings.

Based on the research findings recommendations were made on the need to develop relevant CAI packages for teaching biology in Nigerian secondary schools. Also, further empirical studies should be carried out on the use of computer for instructional purposes, on different subjects and at different levels to provide sound basis for the integration of computer in Nigerian schools. This study also provided a rich source of material for literature review.

2.11 Summary

In this chapter, literature was reviewed in the following areas: Emergence, Development and Integrating CAI into the Classroom Teaching and Learning which revealed that CAI integration into the classroom is enhance, and extend student knowledge, better delivery and knowledge sharing through networks and quality distance learning in management education. Theoretical Framework By engaged learning, we mean that all student activities involve active cognitive processes such as creating, problem-solving, reasoning, decision-making, and evaluation. In addition, students are intrinsically motivated to learn due to the meaningful nature of the learning environment and activities. Engagement theory is based upon the idea of creating successful collaborative teams that work on ambitious projects that are meaningful to someone outside the classroom; in an attempt to reveal the Nature of CAI, it was made to realize that the use of computers in schools may be divided into learning about computers and learning with, from or through computers. Hence, the three major categories that make-up what has become known as computer-assisted

instruction (CAI) was stated as drill and practice, tutorials, and simulation. Also, the two major types of CAI are identified as *adjunct* and primary.

Teachers are no more the sole custodians of knowledge but with CAI, they now direct and assist learners in acquiring knowledge. On the Students in the Computer Era, literature was reviewed and some researchers stated that students are now taking a greater responsibility for their own learning, as they seek, find and share knowledge with others. Through CAI there has been a rise in the quality of educational delivery; Classroom Trainer Resistance to e-learning which is informed by concept of work role, belief about practice, beliefs about quality of e-learning, personality factors, and vision of technology as a support tool; Teacher Education in CBL, Rationale for CAI in Teacher Education which is based on the fact that there is a changing role of teachers with the Computer era there is the advocating for computer technology to be infused in the entire teacher education programme so that students should experience innovative technology-supported learning environments in their teacher education programme; and some Empirical Studies reviewed which were directly related to the present study.

From the literature reviewed so far, it was revealed that most of the population targeted was mainly younger generation, as the study is meant for preparing students of the future. Age has not been emphasized and also the issue of gender bias did not appear to be a major bone of contention; this is because students of the future whether male or female need the same type of training and experience in the application of CAI in teaching. The empirical studies so far looked into have mostly been survey design and experimental studies to see the effects of CAI on the students' academic performance. As such this study will employ the use of quasi-experimental design to investigate the effect of CAI on students' performance in Economics.

CHAPTER THREE

RESEARCH DESIGN AND METHODOLOGY

3.1 Introduction

This chapter explains the research design and methodology used for the study under the following sub-headings: Research Design, Population of the study, Sample and sampling techniques, Research Instrument, Validity of the Instrument, Pilot Study, Reliability of the Instrument, Procedure for data collection, and Procedure for data analysis.

3.2 Research Design

This study employed the use of quasi-experimental design. Quasi-experimental design according to Dinardo (2008) is a research design used to estimate the causal impact of an intervention on its target population. It allows the researcher to control the assignment to the treatment condition, but using some criterion other than random assignment (e.g., an eligibility cutoff mark). Quasi-experimental design does not use random assignment of subjects, rather, intact class are usually used. For instance, a researcher may which to conduct experiments involving secondary school students. Under normal circumstances, he would randomly select the subjects and also randomly assign them to experimental or control conditions. However, a practical difficulty often experienced by researchers in this respect is the reluctance of the school authorities to permit the researcher to disorganize their classes as would be required by randomization. Faced with this situation, the researcher may not have any option but to use the classes as they are (intact or non-randomized classes); thereby settling for a quasi-experiment.

This design is a 2x2 paradigm. This paradigm represents two groups: the Computer Assisted Instruction (experimental group), and Conventional Instruction (Control group); and two levels of gender (Male and female). The methodology involved using one or more elements of different teaching, learning, and assessment tools (both Computer Assisted

Instruction and Conventional Instruction) and in-class activities to engage the students in active learning. Consequently, the research design is illustrated below:

Experimental Group $\longrightarrow O_1 \longrightarrow X \longrightarrow O_2$

Control Group $\longrightarrow O_1 \longrightarrow$ --- $\longrightarrow O_2$

Key:

O_1 Pre-test

X Treatment

O_2 Post-test

3.3 Population of the Study

The target population of this study comprised of all the 10584 (ten thousand, five hundred and eighty four) SSS II students of public senior secondary schools in Ekiti State, Nigeria. The total population composed of 183 public secondary schools. Table 3.1 below shows the state summary of the total population of the SSS II students of the public senior secondary schools in each of the 16 local government area of the state.

Table 3.1: Population of the Study

S/N	Population Distribution of Schools by local governments	No of Schools	Population of SSS II Students		
			Male	**Female**	**Total**
1.	Ado-Ekiti Local Government	14	651	566	1217
2.	Efon Local Government	6	197	186	383
3.	Ekiti West Local Government	13	370	399	769
4.	Ekiti East Local Government	11	430	414	844
5.	Ekiti South-West Local Government	10	250	236	486
6.	Emure Local Government	5	134	120	254
7.	Gbonyin Local Government	13	406	380	786
8.	Ido/Osi Local Government	15	263	285	548
9.	Ijero Local Government	17	589	530	1119
10.	Ikere Local Government	10	115	198	313
11.	Ikole Local Government	16	420	443	863
12.	Ilejemeje Local Government	6	155	165	320
13.	Irepodun/Ifelodun Local Government	13	373	412	785
14.	Ise/Orun Local Government	8	266	279	545
15.	Moba Local Government	11	242	251	493
16.	Oye Local Government	15	420	439	859
Total		**183**	**5281**	**5303**	**10584**

Source: Ekiti State Teaching Service Commission, Ado-Ekiti, 2012.

3.4 Sample and Sampling Techniques

Four schools were randomly sampled from 183 public secondary schools in Ekiti State. The entire population of the SSS II Students of the four Public Senior Secondary Schools was used as the sample. The nature of the study, however, required that the research sample should be purposively selected. This is because a research on CAI must necessarily be conducted in schools where computers are available for students' use and where the students are computer literate. As a result, the Government Science College Iyin-Ekiti and Community High School Iyemero-Ekiti, Ekiti State was purposely sampled for the study as the experimental group. Hence, Government College Oye-Ekiti and Ijaloke Grammar School

Emure-Ekiti, Ekiti State was also sampled as the control group, as the school is believed to be more or less equivalent in standard to the school used as the experimental group.

The sample for Experimental Group was made up of 100 students. This comprises of 61 males and 39 females while the control group also made up of 60 males and 35 female students. The classification of the population into control and experimental groups is as presented in Table 3.2

Table 3.2: Sample Size Distribution

Local Government	Sample Schools	Gender		Total number of SSS II Students
		M	F	
Irepodun/ Ifelodun Local Government	Government Science College, Iyin-Ekiti.	40	22	62
Ikole Local Government	Community High School, Iyemero-Ekiti.	21	17	38
Oye Local Government	Government College, Oye-Ekiti.	24	19	43
Emure Local Government	Ijaloke Grammar School, Emure-Ekiti.	36	16	52
Total (M+F)	**4**	**121**	**74**	**195**

Source: Ekiti State Ministry of Education, 2013.

3.5 Instrumentation

The instrument for this research consists of the treatment instrument "Economics Performance Test (ECOPET)". The experimental group and the control group were given a pre-test to ensure homogeneity. The purpose of this test was to measure the performance of the students constituting the sample. The researcher made a thorough study of the Economics units and the techniques of test construction. The researcher, in consultation with Economics class teacher, prepares lesson plan and constructed a test (see appendix B and C) comprising multiple choice items and items of short answers. These items were based on the selected Economics units on (1) Measures of Central Tendency (2) Theory of Cost (3) Demand and

Supply. These units were taught during the experiment to both experimental and control group, which is intended to measure the outcomes of learning. The test instrument; Economics Performance Test (ECOPET), is a 20 items of short answer and multiple-choice objective test with five options each which were drawn from the past Senior School Certificate Examination (SSCE) Economics questions. The test content is based on a table of specification covering the six levels of cognitive domain of learning.

Lesson Plan

Sequential lesson plans were developed by the researcher and were used by the regular Economics teacher who will be the research assistants for uniformity. The lesson plan for each objective was prepared and the research assistants matched them to their respective instructional guide. The topics were broken down into achievable behavioral objective. The lesson plans was given to two experienced Economics teachers for validation. They were requested to examine the following aspects:

1. Clarity and appropriateness of the lesson objectives for the students.
2. Conformity of the instructional methods and appropriateness of the instructional materials.
3. Relevance of student activities and evaluation questions for the lessons.

3.5.1 Validity of the Instrument

The researcher submitted the drafted treatment instrument to both his first and second supervisors in Curriculum and Instruction Section, Department of Educational Foundations and Curriculum, Ahmadu Bello University, Zaria. These items were subjected to thorough scrutiny and proof-reading by these experts to ensure that its contents were in line with the research questions. This supported the view of Berge (1995) who stated that any research instrument to ascertain its validity should be given to a panel of experts to determine if its

items (contents) can elicit the desired data they are intended to elicit and this in essence is to ensure its content validity to ensure that necessary adjustments are made thereafter.

3.5.2 Pilot Study

In order to ascertain the reliability of the research instruments, a pilot study was carried out. The main purpose of pilot study, according to Kerlinger, Fred, and Howard (2000), is to confirm the suitability of the instrument for its adequacy and for the effectiveness of the instrument.

Pilot study was carried out in Okeoro/Iroko Comprehensive High School, Okeoro-Ekiti, Ekiti State. The reason for the choice of Okeoro/Iroko Comprehensive High School was that the school is believed to be more or less equivalent in standard to the schools used for this study and was not in any way involved in the main study. Hence, the Economics Performance Test (ECOPET) which is a 20 items of short answer and multiple-choice objective test with five options each were administered to thirty (30) SS II students of Okeoro/Iroko Comprehensive High School.

3.5.3 Reliability of the Instrument

In order to test the quality of the treatment instrument (ECOPET) that was used in the study, or to test the "consistency" of the measures, a quantitative analysis of inquiry was performed using the Statistical Package for Social Sciences (SPSS) version 22.0 of a computer programme to statistically test the reliability of the research instrument. The reliability coefficient (r) level of the ECOPET instrument was determined using Pearson Product Moment Correlation Coefficient (PPMCC) and was found to be 0.88. This was a confirmation of test of reliability according to Spiegel and Stevens (1999). According to them, an instrument is considered reliable if it lies between 0 and 1, and that the closer the calculated reliability coefficient is to zero, the less reliable is the instrument, and the closer

the calculated reliability co-efficient is to 1, the more reliable is the instrument. This, therefore, confirms that the research instrument is suitable and reliable for use as an instrument for data collection for the main study.

3.6 Procedure for Data Collection

The procedure that was used for data collection involved the use of: Pre-test, Treatment, and Post-test.

i. Pre-test

Pre-test was at the initial stage administered simultaneously to both Experimental and the Control groups before treatment. The researcher conducted the experiments and also administered the measurement instrument (treatment instrument) to the students. The two groups (experimental and control groups) was subjected to the ECOPET as pre-test.

A Man Whitney test was used to ensure homogeneity and assess the level of the groups' prior knowledge for the performance of the treatment and control groups using the same learning environments before conducting any experiments.

ii. Treatment

The treatment for all the groups lasted for eight (8) weeks. After the test of homogeneity, the experimental group was exposed to CAIP which was installed on desktop computers using a web browser (Explorer or Firefox). The students in the experimental group were exposed to the CAI format under teacher's supervision (see appendix F) long enough for them to be familiar with the navigation buttons and use the package independently. In addition, they were encouraged to take enough notes that could be useful for them in the post-test. The control group students were exposed to the conventional teaching method on the same content used for experimental groups. This was done by the regular economics teacher who was specially trained by the researcher. The topics for the instruction were extracted from the

economics syllabus for the SS II at the time of the study. They were taught using conventional classroom format. The classroom contained a chalkboard, chalk, textbook, and charts which was used for the instruction.

iii. Post-test

After the treatment, the two groups were exposed to the ECOPET as post-test. The first lesson on preliminary Measure of Central Tendency for the exercise was jointly conducted for both the control and experimental groups. This is to ensure homogeneity in the lessons which ensured that measurements for the homogeneity are without any bias.

In the first week, Elementary theory of Cost was taught for both the control and experimental groups after which a test was administered and scores were totaled and the average scores was taken down for control and experimental groups separately.

While the experimental group takes their lessons using computer as the teaching tool with lecture/test maker software, the control group was taught the same topic using traditional classroom setting such as using the chalkboard, chalk, duster and textbooks. The two groups, at the end of the teaching were administered with a test, and also the time taken in solving economic problems; this was used as indicators of students' performance throughout the experiment. The test results of each test for the treatment group and control group was collected separately and then subjected to statistical analysis. The performance of the experimental group members who were taught using a range of innovative methods was compared with the performance of the control group members who were taught using only traditional methods.

The experiments employed two different learning environments: the Traditional Learning approach (TL), and the Computer desktop-Based Active Learning Approach (CAL). The researcher introduced computer application software for Economics. Economics software

is an application software that records and processes economics activities in the most efficient manner.

3.7 Procedure for Data Analysis

Both descriptive and inferential statistics were used in the analysis of data. The bio-data of the respondents were analyzed using frequencies and percentage while the descriptive statistics of mean and standard deviation were used to answer the research questions earlier stated in chapter one of this study, followed by detailed interpretation.

For the four null hypotheses, inferential statistics of t-test was used to test each of them at p =<0.05 (5%) level of significance. The t-test is appropriate to test whether the means of two groups are statistically different from each other. Hence, hypothesis that is greater than 5% or P=>0.05 was rejected and hypothesis that is less than 5% that is P=<0.05% was retained.

CHAPTER FOUR

DATA ANALYSIS AND RESULTS

4.1 Introduction

The main purpose of this study was to determine the effect of Computer Assisted Instruction (CAI) on students' performance in economics in senior secondary schools in Ekiti State, Nigeria. To achieve this, 195 participants participated in the study. 100 students formed the treatment group while 95 students formed the control group. Pretest and posttest was administered to each group and the test were subjected to statistical analysis using the appropriate tools and procedure in SPSS ver. 22 and result presented in tabular form in the following paragraph.

4.2 Demographic Characteristics of Respondents

A total of 195 SS II students of Economics from the four (4) selected senior secondary schools from both urban and rural area in the three (3) senatorial district of Ekiti State were involved in the study. The demographic variables used for the study were: group, and gender. These variables are tabulated in frequencies and percentages respectively in Tables 4.1 – 4.2.

Table 4.1: Frequency and percentage of respondents based on Groups

Groups	Frequency	Percentage
Control group	95	48.7
Experimental group	100	51.3
Total	195	100.0

Table 4.1 indicated that 95 or 48.7% of the respondents belongs to control group and 100 or 51.3% of the total respondents were experimental group. This enfold that both control and experimental group were favourably represented in the study and thus eliminated any bias that could have been attributed to group sentiments in the study. However, based on the table

above, experimental group were more represented than control group. This happens because, some students left the schools used for control group before the final experiment.

Table 4.2: Frequency and percentage of respondents based on Gender

Gender	Frequency	Percentage
Male	121	62.1
Female	74	37.9
Total	195	100.0

Table 4.2 showed that 121 or 62.1% of the respondents were male while 74 or 37.9% of the total respondents were female. This implies that both females and males students were fairly represented in the study and thus eliminated any bias that could have been attributed to gender sentiments in the study. However, it can be deduced that male respondents were more than female respondents. This can be traced to the fact that, male students have the highest percentage of the population of the schools used for both control and experimental groups.

4.3 Answers to Research Questions

4.3 Research Question One: What are the effects of CAI on students' performance in Economics as compared to the traditional method of instruction in senior secondary schools in Ekiti State, Nigeria?

Table 4.3 showed the results of the post-test administered to both the control and experimental groups to determine the effects of CAI on students' performance in Economics as compared to the traditional method of instruction using different learning environment.

Table 4.3: Descriptive statistics table showing the mean and standard deviation of the post-test score of control and experimental group.

Source	*Group*	*N*	*Mean*	*SD*
Scores	Cont.	95	7.90	3.04
	Exp.	100	10.15	3.35

Note: cont. = control group, Exp. = experimental group

Table 4.3, shows standard deviation and mean scores of tests administered to the experimental group and the control group. The result revealed the mean value of 7.90 for the control group and 10.15 for the experimental group; also, the control group has standard deviation value of 3.04 while the experimental group standard deviation was 3.35. This infers that students taught Economics using CAI techniques performed better over those taught using traditional (TL) lecture method of teaching. Hence, CAI teaching method should be encouraged in teaching Economics in the senior secondary schools in Ekiti State, Nigeria.

4.4a Research Question Two: What is the performance of male and female Economics students when exposed to computer assisted instruction in senior secondary schools in Ekiti State?

Table 4.4a revealed the performance of male and female Economics students when exposed to computer assisted instruction using the same learning environment.

Table 4.4a: Descriptive statistics table showing the mean and standard deviation of the post-test score of Male and Female in experimental group.

Source	*Gender*	*N*	*Mean*	*SD*
Scores	Male	60	9.90	3.42
	Female	40	10.52	3.26

Table 4.4a, shows the standard deviation and mean scores of post-test administered to male and female in the experimental group. The result revealed the mean score of 9.90 for male and 10.52 for female; also, the standard deviation of 3.42 for male in the group, while the standard deviation for the female in the group was 3.26. Based on the above result it means that there is no significant difference in the performance of male and female Economics students when exposed to computer assisted instruction in the senior secondary schools in Ekiti State, Nigeria.

Table 4.4b: Descriptive statistics table showing the mean and standard deviation of the post-test score of Male and Female in control group.

Source	*Sex*	*N*	*Mean*	*SD*
Scores	Male	60	7.88	3.03
	Female	35	10.28	3.71

Table 4.4b revealed the mean score of 7.88 for male and 10.28 for female; also, the standard deviation of 3.03 for male in the group, while the standard deviation for the female in the group was 3.71. This result shows that there is significant difference in the performance of male and female Economics students taught with the use of conventional method of teaching in the senior secondary schools in Ekiti State, Nigeria.

4.5 Research Question Three: What is the effect of computer aided instruction (CAI) on the pre-test and post-test mean performance scores of the experimental group of students in senior secondary schools in Ekiti State?

Table 4.5 shows the results of pre-test and post-test mean performance scores of the experimental group of students in senior secondary schools in Ekiti State.

Table 4.5: Descriptive statistics table showing the mean and standard deviation of the Pre-test and Post-test scores of experimental group.

Source	*N*	*Mean*	*SD*
Pre-test score	100	7.66	2.96
Post-test score	100	10.15	3.35

Table 4.5 indicated that pre-test mean score is 7.66 and 10.15 for post-test; also, the standard deviation of 2.96 for pre-test standard deviation, while the standard deviation for the post-test was 3.35. Hence, this implies that the mean performance scores of the post-test were higher than the pre-test mean performance scores; this shows that computer aided instruction has

effect on the pre-test and post-test mean performance scores of the experimental group of students in senior secondary schools in Ekiti State, Nigeria.

4.6 Research Question Four: What is the relationship between students' performance in Economics and CAI drill and practice in senior secondary schools in Ekiti State?

Table 4.6 revealed the relationship between students' performance in Economics and CAI drill and practice in senior secondary schools in Ekiti State.

Table 4.6: Descriptive statistics table showing the mean and standard deviation of students' performance in Economics and CAI drill and practice.

Source	*N*	*Mean*	*SD*
Scores	100	10.15	3.35

4.4 Hypotheses Testing

Four null hypotheses were raised in Chapter One to give statistical validation to findings from research questions of the study. In order to test them for acceptance or rejection, data were collated from sampled participant (students); these hypotheses are tested as follows:

4.7 Hypothesis One: There is no significant difference in the performance of students in Economics when they are exposed to computer assisted instruction, and traditional method of instruction.

The students' scores were taken and the t-test was used in testing the hypothesis. The Summary of data collected and analyzed in respect to null hypothesis one is presented in Table 4.7

Table 4.7: Independent sample t-test showing differences in Post-test scores of Control and Experimental group.

Source	*Group*	*N*	*Mean*	*SD*	*Df*	α	*t-cal*	*t-crit*	*Sig. (2-tailed)*	*Remark*
Scores	Cont.	95	7.90	3.04	193	0.05	-4.88	1.96	.000	Significant
	Exp.	100	10.15	3.35						

Note: Cont. = Control group, Exp. = Experimental group

The test was conducted using independent sample t-test statistics and the mean of the control group is 7.90 and that of the experimental 10.15, the standard deviation for the control group is 3.04 and for the experimental group is 3.35. The observed t-value is -4.88, while the p-value is 0.000 (P<0.005). The null-hypothesis is thus rejected because there was a significant difference in the performance of students in Economics when they are exposed to computer assisted instruction, and traditional method of instruction and the implication is that the use of CAI in teaching of Economics in the senior secondary schools in Ekiti State has significant effect on students' performance as they score higher in any given test. By implication, the test revealed that students exposed to CAI in Economics performed better than those not exposed to CAI.

4.8a Hypothesis Two: There is no significant difference in the performance of male and female Economics students when exposed to computer assisted instruction.

Male and female were not significantly different in their performance when exposed to computer assisted instruction in senior secondary schools in Ekiti State. Independent sample t-test procedure was used for the test and the summary is presented in table 4.8a below:

Table 4.8a: Independent sample t-test showing differences in post-test scores of male and female in experimental group.

Source	*Sex*	*N*	*Mean*	*SD*	*Df*	α	*t-cal*	*t-crit*	*Sig. (2-tailed)*	*Remark*
Scores	Male	60	9.90	3.42	98	0.05	-.911	1.96	.365	Not Sign
	Female	40	10.52	3.26						

Observation of table 4.8a indicated that the mean score of male respondents was 9.90 and standard deviation of 3.42, while the mean score of female respondent was 10.52 with standard deviation of 3.26. Also, observed t-value is -.911, while the p-value is .365 (P>0.005). The decision was to retain the null-hypothesis because there was no significant difference in the performance of male and female Economics students when exposed to computer assisted instruction in senior secondary schools in Ekiti State.

Table 4.8b: Independent sample t-test showing differences in post-test scores of male and female students in control group.

Source	*Sex*	*N*	*Mean*	*SD*	*Df*	α	*t-cal*	*t-crit*	*Sig. (2-tailed)*	*Remark*
Scores	Male	60	7.88	3.03	93	0.05	-4.05	1.96	.000	Significant
	Female	35	10.28	3.71						

Table 4.8b shows the mean score of male respondents to be 7.88 and standard deviation of 3.03, while the mean score of female respondent was 10.28 with standard deviation of 3.71. Also, observed t-value was -4.059, while the p-value is .000 (P<0.005). The result above revealed that there was a significant difference in the performance of male and female Economics students taught with the use of conventional teaching method. This was contrary to the stated hypothesis of no significant difference in the performance of male and female

Economics students when exposed to computer assisted instruction in senior secondary schools in Ekiti State.

4.9 Hypothesis Three: There is no significant difference in the effect of computer aided instruction (CAI) on the pre-test and post-test mean performance scores of the experimental group in Economics in senior secondary schools in Ekiti State.

In the test of this null hypothesis, paired sample t-test was used in establishing if there is significant difference in the effect of computer aided instruction (CAI) on the pre-test and post-test mean performance scores of the experimental group in Economics in senior secondary schools in Ekiti State. The result is summarized in Table 4.9 below:

Table 4.9: Paired sample t-test showing differences in pre-test and post-test scores of experimental group.

Source	*N*	*Mean*	*SD*	*Df*	α	*t-cal*	*t-crit*	*Sig. (2-tailed)*	*Remark*
Pre-test score	100	7.66	2.96	99	0.05	-6.33	1.96	.000	Significant
Post-test score	100	10.15	3.35						

From the statistics presented in Table 4.9, it reveals that the pre-test mean score is 7.66 while the post-test was 10.15 and the standard deviation for pre-test is 2.96 and for post-test is 3.35. The observed t-value was found to be -6.33 and the probability level of significance for the test is 0.000 ($P<0.005$). This implies that computer aided instruction has a significant effect on the pre-test and post-test mean performance scores of the experimental group in Economics in senior secondary schools in Ekiti State. Therefore, the null hypothesis of no significant difference in the effect of computer aided instruction on the pre-test and post-test mean performance scores of the experimental group was rejected.

4.10 Hypothesis Four: There is no significant relationship between students' performance in Economics and CAI drill and practice in senior secondary schools in Ekiti State.

Table 4.10 below revealed that there was a significant relationship between students' performance in Economics and CAI drill and practice in senior secondary schools in Ekiti State.

Table 4.10: One sample t-test showing relationship between students' performance in Economics and CAI drill and practice.

Source	*N*	*Mean*	*SD*	*Df*	α	*t-cal*	*t-crit*	*Sig. (2-tailed)*	*Remark*
Scores	100	10.15	3.35	99	0.05	30.221	1.96	.000	Significant

According to the one sample t-test statistics in Table 4.10, significant relationship exists between students' performance in Economics and CAI drill and practice in senior secondary schools in Ekiti State. This is because the Sig. (p) value is 0.000 (P<0.005). The decision was to reject the null-hypothesis.

4.5 Summary of Major Findings

The following findings emerged from the study based on the analyzed data collected from the study;

1. Findings revealed a significant difference in the post-test performance scores of students taught Economics with the use of computer assisted instruction when compared with those taught using the traditional method of instruction (t-cal = -4.88, *P* = .000).
2. The study indicated that there was no significant difference in the performance of male and female students taught Economics with the use of computer assisted instruction (t-cal = -.911, *P* = .365).
3. There was a significant difference in the effect of computer aided instruction on the pre-test and post-test performance scores of students taught Economics using computer assisted instruction (t-cal = -6.33, *P* = .000).

4. Significant relationship of CAI drill and practice was also found in the overall performance of students taught Economics with computer assisted instruction (t-cal = 30.221, *P* = .000).

4.6 Discussion of Findings

The rapid innovations and increased complexity of today's world present new challenges which put demands on the education system. These challenges for improvement according to Nwoji (2003), could be successfully done by a shift in psychological and pedagogical theories from teacher directed approach to student-centred approach of instruction. The worth of any instructional exercise should be assessed on the basis of the quality of activity embarked upon by the students. Passivity in the instructional process should not be encouraged since it will not be conducive to the atmosphere which the learner needs in order to work on himself/herself as is the pre-requisite for using computer assisted instruction in teaching process. Students' experimental result reveals that the greater part of the teacher's experimental time was spent by the dictates of the students' needs.

Analysis of students' performance scores in Economics as a result of the use of computer assisted instruction approach showed mean score gains in favour of their respective post-test. The plausible explanation on the above findings is that the treatment indicates better performance of experimental groups (i.e. those taught with Computer Assisted Instruction). This means that the way the teachers in the experimental groups taught the lessons, enables students to be more committed to their learning. The motivational drive of the use of Computer Assisted Instruction approaches enables them to take time and master what they learnt. The data presented in table 4.3 provided answers to research question one.

Findings revealed that students taught Economics with Computer Assisted Instruction (CAI) had a higher mean performance score than those students taught using the conventional methods in the post test. In the same vein, independent sample t-test was used to test the first

hypothesis table 4.7 at the calculated T-value (-4.88), significance of P (.000) and confidence level of 0.005, there was a statistically significant difference between the mean scores of the group taught with Computer Assisted Instruction (CAI) and those students taught using the conventional teaching methods in the performance test.

The implication of this finding therefore is that Computer Assisted Instruction is very effective and can assist other approaches that are associated with conventional teaching methods in enhancing students' performance in Economics. This finding is similar to the findings of Odogwu (2003) who found that there was a significant difference in the mathematics achievement of experimental group taught with Computer Assisted Instruction and control group taught with conventional teaching methods in favour of the experimental group. Although, the subjects used above are science based subjects which may likely favour the use of computer, the result in Economics experimental group has given impetus to the use of Computer Assisted instruction in any other subject. Cher Ping Lim (2010) in his study on "The Effect of a Computer-Based Learning (CBL) Support Package on the Learning Outcome of Low-Performance Economics Students" also found out that low-performance students in the CBL support program performed better in Economics as compared to the ones in the traditional remedial program.

The finding is also in line with the assertion of Cotton (2001) who pointed out that the use of computer based learning procedures appears more result oriented than the conventional instruction. He concluded that student learning rate is faster with computer based learning than with conventional instruction.

Independent sample t-test was used to test hypothesis two, table 4.8 at the calculated T-value (-.911), P value (.365) and confidence level of 0.005, hence, the result shows that there was no significant difference in the treatment given to students and their gender with

respect to their mean scores in the post test. The result showed that the effectiveness of treatments on students' performance in Economics does not depend on the level of gender. Hence, there were no differential effects of treatments over levels of gender (male and female), which implies that Computer Assisted Instruction is more effective than conventional teaching methods in improving students' performance in Economics regardless of gender levels.

The data presented in Table 4.5 provided answer to research question three. Findings revealed that computer aided instruction has a significant effect on the pre-test and post-test mean performance scores of the experimental group in Economics in senior secondary schools in Ekiti State. Paired sample t-test was used to test the third hypothesis, table 4.5 shows the calculated T-value (-6.33), significant of P (0.000) and confidence level of 0.005, there was a statistically significant difference in the mean scores of the pre test and post test of the experimental group.

Active engagement of students in the learning activities according to Cotton (2001) improves students' creativity, which enhances transfer of learning in new situation. The provision of active learning environment by the use of Computer based learning for teaching makes the students to engage in higher order thinking task such as analysis, synthesis and evaluation, which in turn improves students' cognitive achievement and also retention of learning.

According to Brewer (2003), providing opportunities to interact with course materials through the use of computers and information technology tends to change the course from competitive endeavour to one that is more collaborative, student-centred and focused on the cognitive development and construction of knowledge in the students irrespective of their

gender. The result of hypothesis four, using one sample t-test showed P-value 0.000 and T-value as 30.221.

The results of these findings as indicated in Table 4.10 showed that significant relationship exists between CAI drill and practice on students' performance in Economics in senior secondary schools in Ekiti State.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Summary

This study was carried out in order to determine the effect of Computer Assisted Instruction (CAI) on students' performance in Economics in Ekiti State senior secondary schools, Nigeria. To attain the objectives of this study, four objectives, four research questions and four null hypotheses were postulated to guide the conduct of the study. The quasi-experimental design was used for the study. The population of the study was made up of all the Senior Secondary School (SSSII) Economics students in public Senior Secondary Schools in Ekiti state. Out of the entire ten thousand five hundred and eighty-four (10584) students, the total of one hundred and ninety-five (195) SSII students was sampled for the study. The experimental group was made up of 100 students and 95 students constituted the students in the control group.

After the development of the instrument titled: Economics Performance Test (ECOPET) to be used for the study. This instrument was given to two experts for the purpose of content/face validity, while to establish the reliability of the instrument, pilot study was carried out with the use of ECOPET which is a 20 items of short answer and multiple-choice objective test with five options each which were drawn from the past Senior School Certificate Examination (SSCE) Economics questions covering Economics units on (1) Measures of Central Tendency (2) Theory of Cost (3) Demand and demand schedule, and (4) Theory of Supply. The test content is based on a table of specification covering the six levels of cognitive domain of learning.

Related literature was reviewed as well as theoretical framework that supports the use of CAI in teaching of Economics in secondary schools was discussed; the impact of CAI on

students' performances in Economics was inclusive. Also, the importance of CAI to teacher training, types of technology and their Educational applications and the problems which are hindering the proper use of CAI in Nigerian schools have been highlighted. The need for effective use of CAI in teaching of Economics was reviewed, as well as empirical studies which are relevant to the present study were reviewed and the major gap which was realized in the review of related literatures was that, few of the authors carried out experiments to examine the effects of CAI on students' performances in Economics and some other courses of study of which this present study applied in order to bridge the existing gap.

The data collected for the study was presented in tables and analyzed using Statistical Package for Social Sciences (t-test was applied). Also frequencies and percentages were used. The four null hypotheses were formulated and tested at 0.005 percent level of significance. The statistical techniques used for analysis was independent sample, paired sample and one sample t-test.

5.2 Conclusions

Findings from the research provided the bases for the researcher to draw the conclusion that the use of CAI in teaching of Economics in senior secondary schools enhances students' performances and they tend to score higher in test administered to them using CAI teaching method than those students taught using traditional method of teaching Economics. With this improved performances in Economics by students using the CAI method of instructions, adequate provision of good CAI programme like Test maker, Lecture maker, Excel, power point, efficient and competent human resource and adequate provision of material resources, like finance, infrastructure, and power supply will further catapult an effective implementation of ICT for enhanced teaching of Economics in the senior secondary schools in Ekiti State and in Nigeria as a whole.

Since the use of computer packages is clearly a strategy that reflects modern business and industry practices and provides students with a learnable tool for creative thinking and problem solving abilities, it is hoped that if Computer Assisted Instruction is employed as one of the methods for teaching Economics to students in the secondary schools in Ekiti State; the students will improve on their learning and passing the senior secondary school certificate (SSC) Examinations with better grade. They will also be able to contribute their quota to maintain peace and order in the nation as a result of CAI collaborative learning.

5.3 Recommendations

Based on the major findings of this study, the following measures were recommended:

1. Since students taught with Computer Assisted Instruction method perform better than those taught using traditional method of teaching, the use of CAI method in teaching of Economics should be encouraged and imbibed by teachers of Economics in secondary schools in Ekiti State. Emphasis should be placed on the pedagogy behind the use of CAI by teachers of Economics for teaching of Economics and other subjects in the educational system.

2. Material resources are very crucial for an effective implementation of CAI in teaching of Economics in secondary schools. The Federal, State and Local governments and private organizations and other stakeholders in education should provide computers, and other CAI infrastructures in all the secondary schools in Ekiti State so as to encourage teachers and students to apply them in their teaching. Adequate fund should be provided by government both at the Federal and State levels for secondary schools for proper management of available CAI accessories. There should also be alternative power supply like solar power and stand-by generators provided by the school authorities through purchases of power plant to supplement electricity source from the

Power Holding Company, since electricity is a very crucial factor for the proper execution of teaching of Economics using CAI enhanced method.

3. Thirdly, Curriculum planners such as Nigerian Education Research and Development Council (NERDC) should consider review of curriculum for Economics in the senior secondary schools with a view to incorporating the Computer Assisted Instruction (CAI) techniques as against the current practice of out-lining the components of information technology in teaching the subject for more identification.

4. CAI drill and practice is appropriate software to use in teaching of Economics. Hence, more of the software should be made available and handy to students and teachers of Economics by the school authority, respective Ministries of Education, Parent Teachers Association, Petroleum Trust Fund as well as the Alumni of the schools, so that they can be conversant with its application in teaching of Economics.

5.4 Implications of the Findings

The findings of the study have implication for Economics teachers, government and administrators of secondary schools and the curriculum planners.

The findings of this study revealed that Computer Assisted Instruction (CAI) improved students' academic performance in Economics than the use of conventional teaching methods only. The implication of these findings is that students studying Economics will learn better, develop more interest and retain their learning better when Computer Assisted Instruction (CAI) is used as one of the teaching methods for teaching Economics. Also, teaching and learning of Economics is simplified and made interesting, to the extent that students are always keen and willing to attend Economics classes to improve their academic performance.

Also Economics teachers have to adopt the use of Computer Assisted Instruction (CAI) to encourage student-centred learning in Economics classrooms in senior secondary schools in Ekiti State. The teachers should be encouraged to be computer literate and have computers for themselves.

The adoption of the Computer Assisted Instruction (CAI) in teaching Economics requires the development of software and well-equipped computer laboratory for its effective implementation. This implies that school administrators and the government need to constantly make provision for employment of computer programmers who will be working with the teachers who teach Economics in secondary schools in Ekiti State.

The findings of the study will also help the planners of secondary school curriculum by giving them information relating to the teaching and learning of Economics, such as indicating appropriate strategies in modification and revision in Economics curriculum. The study will help curriculum planners to have knowledge of interaction between gender and instructional approach in Economics.

5.5 Limitations of the Study

One major limitation faced by the study was constant power outages which delayed the experiment and completion of the results for the experimental group and this prolonged the period of data collection.

Another limitation is distance, the researcher had to travel from one geo-political zone to another to access the respondents, and this meant that a lot of money was involved. There was also the risk of travelling from one extreme end of the country to the other.

5.6 Suggestions for Further Studies

Future research should continue to investigate:

1. The impact of blending CAI and co-operative learning approaches in specific content areas, with students of different ages and social groups. It is crucial to identify the factors that encourage or discourage co-operation in a CAI environment.

2. There is need to also compare the utilization and impact of CAI and conventional approach in Government and Private own schools.

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Appendix A

Curriculum and Instruction Section,
Department of Educ. Found. & Curr.,
Faculty of Education,
Ahmadu Bello University,
Zaria.

Dear Respondent,

REQUEST TO ANSWER RESEARCH QUESTIONS

I am a Postgraduate student of the above school and department carrying out a research titled: "*Effects of Computer Assisted Instruction (CAI) on Students' Performance in Economics in Senior Secondary Schools in Ekiti State, Nigeria*".

Please I solicit for your support in answering the research questions appropriately. The answers collected through the use of this research instrument shall be treated confidentially and shall be applied only for the purpose of this research work.

Thank you for your anticipated cooperation.

Yours sincerely,

Alasoluyi, Oluwaseyi Emmanuel
M.Ed/Educ/2689/2011-2012
08038121367, 08170583079

Appendix B

LESSON UNITS

Subject: Economics

Lesson topics: Consist of 4 lessons

1. Measures of Central Tendency: types of measures of central tendency;
    a. Mean
    b. Median
    c. Mode
2. Theory of Cost: forms of cost;
    a. Total Cost {TC}
    b. Variable Cost {VC}
    c. Average Cost {AC}
    d. Marginal Cost {MC}
    e. Fixed Cost {FC}
    f. Average Fixed Cost {AFC}
3. Demand: demand schedule
    i. Laws of demand
4. Supply: supply schedule
    i. Laws of supply

LESSON PLANS FOR COMPUTER ASSISTED INSTRUCTION (CAI) STRATEGY

Teacher's guide for computer assisted instruction (CAI) strategy.

Computer-assisted instruction (CAI) is the process by which written and visual information is presented in a logical sequence to a learner through a computer. The student learns by reading the text material presented or by observing the graphic information displayed (Locatis & Atkinson, 1984; Wang & Sleeman, 1993). CAI can be characterized as interactive and individualized learning which focuses on students' needs, abilities and interests with only the teacher as a facilitator of learning. To make lesson computer assisted instruction (CAI) approach, attention must be given to the following aspects;

1. Encourage group activities
2. Use concrete instructional aids.
3. Organize activity based instruction.
4. Allow students interactions through independent work.
5. Encourage asking questions.

Lesson 1

Subject: Economics

Class: SSS II

Duration: 45 minutes

Period: 4^{th}

Average age: Age 14^{+}

Sex: Mixed

Number in Class: 40

Topic: Measures of Central Tendency (Types of Measures of Central Tendency)

Reference Book: (i) Basic Economics for Senior Secondary Schools by Paul Kofi Tawaih

(ii) New System Economics, A Senior Secondary Course by Ewa Udu & G.A Agu.

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

i. explain the meaning of measures of central tendency
ii. identify and explain the three types of measures of central tendency.

Teaching Aid: A computer chart showing tables of measures of central tendency.

Previous Knowledge: The students have been taught about basic economic problems.

Introduction: The teacher starts the lesson by revising the previous topic.

Presentation: Teacher presents the lesson in the following steps.

Step I: The teacher introduce the new topic "measures of central tendency" to the students.

Step II: The teacher explain the meaning of central tendency to the students.

Measures of central tendency is that single value that summarises the mass of data presented in a distribution. It is those means/methods of determining the most typical value of the property in a giving data.

Step III: The teacher explains the three types of measures of central tendency which are mean, median, and mode to the students.

Mean: Arithmetic mean is the values, which each item in a distribution would get if the sum total of all the items in the distribution were equally shared among the items.

The mathematical formula for calculating mean is $X = \frac{\sum X}{N}$

Where: X stands for arithmetic mean

$\sum X$ stands for total sum of item

N stands for the number of items

Example: Given these number---2, 4, 6, 8, 10 as the values of items of a distribution, calculate the mean.

Solution: To get the mean, we sum up the total of the items and then divide by the number of the items. i. e $\frac{(2+4+6+8+10)}{5} = \frac{30}{5} = 6$.

Advantages of Mean

1. It serve as an instrument of comparison
2. It is the most commonly used and reliable measures of central tendency
3. It has a stable value
4. It is the most suitable for further statistical analysis.

Disadvantages of Mean

1. The results could be distributed
2. It is very difficult for it to be located by mere inspection
3. The results can be influenced by unrepresentation values
4. It is difficult to compute when the dates are many.

Median: Is the value or the middle item of a given distribution. In selecting the median, it is pertinent to arrange the items either in ascending or descending order of importance. But where odd numbers exist, the middle number is considered the median. For instance, given these numbers---1, 2, 3, 4, 5. To get the median, the middle number will be taken. Therefore the median of the above is 3. But for even number distribution, the average of the two middle numbers make up the median e. g 1, 3, 3, 4, 5, 6, 7. The median is $\frac{4+5}{2} = 4.5$

Advantages of Median

1. It can be graphically be determined
2. It is easy to calculate
3. It give a balance value of a data
4. It is easily understood and can be used for qualitative data.

Disadvantages of Median

1. The formula sometimes is misleading and not yield a correct result
2. It cannot be easily calculated as exactly as the mean
3. Calculation of median may require re-arrangement of data before a correct result could be achieved
4. It is not suitable for further statistical measures.

Mode: Is the value or number that occurs most frequently in a distribution. That is, it is the most common number e. g. 6, 4, 5, 6, 7, 8. From the distribution, the most frequently occurring number or value is 6.

Advantages

1. It is the most popular value
2. It is simple and easy to compute

Disadvantages

1. It is full of instability
2. It is not an ideal measure of central tendency because it is not based on all observation in the set.

Summary: Teacher summarises the lesson to the student.

Conclusion: The teacher lets the students participate in the lesson by allowing them to ask questions on the topic taught to test their level of uderstanding.

Evaluation: Teacher ask the following questions from the students:

i. What is measures of central tendency?

ii. Identify and explain three types of measures of central tendency.

Assignment: What are the importance of measures of central tendency?

Lesson 2

Subject: Economics

Class: SSS II

Duration: 45 minutes

Period: 4th

Average age: Age 14+

Sex: Mixed

Number in Class: 40

Topic: Theory of Cost (Forms of Cost)

Reference Book: (i) Easy to understand Economics for Schools and Colleges by Olukunmi Ogunbitan. (ii) Indispensable Economics of West Africa for Senior Secondary Schools and Colleges by C.E. Andy.

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

i. explain the meaning of theory of cost
ii. discuss the various forms of theory of cost.

Teaching Aid: A chart and graph showing tables of theory of cost.

Previous Knowledge: The students have learnt on the measures of central tendency.

Introduction: The teacher revises the previous topic with the students.

Presentation: The teacher presents the lesson in the following steps.

Step I: The teacher introduce the new topic to the students.

Step II: The teacher explains the meaning of theory of cost.

The word 'cost' has many meaning in different settings. These differences arise because of differences in view points. The accountant sees cost in terms of money cost. That is to say that, accountants sees cost as the actual amount of money paid for a particular item while the Economists see cost in terms of alternative forgone in order to satisfy the need for a particular item.

Step III: The teacher explains the various forms of cost.

1. **Total Cost (TC):** is the cost incurred in the business production of a given output. TC = FC + VC.
2. **Variable Cost (VC):** This includes the cost of buying raw materials and the cost of labour. It changes with output. That is, as output rises, the variable cost also rises. VC = TC – FC.
3. **Average Cost (AC):** This is the total cost of producing a commodity by a firm divided by the number of units of output. $AC = \frac{TC}{Qty}$
4. **Maeginal Cost (MC):** This is a change in the total cost of production brought about by a unit change in the quantity of output. It is the extra cost of increasing output by one unit

   $MC = \frac{\Delta TC}{\Delta TO}$
5. **Fixed Cost (FC):** Is the cost that does not change with output e.g. cost of machines and building. FC = TC – VC.
6. **Average Fixed Cost (AFC):** this is the fixed cost divided by the output since FC is constant and AFC gives a steady falling value as output increases.

Summary: Teacher summarizes the whole lesson.

Conclusion: The teacher concludes the lesson by allowing students to ask question and copy note for them.

Evaluation: Teacher evaluates the lesson by asking the following questions from the students:

i. What do you understand by the theory of cost?

ii. What are the various forms of cost you know?

Assignment: (a) what is revenue cost? (b) what are the various forms of revenue cost?

Lesson 3

Subject: Economics

Class: SSS II

Duration: 45 minutes

Period: 4th

Average age: Age 14+

Sex: Mixed

Number in Class: 40

Topic: Theory of Demand (Demand and laws of demand)

Reference Book: (i) Easy to understand Economics for Schools and Colleges by Olukunmi Ogunbitan. (ii) Indispensable Economics of West Africa for Senior Secondary Schools and Colleges by C.E. Andy.

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

i. explain the meaning of demand
ii. explain the laws of demand

Instructional Material: A graph showing demand and supply table.

Previous Knowledge: The students have learnt about the theory of cost.

Introduction: The teacher begin the lesson by revising the previous lesson with the students.

Presentation: The lesson is presented in the following steps.

Step I: The teacher introduce the new topic "Theory of Demand" to the students.

Step II: The teacher explains the meaning of demand – demand schedule to the students.

Demand can be defined as the quantity of a commodity that a consumer is willing to buy and able to buy at a given price and at a particular time.

Demand schedule shows the quantity of goods that will be demanded at the same state or level of demand at different prices. It can be compiled for individuals or the entire buyers in the market.

Step III: The teacher explain the laws of demand to the students

The law of demand states the higher the price of a commodity, the lower the quantity demanded and the lower the price the higher the quantity that would be demanded.

The downward sloping of demand curve is based on this law and the reasons are:

i. When the price of a commodity is very high only very few people who are rich enough will be able to afford such a commodity, whereas when the price of such commodity falls, a larger number of people will be able to afford it.

ii. A high price of a commodity will make those addicted to that particular commodity to reduce their level of consumption but when the price falls they will go back to their normal level of consumption and even buyers will come into the market.

Summary: The teacher summarizes the whole lesson with the students.

Conclusion: The teacher lets the students participate in the lesson by allowing them to ask questions on the topic taught to test their level of uderstanding.

Evaluation: Teacher evaluates the lesson by asking the following questions:

i. What is demand?

ii. States the laws of demand.

Assignment: (a) Identify and explain four (4) types of demand.

Lesson 4

Subject: Economics

Class: SSS II

Duration: 45 minutes

Period: 4th

Average age: Age 14+

Sex: Mixed

Number in Class: 40

Topic: Theory of Supply (Supply schedule and laws of supply)

Reference Book: (i) Easy to understand Economics for Schools and Colleges by Olukunmi Ogunbitan. (ii) Indispensable Economics of West Africa for Senior Secondary Schools and Colleges by C.E. Andy.

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

i. explain the meaning of and supply
ii. discuss the supply schedule.
iii. explain the laws of supply

Instructional Material: A graph showing demand and supply table.

Previous Knowledge: The students have learnt about the theory of demand.

Introduction: The teacher begin the lesson by revising the previous lesson with the students.

Presentation: The lesson is presented in the following steps.

Step I: The teacher introduce the new topic "Theory of Supply" to the students.

Step II: The teacher explains the meaning of supply – supply schedule to the students.

Supply can be defined as the quantity of a good or service that producers are willing to offer for sale at a given price and at a given time.

Step III: The teacher explain the laws of supply to the students

The supply schedule is a table that shows the different quantities of goods that a supplier is willing to offer for sale at different prices.

The laws of supply states that, all things being equal, the higher the price, the higher the quantity of a commodity that will be supplied or the lower the price, the lower the quantity of the commodity that will be supplied.

Summary: The teacher summarizes the whole lesson with the students.

Conclusion: The teacher lets the students participate in the lesson by allowing them to ask questions on the topic taught to test their level of uderstanding.

Evaluation: Teacher evaluates the lesson by asking the following questions:

i. What is supply?

ii. Discuss the supply schedule

iii. States the laws of supply.

Assignment: (a) What are the causes of abnormal supply?

LESSON PLAN FOR CONVENTIONAL TEACHING METHOD

Teacher's guide to conventional teaching method

This is a teaching method that is largely one man show with uninvolved audience. Class is usually dominated by lectures or direct instruction focusing on text book materials. Students sit passively and watch the teacher write note on the board and copy what the teacher does, with little room for students to ask questions, make initiatives or independent thought. Attention must be paid to the following:

1. Minimal students' interaction (chalks and talks only)

2. Activities are mostly dominated by the teacher, giving only examples, without using concrete teaching aids.

3. Little opportunity to ask question.

Lesson 1

Subject: Economics

Class: SSS II

Duration: 45 minutes

Period: 4th

Average age: Age 14+

Sex: Mixed

Number in Class: 21

Topic: Measures of Central Tendency (Types of Measures of Central Tendency)

Reference Book: (i) Basic Economics for Senior Secondary Schools by Paul Kofi Tawaih

(ii) New System Economics, A Senior Secondary Course by Ewa Udu & G.A Agu.

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

i. explain the meaning of measures of central tendency

ii. identify and explain the three types of measures of central tendency.

Instructional Material: A chart showing tables of measures of central tendency.

Previous Knowledge: The students have been taught about basic economic problems.

Introduction: The teacher ask questions from the students on the previous topic.

Presentation: The lesson is presented in the following steps.

Step I: The teacher starts the lesson by introducing the new topic "measures of central tendency" to the students.

Step II: The teacher explain the meaning of central tendency to the students.

Measures of central tendency is that single value that summarises the mass of data presented in a distribution. It is those means/methods of determining the most typical value of the property in a giving data.

Step III: The teacher explains the three types of measures of central tendency which are mean, median, and mode to the students.

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The mathematical formula for calculating mean is $X = \frac{\sum X}{N}$

Where: X stands for arithmetic mean

$\sum X$ stands for total sum of item

N stands for the number of items

Example: Given these number---2, 4, 6, 8, 10 as the values of items of a distribution, calculate the mean.

Solution: To get the mean, we sum up the total of the items and then divide by the number of the items. i. e $\frac{(2+4+6+8+10)}{5} = \frac{30}{5} = 6$.

Advantages of Mean

1. It serve as an instrument of comparison

2. It is the most commonly used and reliable measures of central tendency
3. It has a stable value
4. It is the most suitable for further statistical analysis.

Disadvantages of Mean

1. The results could be distributed
2. It is very difficult for it to be located by mere inspection
3. The results can be influenced by unrepresentation values
4. It is difficult to compute when the dates are many.

Median: Is the value or the middle item of a given distribution. In selecting the median, it is pertinent to arrange the items either in ascending or descending order of importance. But where odd numbers exist, the middle number is considered the median. For instance, given these numbers---1, 2, 3, 4, 5. To get the median, the middle number will be taken. Therefore the median of the above is 3. But for even number distribution, the average of the two middle numbers make up the median e. g 1, 3, 3, 4, 5, 6, 7. The median is $\frac{4+5}{2} = 4.5$

Advantages of Median

1. It can be graphically be determined
2. It is easy to calculate
3. It give a balance value of a data
4. It is easily understood and can be used for qualitative data.

Disadvantages of Median

1. The formula sometimes is misleading and not yield a correct result
2. It cannot be easily calculated as exactly as the mean
3. Calculation of median may require re-arrangement of data before a correct result could be achieved
4. It is not suitable for further statistical measures.

Mode: Is the value or number that occurs most frequently in a distribution. That is, it is the most common number e. g. 6, 4, 5, 6, 7, 8. From the distribution, the most frequently occurring number or value is 6.

Advantages

1. It is the most popular value
2. It is simple and easy to compute

Disadvantages

1. It is full of instability
2. It is not an ideal measure of central tendency because it is not based on all observation in the set.

Summary: The teacher summarizes the lesson to the students.

Conclusion: The teacher conclude the lesson by copying note for the students.

Evaluation: Teacher ask the following questions from the students:

i. What is measures of central tendency?

ii. Identify and explain three types of measures of central tendency.

Assignment: What are the importance of measures of central tendency?

Lesson 2

Subject: Economics

Class: SSS II

Duration: 45 minutes

Period: 4^{th}

Average age: Age 14^{+}

Sex: Mixed

Number in Class: 21

Topic: Theory of Cost (Forms of Cost)

Reference Book: (i) Easy to understand Economics for Schools and Colleges by Olukunmi Ogunbitan. (ii) Indispensable Economics of West Africa for Senior Secondary Schools and Colleges by C.E. Andy.

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

i. explain the meaning of theory of cost
ii. discuss the various forms of theory of cost.

Instructional Material: A chart showing tables of theory of cost.

Previous Knowledge: The students have learnt on the measures of central tendency.

Introduction: The teacher starts the lesson by revising the previous lesson with the students.

Presentation: The instructional procedure is presented in the following steps.

Step I: The teacher introduce the new topic "theory of cost" to the students.

Step II: The teacher explains the meaning of theory of cost.

The word 'cost' has many meaning in different settings. These differences arise because of differences in view points. The accountant sees cost in terms of money cost. That is to say that, accountants sees cost as the actual amount of money paid for a particular item while the Economists see cost in terms of alternative forgone in order to satisfy the need for a particular item.

Step III: The teacher explains the various forms of cost.

1. **Total Cost (TC):** is the cost incurred in the business production of a given output. TC = FC + VC.
2. **Variable Cost (VC):** This includes the cost of buying raw materials and the cost of labour. It changes with output. That is, as output rises, the variable cost also rises. VC = TC – FC.
3. **Average Cost (AC):** This is the total cost of producing a commodity by a firm divided by the number of units of output. AC = $\frac{TC}{Qty}$

4. **Maeginal Cost (MC):** This is a change in the total cost of production brought about by a unit change in the quantity of output. It is the extra cost of increasing output by one unit

   $MC = \frac{\Delta TC}{\Delta TO}$

5. **Fixed Cost (FC):** Is the cost that does not change with output e.g. cost of machines and building. FC = TC – VC.
6. **Average Fixed Cost (AFC):** this is the fixed cost divided by the output since FC is constant and AFC gives a steady falling value as output increases.

Summary: The teacher summarizes the whole lesson to the students.

Conclusion: The teacher concludes the lesson by copying note for the students.

Evaluation: Teacher evaluates the lesson by asking the following questions from the students:

i. What do you understand by the theory of cost?

ii. What are the various forms of cost you know?

Assignment: (a) what is revenue cost? (b) what are the various forms of revenue cost?

Lesson 3

Subject: Economics

Class: SSS II

Duration: 45 minutes

Period: 4^{th}

Average age: Age 14^{+}

Sex: Mixed

Number in Class: 21

Topic: Theory of Demand (Demand and laws of demand)

Reference Book: (i) Easy to understand Economics for Schools and Colleges by Olukunmi Ogunbitan. (ii) Indispensable Economics of West Africa for Senior Secondary Schools and Colleges by C.E. Andy.

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

i. explain the meaning of demand

ii. explain the laws of demand and supply

Teaching Aid: A graph showing tables of demand and supply schedule.

Previous Knowledge: The students have been taught the theory of cost.

Introduction: The teacher revises the previous lesson with the students.

Presentation: The teacher presents the lesson in the following steps.

Step I: The teacher starts the lesson by introducing the new topic " Theory of Demand" to the students.

Step II: The teacher explains the meaning of demand – demand schedule to the students.

Demand can be defined as the quantity of a commodity that a consumer is willing to buy and able to buy at a given price and at a particular time.

Demand schedule shows the quantity of goods that will be demanded at the same state or level of demand at different prices. It can be compiled for individuals or the entire buyers in the market.

Step III: The teacher explain the laws of demand to the students

The law of demand states the higher the price of a commodity, the lower the quantity demanded and the lower the price the higher the quantity that would be demanded.

The downward sloping of demand curve is based on this law and the reasons are:

i. When the price of a commodity is very high only very few people who are rich enough will be able to afford such a commodity, whereas when the price of such commodity falls, a larger number of people will be able to afford it.

ii. A high price of a commodity will make those addicted to that particular commodity to reduce their level of consumption but when the price falls they will go back to their normal level of consumption and even buyers will come into the market.

Summary: The teacher summarises the lesson with the students.

Conclusion: The teacher lets the students participate in the lesson by allowing them to ask questions on the topic taught to test their level of uderstanding.

Evaluation: Teacher evaluates the lesson by asking the following questions:

i. What is demand?

ii. States the laws of demand and supply.

Assignment: (a) Identify and explain four (4) types of demand.

Lesson 4

Subject: Economics

Class: SSS II

Duration: 45 minutes

Period: 4th

Average age: Age 14^{+}

Sex: Mixed

Number in Class: 40

Topic: Theory of Supply (Supply schedule and laws of supply)

Reference Book: (i) Easy to understand Economics for Schools and Colleges by Olukunmi Ogunbitan. (ii) Indispensable Economics of West Africa for Senior Secondary Schools and Colleges by C.E. Andy.

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

i. explain the meaning of and supply

ii. discuss the supply schedule.

iii. explain the laws of supply

Instructional Material: A graph showing demand and supply table.

Previous Knowledge: The students have learnt about the theory of demand.

Introduction: The teacher begin the lesson by revising the previous lesson with the students.

Presentation: The lesson is presented in the following steps.

Step I: The teacher introduce the new topic "Theory of Supply" to the students.

Step II: The teacher explains the meaning of supply – supply schedule to the students.

Supply can be defined as the quantity of a good or service that producers are willing to offer for sale at a given price and at a given time.

Step III: The teacher explain the laws of supply to the students

The supply schedule is a table that shows the different quantities of goods that a supplier is willing to offer for sale at different prices.

The laws of supply states that, all things being equal, the higher the price, the higher the quantity of a commodity that will be supplied or the lower the price, the lower the quantity of the commodity that will be supplied.

Summary: The teacher summarizes the whole lesson with the students.

Conclusion: The teacher lets the students participate in the lesson by allowing them to ask questions on the topic taught to test their level of uderstanding.

Evaluation: Teacher evaluates the lesson by asking the following questions:

i. What is supply?

ii. Discuss the supply schedule

iii. States the laws of supply.

Assignment: (a) What are the causes of abnormal supply?

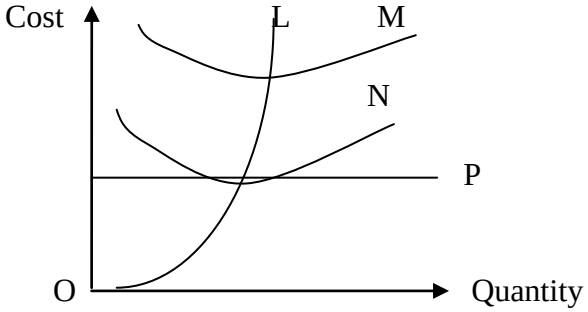
Appendix C

PRE-TEST INSTRUMENT
Economics Performance Test (ECOPET)

Gender: M [ ] F [ ] **Time:** 35 Minutes

Please place a tick (√) against the appropriate answer

1. **Economics is best described as the study of**
   (a) the wealth of Nations (b) how man consumes his products (c) how man provides for his everyday needs (d) the distribution of wealth.
2. **Economists speak about 'opportunity cost' when a consumer**
   (a) has the chance to minimize costs (b) has to forgo one thing in order to have another (c) can equate his fixed costs with his variable costs (d) is able to save part of his income.
3. **The costs which a firm will incur whether it is in production or not, is referred to as**
   (a) average cost (b) variable cost (c) opportunity cost (d) fixed cost.
4. **Which of the curves in the diagram below represents the firm's marginal cost (MC)?**



(a) curve P

(b) curve N

(c) curve M

(d) curve L

5. **If price falls below the equilibrium**
   (a) demand will equal supply (b) demand will be greater than supply (c) supply will be greater than demand (d) price will become indeterminate.
6. **The greatest foreign exchange earner for Nigeria before the advent of petroleum was**
   (a) mining (b) handicraft (c) agriculture (d)manufacturer (e) tourism.
7. **An exceptional demand is one in which the**
   (a) supplier sells all that he takes to the market (b) consumers do not buy from the market (c) quantity demanded falls as price falls (d) purchase of services and not products is considered.

Use the table below to answer question 8 and 9.

Scores (X)	**0**	**2**	**4**	**5**	**6**	**7**	**8**
Frequency (F)	**7**	**11**	**6**	**7**	**7**	**4**	**3**

8. **In the distribution above, the mode is** (a) 2 (b) 3 (c) 4 (d) 5 (e) 6
9. **The median is** (a) 2 (b) 3 (c) 4 (d) 5 (e) 6
10. **The equilibrium price of mangoes is ₦1.00. If the price falls to ₦50k, there will be**

(a) an excess demand (b) excess supply (c) a surplus in the market (d) many sellers in the market.

11. When the demand for a commodity is inelastic, total revenue will fall if

(a) price is increased (b) price is reduced (c) price remains constant (d) price is not given (e) the commodity is a luxury.

12. A normal demand curve (a) is concave to the point of origin (b) is convex to the point of origin (c) is parallel to X axis (d) is parallel to Y axis (e) slopes upwards from left to right.

13. A demand schedule is (a) a table containing the price of goods (b) a table showing the relationship between price and quantity demanded of a commodity (c) a table showing the consumer demand in order of importance (d) the market demand.

14. The equilibrium position of a firm is attained (a) when MC=AR (b) when MC=P (c) when MC=MR (d) when AC=AR (e) when WR=MR.

15. Income elasticity of demand is the measurement of the responsiveness of

(a) price to changes in income (b) quantity demanded to changes in income (c) changes in expenditure to changes in income (d) changes in expenditure to changes in price of the commodity.

16. The price elasticity coefficient indicates (a) how far business can reduce cost (b) the degree of competition (c) the extent to which curve shifts (d) consumer responsiveness to price changes.

17. When price elasticity of supply is equal to 0.4, supply is said to be (a) inelastic (b) elastic (c) unitary elastic (d) public utilities.

18. Given the demand function for commodity XQd=12-2P where Qd is the quantity demanded and P the price of the commodity. Use the demand function to complete the table below.

Price (P)	**6**	**5**	**4**	**3**	**2**	**1**	**0**
Qd							

19. Calculate the mean, median and mode of the following set of numbers:

21, 22, 23, 24, 25, 26, 27, 23, 28, 29, 30, 24, 31, 34, 23.

20. If the monthly income of Mr. Owoeye of Okeoro/Iroko Comprehensive High School, Okeoro, Ekiti increases from N10,000 to N15,000 and increases his level of consumption from N4,000 to N6,000.

You are required to calculate Mr. Owoeye's marginal propensity to consume.

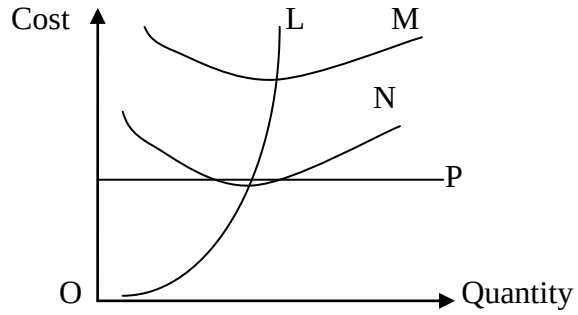
Appendix D

POST-TEST INSTRUMENT
Economics Performance Test (ECOPET)

Gender: M [ ] F [ ] **Time:** 35 Minutes

Please place a tick (√) against the appropriate answer

1. **Economics is best described as the study of**
   (a) the wealth of Nations (b) how man consumes his products (c) how man provides for his everyday needs (d) the distribution of wealth.
2. **Economists speak about 'opportunity cost' when a consumer**
   (a) has the chance to minimize costs (b) has to forgo one thing in order to have another (c) can equate his fixed costs with his variable costs (d) is able to save part of his income.
3. **The costs which a firm will incur whether it is in production or not, is referred to as**
   (a) average cost (b) variable cost (c) opportunity cost (d) fixed cost.
4. **Which of the curves in the diagram below represents the firm's marginal cost (MC)?**



(a) curve P

(b) curve N

(c) curve M

(d) curve L

5. **If price falls below the equilibrium**
   (a) demand will equal supply (b) demand will be greater than supply (c) supply will be greater than demand (d) price will become indeterminate.
6. **The greatest foreign exchange earner for Nigeria before the advent of petroleum was**
   (a) mining (b) handicraft (c) agriculture (d)manufacturer (e) tourism.
7. **An exceptional demand is one in which the**
   (a) supplier sells all that he takes to the market (b) consumers do not buy from the market (c) quantity demanded falls as price falls (d) purchase of services and not products is considered.

Use the table below to answer question 8 and 9.

Scores (X)	**0**	**2**	**4**	**5**	**6**	**7**	**8**
Frequency (F)	**7**	**11**	**6**	**7**	**7**	**4**	**3**

8. **In the distribution above, the mode is** (a) 2 (b) 3 (c) 4 (d) 5 (e) 6
9. **The median is** (a) 2 (b) 3 (c) 4 (d) 5 (e) 6
10. **The equilibrium price of mangoes is ₦1.00. If the price falls to ₦50k, there will be**

(a) an excess demand (b) excess supply (c) a surplus in the market (d) many sellers in the market.

11. **When the demand for a commodity is inelastic, total revenue will fall if**
(a) price is increased (b) price is reduced (c) price remains constant (d) price is not given (e) the commodity is a luxury.
12. **A normal demand curve** (a) is concave to the point of origin (b) is convex to the point of origin (c) is parallel to X axis (d) is parallel to Y axis (e) slopes upwards from left to right.
13. **A demand schedule is** (a) a table containing the price of goods (b) a table showing the relationship between price and quantity demanded of a commodity (c) a table showing the consumer demand in order of importance (d) the market demand.
14. **The equilibrium position of a firm is attained** (a) when MC=AR (b) when MC=P (c) when MC=MR (d) when AC=AR (e) when WR=MR.
15. **Income elasticity of demand is the measurement of the responsiveness of**
(a) price to changes in income (b) quantity demanded to changes in income (c) changes in expenditure to changes in income (d) changes in expenditure to changes in price of the commodity.
16. **The price elasticity coefficient indicates** (a) how far business can reduce cost (b) the degree of competition (c) the extent to which curve shifts (d) consumer responsiveness to price changes.
17. **When price elasticity of supply is equal to 0.4, supply is said to be** (a) inelastic (b) elastic (c) unitary elastic (d) public utilities.
18. Given the demand function for commodity XQd=12-2P where Qd is the quantity demanded and P the price of the commodity. Use the demand function to complete the table below.

Price (P)	**6**	**5**	**4**	**3**	**2**	**1**	**0**
Qd							

19. **Calculate the mean, median and mode of the following set of numbers:**

21, 22, 23, 24, 25, 26, 27, 23, 28, 29, 30, 24, 31, 34, 23.

20. If the monthly income of Mr. Owoeye of Okeoro/Iroko Comprehensive High School, Okeoro, Ekiti increases from N10,000 to N15,000 and increases his level of consumption from N4,000 to N6,000.

You are required to calculate Mr. Owoeye's marginal propensity to consume.

Appendix E

Answers to Economics Performance Test (ECOPET)

1. A	**6. C**	**11. B**	**16. D**
2. B	**7. C**	**12. A**	**17. A**
3. D	**8. A**	**13. B**	
4. D	**9. D**	**14. C**	
5. B	**10. A**	**15. B**	

18. Qd = 12 – 2P **Where P = 6** **Qd = 12 – (2 x 6)** **= 12 – 12** **= 0**	**Where P = 5** **Qd = 12 – (2 x 5)** **= 12 - 10** **= 2**	**Where P = 4** **Qd = 12 – (2 x 4)** **= 12 - 8** **= 4**	**Where P = 3** **Qd = 12 – (2 x 3)** **= 12 - 6** **= 6**
Where P = 2 **Qd = 12 – (2 x 2)** **= 12 – 4** **= 8**	**Where P = 1** **Qd = 12 – (2 x 1)** **= 12 – 2** **= 10**	**Where P = 0** **Qd = 12 – (2 x 0)** **= 12 – 0** **= 12**	

19. After rearrangement we have:

21, 22, 23, 23, 23, 24, 24, 25, 26, 27, 28, 29, 30, 31, 34.

The Mean = $\bar{X} = \frac{\sum X}{N}$

$\bar{X} = \frac{390}{15} = 26$

The Median = 25
The Mode = 23

20. Initial Income per month = ₦10,000.00
New Income per month = ₦15,000.00
Changes in Income (ΔY)
= ₦15,000 - ₦10.000
= ₦5,000

Initial Consumption per month = ₦4,000.00
New Consumption per month = ₦6,000.00
Changes in Consumption (ΔC)
= ₦6,000 - ₦4,000
= ₦2,000

MPC $= \frac{\Delta C}{\Delta Y}$

$= \frac{₦2,000.00}{₦5,000.00} = 0.4$

Appendix F

STUDENTS IN EXPERIMENTAL GROUP IN GOVERNMENT SCIENCE COLLEGE, IYIN-EKITI OBSERVING THE RESEARCHER WHILE INSTALLING COMPUTER ASSISTED INSTRUCTION PACKAGE (CAIP)

STUDENTS IN GOVERNMENT SCIENCE COLLEGE, IYIN-EKITI AND THE RESEARCHER TEST-RUNNING CAI PROGRAMME

MALE & FEMALE STUDENTS IN EXPERIMENTAL GROUP IN GOVERNMENT SCIENCE COLLEGE, IYIN-EKITI VIEWING PROJECTOR

COMPUTER LAB AT GOVERNMENT SCIENCE COLLEGE, IYIN-EKITI.

Students in CAI Drill and Practice in Community High School, Iyemero-Ekiti.

MALE AND FEMALE EXPERIMENTAL GROUP IN COMMUNITY HIGH SCHOOL, IYEMERO-EKITI. UNDER TEACHER'S SUPERVISION.