

**EFFECTS OF INFORMATION AND COMMUNICATION
TECHNOLOGY (ICT) ON SECONDARY SCHOOL STUDENTS'
ECONOMICS PERFORMANCE IN KADUNA STATE**

BY

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Declaration

I hereby declare that this study “Effects of Information and Communication Technology on Secondary Schools Students’ Economics Performance in Kaduna State” was conducted by me in the Department of Educational Foundations and Curriculum under the supervision of Drs. H. O. Yusuf; A. F. Mohammed and S.U. El-Yaqub. This work has never in anyway or means been presented elsewhere for the award of higher degree. All sources of information used for the study were duly acknowledged by references.

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Certification

This dissertation titled, “EFFECTS OF INFORMATION AND COMMUNICATION TECHNOLOGY ON SECONDARY SCHOOLS STUDENTS’ ECONOMICS PERFORMANCE IN KADUNA STATE” by Emmanuel Adeniyi Adeshina meets the regulations governing the award of the degree of Doctor of Philosophy in Education (Curriculum and Instruction) of Ahmadu Bello University, Zaria and is approved for its contribution to knowledge and literally presentation.

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Abstract

The study investigated “Effects of Information and Communication Technology on Secondary Schools Students’ Economics Performance in Kaduna State, Nigeria”. The objectives of this study amongst others sought to investigate the performance of SS2 Economics students taught with the use of CAI and those taught with the conventional method of teaching. Six research questions and hypotheses were drawn from the objectives of the study. The theoretical framework of the study was based on the “Technological Pedagogical and Content Knowledge” (TPACK) theory which strives to capture some essential qualities of knowledge required by teachers for technology integration in their teaching. It also provides better feedback on student academic performance. TPACK emerges from understanding the intersection of content, pedagogy and technology knowledge underlying meaningful and deeply skilled teaching with the use of technology. Areas related to the study such as impact of CAI on students’ academic performance, independent learning skill acquisition, gender and location, were reviewed. Some empirical studies were also reviewed. Research design used was the two by two pre-test post-test quasi experimental control group design. The targeted population was twenty-three thousand, four hundred and sixty Public Senior Secondary two (SS2) school students in twelve educational zones of Kaduna State. A stratified random sampling technique was adopted to draw two hundred SS2 Economics students from the rural and urban centres of two educational zones of the state. Economics Achievement Test (EAT) made up of forty items of multiple choice objectives and ten fill in the blank questions from two topics in Economics were developed and validated as test instrument for data collection. The six research questions were answered using statistical techniques such as: mean and standard deviation while the hypotheses were tested using co-variance and two sample t-test at 0.05 level of significance. The results amongst others revealed that students taught with the use of CAI performed significantly better than those taught without CAI. The result also shows that the use of CAI in teaching Economics is not significantly affected by school location. Three hypotheses were accepted while three were rejected. Based on the findings, it was concluded that school location does not affect the performance of Economics students with the use of CAI. It was therefore recommended amongst others that CAI programme be encouraged as an effective tool for teaching and learning of Economics in schools.

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List of Abbreviations

- i) ADDIE - Analysis, Design, Development, Implementation and Evaluation
- ii) CAI - Computer Assisted Instruction
- iii) CD-ROM - Compact Disk Read Only Memory
- iv) EAT - Economics Achievement Test
- v) e.g. - for example
- vi) e.t.c - etcetera
- vii) ICT - Information and Communication Technology
- viii) i.e - that is
- ix) NECO - National Examinations Council
- x) NGOs - Non-governmental Organizations
- xi) TPACK - Technological Pedagogical Content Knowledge
- xii) viz - namely
- xiii) WASSCE - West African Secondary School Certificate Examination

Operational Definition of Terms

Effect: This concept is referred to as either positive or negative changes brought about by one variable factor on another.

Information and Communication Technology: This is referred to as all electronic/computerize Computer Assisted Instruction facilities used in teaching and learning process, assessing information, storing, disseminating, managing and processing of data.

ICT-Driven Instructional Aids: These refer to all computer electronic devices employed in delivery of lessons by teachers in the classrooms.

Computer Assisted Instruction: This refers to an interactive instructional strategy in which computer electronic devices are used to present lessons and also monitor the learning process.

Academic Performance: This is referred to as the perceived impact of the use of Computer Assisted mode of Instruction on students' performance.

Independent Learning Skills: This refers to the ability of students to manipulate the computer system on their own to perform some learning task assigned/programmed by the teacher.

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

The world of today is characterized by revolutionary advances powered by Information and Communication Technology (ICT). The world is being reduced to a global village through the use of information and communication technology thus, ICT promotes national development and better relationship with other nations. ICT refers to the electronic and communication devices associated with human interactive materials that enable users to employ them for a whole range of teaching and learning process (Cox, Preston and Cox, 1999a). Information Communication Technology is the fusion of two technologies: They are Information Technology (IT) and Communication Technology (CT) (Iwu, 2006). ICT embraces all technologies for manipulative communication of information and also encompasses any medium used to record information such as: radio, television, etc., and technology for communication through voice and sound or images using microphone, camera, loudspeaker, telephone/ mobile phones (Osu, Udosen, and Akpan, 2010). Information and Communication Technologies (ICTs) are indispensable and have been accepted as part of the contemporary world, especially in the industrialized societies to the extent of giving a new phase to the education system in terms of pedagogical approach (Ololube, 2006). According to Fari (2010), information and communication technology facilities are described as all the facilities available for the identification, generation, processing, storage, packaging, preservation, conservation and transfer of information, regardless of time and distance constraints. In other words, Information and Communication Technologies are information handling tools used for producing, storing, processing, distributing and exchanging of information. Today, it is an increasingly powerful tool

for participating in global markets, promoting political accountability, improving the delivery of basic services and enhancing local development opportunities (UNDP, 2006). ICT facilities influence and affect peoples' private and corporate work life in one way or the other. These ICT facilities are all encompassing in areas like technology, socialization, politics, economics and education, for global transformation. Therefore, it becomes pertinent for teachers, who serve as key implementers of the nation's educational policy, to be well-informed and adequately equipped with ICT facilities in order to function productively in this age of information explosion and technological advancement.

The Federal Ministry of Education (2010) identifies the role of ICT policy on education amongst others as:

“The policy provides the needed guidance on what is expected in the entire process of ICT integration in education to all stakeholders in education. Its’ implementation, therefore, should lead to a speedy transformation of the teaching, learning and administration of education. This in turn will foster the production of graduates in the education system that can survive in the contemporary society, sustain national development and compete globally (p.3).

The realization of this policy statement lies basically in the capability of the key implementers of the nation's educational policy i.e. teachers to integrate ICT-Driven instructional aids effectively through Computer Assisted mode of Instruction (CAI) in their day to day classroom activities for effective pedagogy. It is clear that ICT is a world of its own, it has various diversified aspects. The aspect relevant to this study is ICT-Driven Instructional aid basically, the “Computer Assisted mode of Instruction” (CAI). According to Nwike and Chukwudum (2011), Computer Assisted Instruction (CAI) is one of the products of computer technology and it proves to be an effective method of instruction delivery. It is pertinent to note that CAI has a major advantage of individualizing instruction by presenting varied and flexible experiences to the

individual learner and takes care of learners' indifference. It also makes use of guided discovery and inquiry method which ensure the application of effective teaching methods to the learner. It therefore implies that the provision of these ICT-driven Instructional facilities on their own cannot make any impact on the students' academic performance until they are effectively utilized in the teaching and learning process. Okafor (2009), states that in applying the CAI mode of instruction, the computer is fed in sequential manner with what to teach, the steps to be followed, how to evaluate success, how and when other classroom activities are to be carried out. This informs the basis of investigating into the "Effects of the Use of Information and Communication Technology on Secondary School Students' Economics Performance in Kaduna State".

The National Policy on Education states that education is an instrument for effecting national development (FRN, 2004). It makes the incorporation of ICT into teaching-learning process a vital instructional tool in fostering the national educational goals and development. To buttress this, Galenouh, Gordlier and Murphy (2004), opined that, the development and role of ICT in educational sector is believed to set the pace for any form of innovation and changes that can ever happen to any nation. It was asserted by Albirini (2006) that, the winds of change in today's education sector have made information communication technology to be programmed towards meeting the set educational goals.

There are challenges and concerns as a result of knowledge explosion due to the introduction of ICT in almost every field of human endeavour, which calls for an awakening in teaching profession likewise. Teachers need to be conscious of the quality of their teaching which is determined by the quality of teaching aids employed such as charts, model-static, specimen and slides (Sansanwal, 2009). As an information handling tool, ICT can be used in producing, storing, processing, distributing and

exchanging of information. It therefore, implies that ICT could help teachers to be more effective in work-life and resourceful in content management. Hence, these will make teaching tasks to become less cumbersome and productive thereby improving students' academic performance. Basically, the utilization of ICT-Driven instructional aids through CAI is meant to serve as an orientation stimulus to support the teachers' teaching strategies and not to replace them. A paradigm shift from the traditional "chalk and talk" form of teaching to the use of ICT through CAI could make teaching-learning process more real and practical, thereby resulting to better performances of students academically.

Economics as a social science subject was introduced into the Nigerian curriculum in the year 1967 and as at then, only ten (10) candidates registered and later sat for the senior secondary school final year examination (Odusanya, 2001, cited in Yusuf, 2012). Presently, because of the importance of Economics to all aspects of human endeavour, Nigeria has recorded a tremendous increase in the percentage of candidates who register and sit for Economics yearly at both West African Senior Secondary Certificate Examination (WASSCE) and National Examination Council (NECO) levels (Odusanya, 2001, cited in Yusuf, 2012). The West African Examination Council syllabus (2004-2008) states the objectives of teaching Economics as a subject in senior secondary schools as:

- i) understand the basic economics principles, concepts and tools for economic analysis;
- ii) have knowledge of the structure and functions of economic institutions, commercial, industrial and financial;
- iii) understand the basis for rational economic decisions;
- iv) understand and be able to explain the basis and structure of the West African economy, including the roles of agriculture, industry and mining and their contributions to the national income;
- v) ability to follow the roles and status of the West African countries in international economic relationships; and

- vi) appreciate the problems West African countries encounter in their economic development.
(adapted from WASSCE, 2004-2008 syllabus p.176)

The above stated objectives could be achieved in students offering Economics at the end of the three-year course through the use of Computer Assisted Instruction which has such advantages in teaching and learning process. However, this hinges strongly on the ability and capability, as well as the effectiveness of teachers to incorporate teaching strategies such as CAI, which uses ICT-Driven instructional aids in achieving the objectives of lesson at the classroom level. Punie, Zinnbauer and Cabrera (2006), maintained that ICT has not revolutionised teaching methods but rather, the subject content. This implies that Computer Assisted mode of Instruction does not replace the teaching strategies but rather offer supportive devices to enhance content delivery. Reports presented by Chief Examiners WASSCE show that most students who sat for economics between the years 2007-2010 performed at average and below average level at best (see appendix one). According to the reports, factors such as inadequate knowledge of the subject matter, inability to draw and label good diagrams on the part of the students were mentioned. Furthermore, it was observed that the inability of teachers to cover the required syllabus before presenting the candidates for the examinations was amongst many other factors responsible for a declining performance of students. These, could be due to ineffective teaching strategies employed by the teachers and lack of proper understanding of subject content on the part of the students. However, world's leading economic education researchers (for example, Walstad and Soper, 1988; Anderson, 1992; Becker, 2000), have questioned the aims and effectiveness of teaching economics in recent years due to lack of content knowledge and skills among the graduates and more-so their inability to perform effectively in

workplaces have raised deep concerns among parents, teachers, business, communities, teacher educators, researchers, etc.

The benefits of ICT as an important tool in teaching and learning of wide range of topics in Economics such as; statistics, measures of central tendency and national income could enable them understand and learn the subject better. According to Walstad (2001), little attention has been given to the improvement of teaching and learning of economics in recent decades. He further stated that passive learning based on the traditional form of “chalk and talk” has widely characterized the 20th century style of teaching Economics in the Maldives in Asia. According to Jephcote (2004), the teaching of economics as a school subject as well as how it is being learnt has been very much under-researched in many parts of the world. In like manner, Jegede (2002), noted that society is too slow in its approach to take-up ICT usage despite its’ enormous advantages. This in-turn could pose a threat to development of a nation like Nigeria, having education as the instrument “par excellence” for effecting national development. Therefore, if Nigeria will meet up with the global technological advancement through the use of ICT, then, education must be given utmost priority and teacher education must be its guiding principle since no nation can rise above the standard of her teachers (FRN, 2004). The Federal Ministry of Education (2010) has mandated the integration of ICT in education for speedy transformation of teaching, learning and administration of education as a positive step in the right direction. Therefore, it becomes pertinent that a study on the “Effects of ICT on Secondary School Students’ Economics Performance in Kaduna State” be conducted to ascertain its impact on the learners.

1.2 Statement of the Problem

The pattern of teaching and learning process today is expected to shift from the conventional method to a more dynamic and flexible one, which is learner-centred (Ezekoka and Okoli, 2012). This learner-centred approach makes students to influence the content, activities, materials and pace of learning, which places them in the centre of the learning process and enhances independent learning (Collins and O'Brien, 2003). However, despite the glaring relevance of ICT in education, coupled with the huge capital investment of both Federal and State governments through ICT driven project known as "school net" Adomi, (2006) and Okebukola (2004) and donations from Non-Governmental Organizations to Secondary schools in Nigeria, some teachers are still reluctant, ineffective and unproductive in using ICT facilities to improve students' academic performance, especially in Economics. Beetheng and Sim (2008) asserted that, there is still a long way to go before secondary school teachers in developing countries like Nigeria will be able to take advantage of the opportunity provided by the 21st century technology and this was substantiated by Adomi (2010) who reported that 75percent of teachers in Nigerian secondary schools have little or no experience regarding ICT in education.

One of the objectives of teaching Economics is to produce graduates that possess knowledge in basic Economic concepts that can make them function in their own country. It is also to bring about national development and to be able to use ICT knowledge to solve Economic problems in other countries. However, the WASSCE candidates' performance in Economics as reported by the chief examiners (see appendix one) revealed that these objectives are not yet achieved due to inadequate knowledge of the subject matter, inability of the candidates to draw and label diagrams, construct graphs as well as solve simple calculations in mathematical aspects of Economics, resulting to a declining academic performance. These problems as perceived could be as

a result of the teaching strategies adopted on the part of the teachers. Employing the use of ICT-Driven Instructional aids through the Computer Assisted Instruction designed for teaching some aspects of topics in Economics syllabus might be of great benefit in alleviating such perceived problems. Also, observed from the examiners' report is the inability of the Economics teachers to cover every aspect of the Economics syllabus before presenting their students for WASSCE. This might be due to some observed limitations of the traditional "chalk and talk" system of teaching which is more of a teacher-centred approach than learners-centred as practised in some schools today, thereby affecting students' performance at various examinations. The information technological age offers ICT instructional strategies such as CAI designed to make teaching and learning faster, easier, immediate, effective, efficient, individualize and takes care of learners' individual differences regardless of their gender and location. These identified problems therefore, have informed the need to conduct a study on the "Effects of ICT on Secondary Schools Students' Economics Performance in Kaduna State".

1.3 Objectives of the Study

The objectives of this study in specific terms are to achieve the following:

1. To determine the effect whether SS2 students taught Economics with the use of Computer Assisted Instruction will perform better than those taught without Computer Assisted Instruction;
2. To determine the effect on speed of solving questions in Economics amongst SS2 students taught with the use of Computer Assisted Instruction and those taught without Computer Assisted Instruction;

3. To ascertain the effect on the rate at which independent learning skills acquisition will be enhanced amongst SS2 students taught Economics with the use of Computer Assisted Instruction and those taught without Computer Assisted Instruction;
4. To determine the effect of the use of Computer Assisted Instruction on gender mean performance scores amongst SS2 students in Economics;
5. To investigate the effect of the use of Computer Assisted Instruction on the mean performance scores between rural and urban SS2 students in Economics; and
6. To find out the effect of the use of Computer Assisted Instruction on the rate of acquiring independent learning skill between male and female SS2 students in Economics.

1.4 Research Questions

This study intended to find answers to the following research questions:

1. What is the effect on the performance of SS2 students taught Economics with the use of Computer Assisted Instruction and those taught without the Computer Assisted Instruction?
2. What is the effect on the speed of solving questions in Economics amongst SS2 students taught with the use of Computer Assisted Instruction and those taught without Computer Assisted Instruction?
3. What is the effect on the rate of independent learning skill acquisition between SS2 Economics students taught with the use of Computer Assisted Instruction and those taught without Computer Assisted Instruction?

4. To what extent is the effects of the use of Computer Assisted Instruction on gender mean performance scores of SS2 students in Economics?
5. What is the effect on the mean performance scores between rural and urban SS2 students taught Economics with the use of Computer Assisted Instruction?
6. Is there any effect of the use of Computer Assisted Instruction on the rate of acquiring independent learning skill between male and female SS2 students in Economics?

1.5 Hypotheses

The following hypotheses were formulated to guide the study:

- HO₁ There is no significant difference between the performance of SS2 Economics students taught with the use of Computer Assisted Instruction and those taught without Computer Assisted Instruction.
- HO₂ There is no significant difference in speed of solving questions in Economics between SS2 students taught with the use of Computer Assisted Instruction and those taught without Computer Assisted Instruction.
- HO₃ There is no significant difference in the rate of independent learning skill acquisition between SS2 students taught Economics with the use of Computer Assisted Instruction and those taught without Computer Assisted Instruction.
- HO₄ There is no significant difference between gender and the mean performance scores of SS2 students taught Economics with the use of Computer Assisted Instruction.

HO₅ There is no significant difference between the mean performance scores of rural and urban students taught Economics with the use of Computer Assisted Instruction.

HO₆ There is no significant difference between male and female SS2 students' rate of acquiring independent learning skill in Economics with the use of Computer Assisted Instruction.

1.6 Basic Assumptions

The researcher based the study on the following assumptions:

- 1 SS2 Economics students taught Economics with the use of Computer Assisted Instruction will perform better than those taught without Computer Assisted Instruction.
- 2 Use of Computer Assisted Instruction by Economics teachers will enhance the speed of solving questions in Economics by SS2 students.
- 3 Use of Computer Assisted Instruction by Economics teachers will enhance the rate of acquiring independent learning skills amongst SS2 Economics students.
- 4 Use of Computer Assisted Instruction will have the same effect on gender mean performance scores of SS2 students in Economics.
- 5 Use of Computer Assisted Instruction will have the same effect on the mean performance scores of SS2 students taught Economics in rural and urban location.
- 6 Use of Computer Assisted mode of Instruction by Economics teachers will have the same effect on male and female SS2 students' rate of acquiring independent learning skills in Economics.

1.7 Significance of the Study

The importance of this study cuts across several levels of the nations' educational system, ranging from the policy makers, stakeholders down to the major beneficiaries who are the students. The significance are carefully enumerated as follows:

The study will help the National Information Technology Development Agency (NITDA) to measure the level of success of its organization. Likewise, the study hopes to help view possible factors hindering the effective implementation of ICT policy in education especially in secondary schools, with the aim of solving them and improving students' academic performance. In fact, the study may draw the attention of NITDA to see possible areas that will demand review in the ICT policy to meet the current trend in the global market of information technology.

This study will hopefully make the Federal, States and Education Authorities to know the extent to which ICT facilities are available in secondary schools for teaching and learning process as well as know the level of usage/utilization of these facilities by teachers and students for effective teaching-learning process. More so, it is hoped that the study will bring out areas of inadequacies of the Computer Assisted mode of Instruction in secondary schools with the hope that the authorities will help them to overcome challenges to increase learning amongst students.

Examination bodies such as WAEC, NECO, NABTEB and JAMB will also benefit from this study because, if the teachers in secondary schools become effective and efficient in the use of Computer Assisted mode of Instruction, the performance of candidates sitting for these examinations will improve. In addition, the more the teachers in secondary schools become more effective in using Computer Assisted mode of Instruction, the more the students acquire the skills which will be of importance to the examination bodies in facilitating a successful online registration, examination and

checking of results, a system currently adopted for JAMB candidates and later may be implemented by WAEC, NECO and NABTEB.

Head teachers, principals or school administrators are expected to have maximum benefits from this study because it is targeted towards knowing how the use of Computer Assisted Instruction will enhance students' academic performance. This will help them to see the importance of Computer Assisted mode of Instruction and its relevance to effective and functional classroom teaching exercise for better performances of their students academically and this will in turn boost the image of the school in the community. More so, the study will make school administrators to see the need for continuous training of their teachers who are ICT literate and train those who are not for better service delivery.

Teachers will find this study helpful in so many ways. Specifically, some teachers who are reluctant to embrace this innovation or illiterate in the use and knowledge of ICT will see the need for it, if they want to remain relevant in the teaching profession and also ensure the success of their students academically. In addition, teachers who are faced with the problem of overcrowded classrooms can be supported with Computer Assisted mode of Instruction to carry out their teaching effectively without much ado. In fact, this study will be an eye opener and image booster for teachers if they adopt this instructional strategy because lessons can be planned and be taught without the teacher being necessarily present all-through in the classroom. More so, it has an added advantage of reducing the burden of teachers to more or less a facilitator in the classroom.

Students, especially those offering economics as a subject in schools who have been exposed to Computer Assisted mode of Instruction will learn how to independently explore information in economics and this will in turn increase their

skills and performance in examinations. Learning becomes easier, real and concrete for students when teachers use Computer Assisted mode of instruction to teach. Students on their own part who have knowledge of ICT can engage in individualized learning at home for better understanding of concepts.

The NGOs and philanthropic organizations who are interested in educational advancement of the nation will see possible areas that require ICT facilities in schools and the need for their support and donations.

Most interestingly, the curriculum planners will benefit from the study because some aspects of the economics curriculum which are out-dated will require a review and new methodology may be adopted in pedagogy such as incorporating/integrating the use of Computer Assisted mode of Instruction to meet present global best practice.

It is hoped that scholars and future researchers carrying out studies in the field of ICT/ teaching and learning economics or in related areas will find this work useful and the findings will increase the contribution to the body of knowledge by taking up research work on some suggested areas recommended for future studies towards the nation's development at large.

1.8 Scope of the Study

The study is limited to the investigation of the “Effects of ICT on Secondary Schools Students’ Economics Performance in Kaduna State”. The researcher hopes to carry out an in-depth study basically on how Computer Assisted Instruction have enhanced the Performance of Students in Economics in Senior Secondary Schools (SS2) in Kaduna State. The study hopes to cover all Students in Public Senior Secondary Schools (SS2) in Kaduna State.

However, the study is delimited to Senior Secondary Schools (SS2), offering Economics as a subject in Kaduna State. Likewise, it is delimited to only those public schools that have Computer Assisted Instruction facilities such as computer systems, CD-ROMs, projectors, video- cassette player and electronic white board.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

2.1 Introduction

This chapter deals with the works of several authors who in one way or the other relates to the Effects of the Use of ICT on Secondary Schools Students' Economics Performance in Kaduna State. In specific terms, the chapter deals with the following amongst others:

- Theoretical frameworks
- The TPACK theory
- Concept of ICT
- Objectives of ICT in Education
- Integrating of ICT into Education system
- Concept of Computer Assisted Instruction
- Characteristics of CAI
- Steps of Developing a CAI package for lesson
- Types of CAI devices used in teaching and learning

- Comparison between convention mode of teaching and CAI
- Impact of CAI on Independent learning
- Impact of ICT on students' academic performance
- Impact of CAI on gender
- Impact of CAI on skill acquisition
- Impact of CAI on school location
- An overview of Economics Subject
- Challenges of teachers and students in teaching and learning Economics
- Empirical studies
- Summary

2.2 Theoretical Framework

This study shall consider two (2) main theories: the Sensory Stimulation theory and the Technological Pedagogical and Content Knowledge theory which will be discussed below.

2.2.1 The Sensory Stimulation Theory

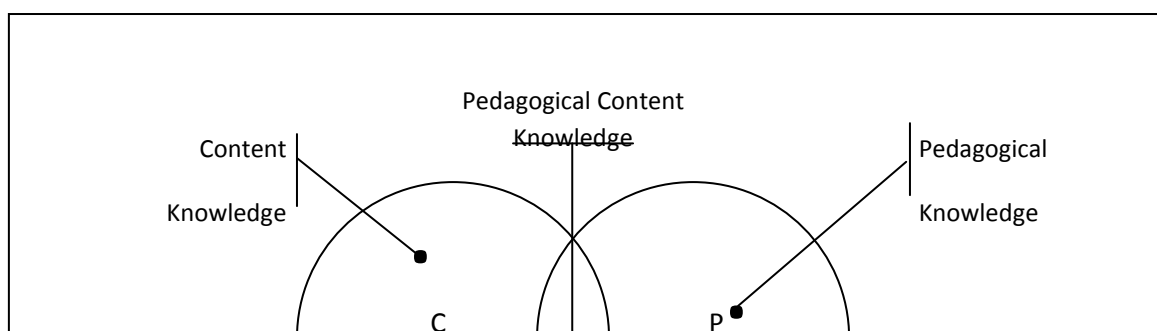
This study will infer the sensory stimulation theory (SST) of learning, which has its basic premise on the fact that effective learning occurs when the senses are stimulated. According to Laird (1985) in Savic (2012), the SST theory states that by stimulating the senses, especially the visual sense, learning can be enhanced. However, this theory states that if multi-senses are stimulated, greater learning takes place. Stimulation through the senses is achieved through a greater variety of colours, volume levels, strong statements, facts presented visually, use of a variety of techniques and media. This theory has relevance to some extent with the present study, which seeks to investigate the "effects of ICT on the performance of SS2 students in Economics". ICT instructional aids such as: Television, Video Machines, Computers disc, Projectors, etc., help to stimulate senses by attracting the attention of the students in the classroom

teaching-learning process to learn. However, this theory will not be best appropriate to the study due to the fact that it has much relevance to enhancing learning situation on the part of the students more than on the part of both teachers and students involved in teaching-learning process. The effective use/utilization of electronic media and other instructional materials in the classroom by the teachers is also a major factor contributing towards achieving the stated lesson objective, hence simulation theory might not be too appropriate to be considered since the study has to do with “Effects of ICT on Secondary Schools Students’ Economics Performance in Kaduna State”.

2.2.2 The Technological Pedagogical and Content Knowledge Theory

This study shall therefore, be based on the theory of “Technological Pedagogical and Content Knowledge” (TPACK) developed by Mishra and Koehler (2006). The TPACK framework strives to capture some of the essential qualities of knowledge required by teachers for technology integration in their teaching, while addressing the complex multifaceted and situated nature of teacher’s knowledge (Mishra and Koehler, 2006). Researchers argued that computers alone do not make the difference in teaching, rather, the difference is made by the pedagogical methods the teachers use when instructing with computer technologies (Clark, 2001). Therefore, TPACK provides a better feedback for integrating technology in classroom teaching and learning process than the Sensory Stimulation Theory (SST) which has some limitations as stated above. The TPACK diagram is shown below:

2.2.2.1 The TPACK Theory Diagram



The TPACK Model (Koehler & Mishra, 2006)

Technological Pedagogical and Content Knowledge (TPACK) emerged from understanding the interaction of content, pedagogy and technology knowledge, underlying true meaningful and deeply skilled teaching with technology. TPACK is the basis of effective teaching with technology and requires an understanding of the representation of concepts using technologies, pedagogical techniques that use technology in constructive ways to teach content; knowledge of what makes concepts difficult or easy to learn and how technology can help redress some of the problems that students face, such as students' prior knowledge (Koehler and Mishra, 2006).

In line with this study specifically, "Effects of ICT on Secondary Schools Students' Economics Performance in Kaduna State" the TPACK theory will be adopted because of its systematic approach to joining technical expertise in teaching with pedagogical content knowledge. Hence, it's an emergent model resulting from the intersection of technology, pedagogy and content. Schmidt (2009) is an advocate of TPACK theory who sees it as the knowledge required by the teacher for integrating technology into their teaching subject area. The theory can be used to solve the problem of ineffective use of ICT in teaching and learning process, especially in situation whereby teachers

lack adequate content knowledge of teaching strategies. The technological aspects are systematically considered in the following ways:

1. Technology Knowledge (TK): understanding technology in a specific subject or discipline;
2. Technological Pedagogical Knowledge (TPK): understanding how technology can shape the ways of teaching;
3. Technological Pedagogical And Content Knowledge (TPACK).

This theory further emphasizes on not only the usage of ICT facilities in teaching and learning but also on teachers employing the adequate pedagogical strategies when using the computer. The TPACK theory identifies with teachers acquiring the content knowledge of the technology employed in teaching and hence, using ICT in teaching and learning subjects like Economics that have broad contents as observed in the WAEC examiners' report. This was advanced as the reason for the failure in Economics examination. Teachers are not able to cover the required syllabus adequately before presenting candidates for final examinations. Furthermore, the effectiveness of teachers in the use of Computer Assisted mode of Instruction according to the TPACK theory will depend on the content knowledge of the technology the teacher wants to use in teaching which will reflect in the student's ability to understand the lesson vis-a-viz their academic performance. Therefore, the theory postulates on the effective teaching and learning process through using technology as supporting aids. Harris (2008), another advocate of TPACK theory supported the view that TPACK-related professional development for teachers would promote both autonomous and collaborative instructional strategy that is required for each topic decision-making while simultaneously encouraging open-mindedness and active involvement of the learners considering the instructional methods, tools, and resources. This becomes important to

the study that seeks to find out how ICT will enhance individual learning amongst economics students.

According to Shulman (1987) the conceptualization of teacher's knowledge was the synergy between content and pedagogical knowledge, or otherwise called pedagogical content knowledge which he argued was the heart of teaching as stated below:

The key to distinguishing knowledge based teaching lies at the intersection of content and pedagogy, is the capacity of a teacher to transform the content knowledge he or she possesses into forms that are pedagogically powerful and yet adaptive to the variations in ability and background presented by the students. (p.15)

Content otherwise referred to as subject matter knowledge is the depth and breadth of knowledge in specific subject area. For example, Economics teachers are knowledgeable in some Economics concepts taught at Senior Secondary two (2) level such as: The Theory of Production; The Theory of Cost and Revenue, etc. The content knowledge of teachers makes them to be experienced in their discipline and keep them abreast of modern trends through the use of ICT-driven facilities for seeking more information. Therefore, the TPACK theory is based on adequate content knowledge of subjects and effective utilization of ICT facilities by teachers during teaching-learning process to improve the academic performance of students. This content is the information that is programmed into an electronic device through the use of devices like; CD-Rom, slides, films, flash-drives, video-cassettes, audio cassettes, etc. Lessons can be presented logically by playing these devices through the use of electronic machines like the computer and projector to support active teaching-learning process in the classroom.

Pedagogical knowledge is that skill required by the teacher that spans through content areas (i.e. formative assessment, classroom management and motivation

strategy) for a successful teaching-learning process in the classroom (Doering, Valetsianos, Scharber and Miller, 2009). Teachers make pedagogical decisions about teaching and learning based on the objectives of their lesson. For instance, teachers make use of curriculum, syllabus and lesson plan in the planning and teaching of a particular topic in Economics. Pedagogical knowledge here spans through the objectives of the lesson, entry behaviour, presentation, evaluation and other activities that takes place in the classroom. These constitute the major factors in determining the successful planning, effective delivery and evaluation of a lesson in the classroom thereby enhancing students' academic performance.

However, Mishra and Koehler (2006) built on Shulman's conceptualization by including the third component to the teacher pedagogical content knowledge i.e. technological knowledge. They introduced the union of three (3) different types of knowledge as a representative of what teachers need to know coining the combined framework "Technological Pedagogical Content Knowledge". Hence, TPACK is the basis of effective teaching with technology and therefore, requires an understanding of the representation of concepts, using technologies in constructive ways to teach content. This view relates to the study because it seeks to determine the effects of using ICT on the performance of students in Economics, thereby resulting to skill acquisition, enhancing performance and independent learning of Economics amongst SS2 students.

2.3 The Concept of Information and Communication Technology (ICT)

Information and Communication Technology (ICT) combines three comparative complementary concepts - which describe its desired meaning and area of coverage. Information is a message that is transmitted and received in the process of communication and these messages, ideas or feelings are shared by both the receiver

and sender at the same time. Communication refers to any process in which people share the same information, ideas and feelings. It involves spoken and written words, body language, personal mannerisms and style (Okorie, 2010). Technology refers to the systematic application of the tools and art. In practice, communication cannot be effective if information is not accurately received by the target audience, the passage of information cannot be complete without the instruments of communication and feedback. Technology makes communication easier, faster and more effective. Today, information and communication technology uses a combination of computer, telecommunication, and information systems services and products. Hence, communication serves as a connection- link between the teacher and the learners for effective pedagogy to take place in the classroom.

There are diverse meanings to ICT by different people depending on the context of its usage. Definition of ICT by some scholars differs:

According to Uzoigwe (2001), ICT involves all technologies employed in order to facilitate the collection, storage, retrieval and communication of information by the fastest means.

Anderson and Glen (2003) defined ICT as generally related to those technologies that are used for accessing, gathering, manipulating, and presenting or communicating information. The technologies could include hardware (e.g. computers and other devices); software applications; and connectivity (e.g. access to the internet, local networking infrastructure, video- conferencing).

Information and Communication Technology, according to Oloruntegbe (2006), can be viewed in the following perspectives:

- As an object, what is learnt is dependent on the type of education and the level of learners. Objects include computer and accessories, internet access, satellite, on line-self learning packages, etc.
- As an assisting tool: ICT here can be used to support teaching in content and methodology. It can equally be used to conduct research, collect data and communicate.
- As a medium of teaching and learning: teachers can teach and equally learners can learn drills, simulations and educational networks.
- As tool for organization and management. This relates to ICT being used to handle school records like time tabling, attendance register, fees collection, and examination registration and examination results.

According to Onuagha (2006), computer is an electronic technology device that accepts data and information (input), processes data according to instruction given by the user, search information use for teaching in the classroom, display the result in the way the user will understand and store the information.

World Bank (2002) in Adokiye (2008) defined the concept of ICT as consisting of hardware, software, networks and media for collection, storage, processing, transmission and presentation of information (voice, data, text and images) for use by means of electronic devices.

According to Alazliner and Kamaruzman (2009) ICT is the application of science in information handling. It is assumed that the use of conceptualized information technology in instructional delivery will enhance effective teaching-learning process to take place.

Bakac and Akbay (2011) describe information and communication technology as all types of technology that facilitate communication and the processing and transmission of information by electronic means (radio, television, telephone, computers, CD-Roms and the internet).

Hence, information communication technology can be defined in this study as a world of electronic and communication device that accepts data and information, creates, processes, stores, retrieves and disseminates them through internal and external networks technology.

From the various definitions of authors above, it is clear that ICT is an indispensable tool that needs to be integrated by every classroom teacher into the teaching and learning process for efficient and effective service delivery and attaining best global practices.

2.4 Information and Communication Technology in Education

The education system today has found the place of integrating ICT into every stage of pedagogy in the school system. ICT when applied to education, enhances the delivery and access to knowledge, improves the breadth and scope of the curriculum, increases learning rates, encourages critical thinking and offers unlimited means of achieving educational goals (Iloanusi and Osagwu, 2009). The Federal Ministry of Education (2010) states the place of ICT in achieving the national educational goals as:

“The policy provides the needed guidance on what is expected in the entire process of ICT integration in education to all stakeholders in education. Its’ implementation therefore should lead to a speedy transformation of the teaching, learning and administration of education. This in turn will foster the production of graduates in the education system that can survive in the contemporary society, sustain national development and can compete globally (p.3).

The above policy statement poses challenges to the nations’ education system and her stakeholders if ICT-driven instructional mode of learning will be successfully integrated into the school system for quality service delivery. This will help in

producing the crop of graduates that will meet up the technological advancement needed globally for national development. Education is seen as the bedrock for any sustainable national development, therefore, it behoves that ICT is the horse that education must ride on to meet up global transformation, especially for the developing nations like Nigeria.

The increase in the trend of use of ICT in classroom work across the globe has been necessitated by three major factors and they are:

- Electronic technological devices are being used to prepare the present generation of young people for a future work place that will undoubtedly be characterized by information technology (IT). Preparing students in economics for future economic and national development of the country that can be done through the use of ICT tools, electronic conferencing programmes, the web, spread sheets, database etc. which when adopted will enhance students' critical thinking.
- ICT tools make schools more efficient in the teaching-learning enterprise, classroom teachers' personal professional development and academic productivity will be greatly enhanced.
- ICT tools are being used to improve reform or renovate teaching and learning. Learners are stimulated to learn actively either on an independent basis or working closely with others (Olorundare, 2007).

2.4.1 Integrating ICT into the Education System

In order to gain access into the school system, Tinio (2002) observed that ICTs can expand access to education in the following ways:

- **Anytime, anywhere:** One defining feature of ICTs is the ability to transcend time and space. ICTs make possible and asynchronous learning or learning

characterized by a time lag between the delivery of instruction and reception by learners. Online course materials, for example, may be accessed 24hours a day, 7days a week. ICT-based educational delivery (e.g. educational programing broadcast over radio or television) also dispenses with the need for all learners and the instructor to be in one physical location. Additionally, certain types of ICTs, such as teleconferencing technologies enable instruction to be received simultaneously by multiple geographically dispersed learners (i.e. synchronous learning).

- **Access to remote learning resources:** Teachers and learners no longer rely solely on printed books and other materials in physical media housed in libraries and available in limited quantities for their educational needs, due to the internet and the world wide web, a wealth of learning materials in almost every subject and in variety of media can now be accessed from anywhere or at any time of the day with unlimited number of people. This is particularly significant for many schools in developing countries, and even some in developed countries that have limited and out dated library resources. ICTs also facilitate access to resource persons, mentors, experts, researchers, professionals, business leaders, and peer all over the world.
- **Improving the quality of education and training:** This is a critical issue, particularly at a set time of educational expansion. ICTs can enhance the quality of education in several ways: By increasing learners' motivation and engagement; by facilitating acquisition of basic skills, and by enhancing teacher training (Haddad and Jurich, 2002). ICTs are also transformational tools which when used appropriately can promote the shift to a learner-centred environment.

- **Motivating to learn:** ICTs such as videos, television and multimedia computer software that combined text, sound and colourful, moving images can be used to provide challenging and authentic content that will engage the student in the learning process. Interactive radio likewise makes use of sound effect, songs, dramatization, comic skits, and other performance convention to compel the student to listen and become involved in the lessons delivered. More so that any type of ICT networked computers with internet connectivity can increase learner motivation as it combines the media richness and interactivity of other ICTs with the opportunity to connect with real people and to participate in real world event.
- **Enhancing teacher training:** ICTs have also been used to improve access to and quality of teacher training. For example in China, large scale radio and television based teacher education for many years have been conducted by the China Central Radio and Television University, the Shanghai radio and TV University in the country (Carnoy, 2002 in Tinio, 2002).

With the above advantages, it could be said that the place of ICT becomes imperative to current trends in the teaching-learning process in the school system because it offers divers ways for people to access quality education conveniently towards achieving national educational objectives.

2.4.2 Objectives of ICT in Education

The Federal Ministry of Education (2010) states the objectives in the long term vision of ensuring equal access to quality basic education for all citizens and to integrate Nigeria into the knowledge based economy. The objectives amongst others include to:

- Provide access to ICT for all teachers and learners.

- Promote education for all through usage of all types of electronic media.
- Emphasize the role of ICT as a tool for teaching and learning.
- Use ICT to increase efficiency and effectiveness of the school system.

According to Manjulika and Reddy (2002), access to ICT varies enormously from country to country. This is particularly evident when comparing developed and developing countries- showing a stark digital difference. In view of actualizing these objectives, there is need for adequate funding and provision of material resources required in every school system for effective teaching and learning process by the government, private donors and Non-Governmental Organizations (NGO's) due to the capital intensive implications involved. Furthermore, Onwumere (2012) stated the need for teachers to become more effective and competent in service delivery in the following areas:

- Critical thinking
- Broad competencies
- ICT competencies to enable expert work
- Decision making
- Handling of dynamic situations
- Working as a member of team
- Communication efficiency

By possessing these qualities, teachers will be functional and they will be kept abreast with information regarding their subject matter. However, Ike (2009) study observed that the students seem to be more computer literate than their teachers who are found wanting when they are neither computer literate nor conversant with its utilization to improve the teaching and learning situation. To develop the above skills and competencies in the teachers, there is need for the ICT-Driven facilities to be

provided in an enabling school environment and in-house training or workshop should be organized for teachers by the school management.

2.5 The Approaches of Integrating ICT into Education System

UNESCO (2002) report identified about four main approaches through which educational systems and individual schools can advance their adoption and use of ICT-Driven facilities. Consequently, Jonathan and Tom (2002) in Mohammed (2012), also state that these are the approaches through which educational systems and individual schools may proceed in integrating the use of ICT-Driven Instructional aids in classroom teaching-learning process. Iloanusi and Osagwu (2009) state the four approaches/phases of ICT integration in Nigeria as: emerging phase; applying phase; infusion phase and lastly the transformation phase. The stages are:

Emerging → Application → Infusing → Transforming

The Emerging Approach: This is the beginning level which the school demonstrates the approach through buying or receiving computers donated with software, while the administrators and teachers begin to explore the possibilities and consequences of using ICT facilities for school management and including it in the curriculum. The traditional teacher-centred method is very much common in such schools at this level.

The Application Approach: This is the stage at which the school where the new ICT facilities is to be applied to the teaching- learning process. Here, the administrators and teachers use ICT facilities for tasks ready to be carried out in the school management and in the curriculum and hence, teachers largely dominate the learning environment at this level. Schools within this stage, adapt the curriculum so as to increase the use of ICT facilities in various subject areas with specific tools and software.

The Infusing Approach: This approach involves bringing together or integrating ICT facilities across the curriculum and is seen in those schools that now employ and arrange computer-base technologies in laboratories, classrooms and administrative offices. Educationists explore new ways in which ICT facilities change their personal productivity and professional practice. This curriculum begins to merge subject areas to reflect present global views at this level.

The Transforming Approach: Schools at the transforming stage are those that use ICT facilities to rethink and renew the school organization in creative ways. ICT facilities become an integral, though invisible part of daily personal productivity and professional practice. The focus of the curriculum is now learner-centred and integrates subject areas in real world situation.

Illaonusi and Osagwu (2009) claimed that 90% of Nigeria's educational institutions fall within emerging phase, 7% in applying phase, just only 3% are in the infusion and transformation phase, hence, only few sectors of the economy have gone beyond this phase. This may suggest that a good number of schools are at the verge of considering the integration of ICT- Driven Instructional Aids in their pedagogical approach.

2.5.1 Stages of Teaching and Learning Using ICT Tools

Teaching and learning processes are interrelated and inter-connected to each other; therefore it becomes necessary to understand the process of effective integration of ICT tools into teaching-learning situation. Onwumere (2012), reveals that studies carried out on teaching and learning have shown that there are four (4) major stages in which teachers and students teach and learn about as well as gain confidence in the use

of ICT tools. These include: discovering, learning how, understanding how and when and specializing in the use of ICT tools.

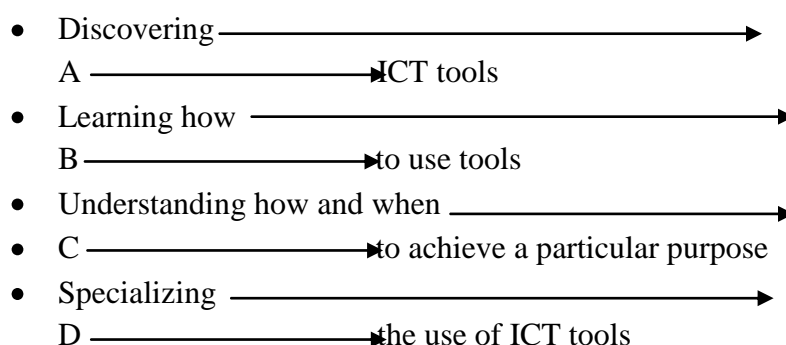
Discovering ICT Tools: Teachers and learners need to discover tools necessary for ICT, and learn how those tools can be used effectively in the classroom. At this stage, emphasis is made on ICT literacy and basic skill considering the emerging approach in ICT development.

Learning How to Use ICT Tools: When the ICT tools are discovered, the users will learn how to use them with the general or particular approach.

Understanding How and When to Use ICT Tools: Having learnt how to use the tools, it is important to know the best way to use them in order to achieve a particular purpose, such as in completing a given project. This implies the ability to recognize situation where ICT facilities will be helpful, choosing the appropriate tools for a particular task and using these tools in combination to solve real problems.

Specializing in the Use of ICT Tools: This occurs, when the teachers and learners enter more deeply into the science of discovering those things that are used to create and support ICT. The students at this point learn ICT as a subject to become specialists. These are obtainable at vocational or professional education rather than general education and are quite different from other stages as involving the use of ICT tools.

The above points can be illustrated using the diagram below.



(Model of stages of teaching and learning with and through ICT, UNESCO, 2002).

2.6 Classification of Various Types of ICT Applications in Education

There are various types of ICT applications that can be used in education.

Computer has found application in education in the following areas:

- Computer Assisted Instruction (CAI)
- Computer Aided Instruction (CAI)
- Computer Assisted Learning (CAL)
- Computer Based Education (CBE)
- Computer Based Instruction (CBE)
- Computer Enriched Instruction (CEI)
- Computer Managed Instruction (CMI)

2.6.1 Concept and Techniques of Computer Assisted Instruction

Various experts have defined computer assisted instruction from different educational perspectives based on its relevance to pedagogy as follows:

According to Chimezie (1998), Computer Assisted Instruction is a teaching process directly involving the computer in the presentation of instruction in an interactive mode to provide and control the individualized learning environment for each individual student. In addition, Audu and Agbo (2010) defined Computer Assisted Instruction as an interactive instructional technique, whereby a computer is used to present the instructional material and monitor the learning that takes place. Computer Assisted Instruction learning uses a combination of text, graphics, sound and video in the learning process through interaction and guidance of computer to achieve certain instructional goals. According to Iwu (2006) in Ukegbu and Udechukwu (2011), the computer is encapsulated in the Computer Assisted Instruction within its various techniques as;

-Drill and Practice

- Tutorials
- Simulation Mode
- Educational Games
- Demonstration using audio-visual materials.
- Discovery Mode and
- Dialogue Level

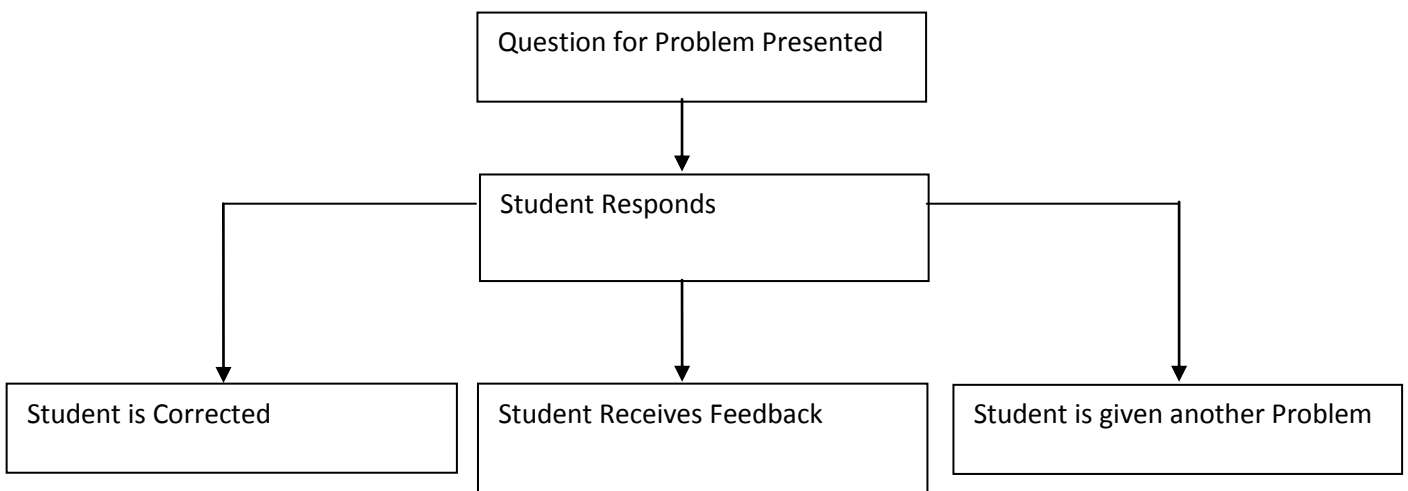
Drill and Practice: This is the commonest used CAI application during the advent of computer use in education due to its simplicity and the program could show off effectively the capabilities of the computers which is important for a computer-enthusiastic teacher to serve as means of gaining the attention of the learners. Drill and practice program assumes that the concept, skills, procedure have already been taught to the learner, therefore the learner is presented with a task often selected randomly and the feedback is given as soon as it is completed. Drill and practice program usually provide different set of questions with varied format because at each stage, the computer asks questions and seeks responses objectively, using a very repetitive type of procedure. Therefore, the learners are given the opportunity to try or attempt several times before the correct answer is presented by the computer. This program has the advantage of relieving the teacher of having to administer work, mark papers and keep records because the computer keeps track records of each student's performance and can inform the teacher accordingly. Drill and practice is most suitable for such subjects like mathematics, statistics and economics, spelling and equipment training. A typical example of drill and practice program is the "who wants to be a millionaire program shown on the Nigerian Television Authority". Drill and practice software differs from tutorial software in a particular way: it helps students to remember and utilize the skills they have acquired previously during the teaching and learning process, whereas a tutorial program teaches a new material. Students must be familiar with certain concepts

prior to working with the drill and practice programs in order to understand the content.

A typical drill and practice program have four (4) steps:

- i) The computer screen presents the students with questions to respond to or problems to solve;
- ii) The student responds;
- iii) The computer informs the student whether his or her answer is correct; and
- iv) If the student answer is correct, he or she is given another problem to solve, but if the student responds with a wrong answer, he or she is corrected by the computer. (Sharp, 1996; Tabassum, 2004)

The diagram is shown as follows:



Drill and Practice Program Steps (Source: Sharp, 1996; Tabassum, 2004)

Tutorials: This is a computer program whereby the computer acts as an instructor. It is used in teaching new topics. The computer presents and teaches new concepts and principles and once the learner exhibits clear understanding, the learner immediately goes over to the next activity. Though practically, computer tutorial is very limited in its ability to assess the level of understanding of the student unlike in classroom situation when the teacher asks questions, the teacher can assess the students' level of understanding of the topic, the degree of effectiveness of the instructional materials

used by not only listening to the answer given, but by also observing the speed with which it is given, the degree of hesitation, the body language of the students, etc.

Dialogue Level: It is regarded as the highest level of language. Dialogue involves a sophisticated interaction between the learner and the computer. The learner here can actually talk to the computer and engage in real dialogue. The learner interacts with the machine by asking questions and giving responses of which the computer understands and reacts appropriately.

Simulation Mode: Simulation is a program that models real life situation and enables the students to manipulate and experiment with it. Simulation is becoming increasingly popular for new types of skills because it can create conditions that are nearly similar to the actual situation. A common example of simulation is a flight simulator, which introduces pilots to potential situation and problems. The normal justification for using simulations is where the real thing used is very expensive, too dangerous or too time consuming. Simulation can bridge the gap from abstract knowledge presented in the classroom to actual performance by letting the students learn the difference between the good and bad decisions.

Simulation Teaching: This involves using computer to represent the operation of a system in a real-life situation. Computer simulation programs were first developed for training aircraft pilots. They represent exactly the operations executed by pilots in a real-life flying situation (e.g. take-off, and the landing in different weather conditions). These techniques have been fully applied in teaching science and technology, engineering, biology, geography, chemical and medical sciences.

Educational Games: Educational games are useful for instruction, for example, programs of games could be played between either two or more students who compete among themselves or by one student. Games will be a good instructional tool only if it

is content-based. Educational games are normally placed in a group of their own, but in practice, it is often difficult to differentiate between games, drill and practice programs or simulations. Games also have a place to play in the classroom, especially as a way of increasing the motivational level of students. The key aim of educational games is to motivate learners to interact with instructional materials. These modes of instruction have been found useful in mathematics, sciences and language.

Discovery Mode: In discovery, the inductive approach to teaching and learning is followed. The learner is encouraged to proceed through trial and error approach, i.e.; by solving a given problem, realizing, where and how he/she went wrong, trying again and finally, solving the complex problem. (Adapted from Audu and Agbo, 2010)

However, for the purpose of this study, the drill and practice system of CAI will be adopted by the researcher to teach two topics in Economics due to its numerous advantages such as: it presents tasks to the learners at each stage of the learning, it takes care of learners individual differences, provides immediate feedback, encourages individual learning by students and as well keep track records of students performances.

2.6.2 Characteristics of Computer Assisted Instruction

Computer Assisted Instruction has several unique features which make it an exciting instructional strategy. It provides constant and timely interaction with the instructor and gives immediate feedback. Students can repeat tutorials as often as needed and work at their own pace. CAI can be used where there is large number of students than the normal traditional classroom could afford. Intelligently, the CAI is programmed to adapt to the student's individual needs. It acquires information about the

student's current knowledge of a subject and his/her goals in learning the subject and then creates a user profile based on this knowledge. It can also adjust itself to the individual student where the need arises. (Audu and Agbo, 2010). Characteristics of a computer in teaching-learning process are as follows:

- Never get tired, never get exhausted or angry
- Allow students to work privately
- Never forget to correct or praise
- Are fun and entertaining
- Are self-paced
- Give immediate feedback
- Are more objective than the teachers
- Free teacher for more meaningful contact with student
- Give a sense of control over learning
- Are excellent for drill and practice
- Call for using sight, hearing and touch sense organs.

Also, supported by the view of Onuwa, ICT-Driven Instructional aid has the following characteristics:

- Accelerates students basic skills in school subjects like Economics, English and Mathematics;
- Challenges students to learn independently;
- Updates teacher with efficient and effective tools to take care of learners' individual differences;
- Provides opportunities for cooperation with colleagues through networking and internet services, thereby encouraging interactive learning;
- Educators and learners are challenged to new methods of acquiring knowledge through knowledge sharing and connection to the global world.

In specific terms, the characteristics of Computer Assisted Instruction are as follows:

- It has the capacity to initiate flexible interactions with the student.
- The computer is able to record and store all the responses of 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 information in planning to determine which branch to take.

However, there are some basic assumptions of CAI and are stated as follows:

- CAI can be provided simultaneously for as many as 4000 students.
- CAI is suitable for all types of teaching and learning activities.
- As the learner's performance is going to be recorded automatically in computer memory, immediate feedback can be provided to the learners by the teachers and also the teachers can use the data in making the best teaching strategy for the learner in future (Vanaja and Rajasekar, 2010).

The use of CAI in classroom teaching and learning process has shifted learning from teacher-centred to learner-centred where the teacher is seen as a facilitator rather than a dispenser of knowledge. Teaching and learning of economics should portray an active and dynamic classroom which enables the students' thinking, hearing and applying what they have learnt.

2.6.3 Uses of Computer Assisted Instruction

The importance of using CAI can be enumerated in the following ways:

- a) **Self-Pacing:** CAI provides one-to-one interaction with a student, as well as an instantaneous response to the answers elicited, and allows students to proceed at their own pace. Computer Assisted mode of Instruction moves at the students' pace and usually does not move ahead until they have mastered the skill. They allow students to progress according to their own pace and work individually or

in a group. Programs provide differentiated lessons to challenge students who are at risk, average, or gifted. One student can move onto more demanding educational activities before the rest of the class without disrupting anyone else's learning. Simultaneously, another student can repeat certain learning activities as often as advisable. Computer Assisted Instruction improves instruction for students with disabilities because students receive immediate feedback and do not continue to practice the wrong skills.

- b) **Relevance and Quality of Education:** Computer- based instruction can also enhance the relevance and quality of educational activities which is often registered as a prime concern for parents and students. Collaborating with an appropriate site for learning activities will offer a wealth of choices for students to select from. With educational activities organized for different levels of education covering a vast array of subject material, a valuable partnering site will empower the instructor with the ability to choose learning activities to target the students' needs best. Furthermore, if the site includes authoring tools, the teacher or parent may create new educational activities to address any under-served curricular areas. Additionally, a user community, if offered, may enable the sharing of learning activities far more easily than before. Providing instruction on the computer helps foster increased relevance for the lessons involved.
- c) **Diagnostic:** CAI can be used diagnostically, and, once a student's problem has been identified, it can then focus on the problem area. Finally, because of the privacy and individual attention afforded by a computer, some students are relieved of the embarrassment of giving an incorrect answer publicly or of going more slowly through lessons than other classmates.

- d) **Re-teaching and Reinforcing:** Computers are particularly useful in subjects that require drill, freeing teacher time from some classroom tasks so that a teacher can devote more time to individual students. Computers offer different types of classroom activities and a change of pace from teacher-led or group instruction to a personalized form of instruction.
- e) **Personalized Feedback of Instruction:** Computers provide immediate feedback, letting students know whether their answer is correct. If the answer is not correct, the program shows students how to correctly answer the question.
- f) **Multisensory presentations:** Computer programs are interactive and can illustrate a concept through attractive animation, sound, and demonstration.
- g) **Motivation and Reward:** Computers capture the students' attention because the programs are interactive and engage the students' spirit of competitiveness to increase their scores (adapted from Vanaja and Rajasekar, 2010).

CAI therefore, can be said to be an effective tool when utilized under proper conditions such as: the course material should be carefully prepared by persons who are knowledgeable in the subject matter, computer technology and considering the learning theory. Also, the academic support required by the students must be provided by the teachers as well as CAI course-ware must be of high quality, user friendly and well organized.

2.6.4 Preparation of Computer Assisted Instruction Package

Preparation of effective CAI programmes follows a step by step process. The development of a CAI can be based on the ADDIE instructional system design model which consists of five (5) phases: Analysis, Design, Development, Implementation and Evaluation. The ADDIE model provides a means for identifying the target audience's

needs and reinforce the use of this information for the design and development of the CAI. Throughout the implementation phase, necessary feedback should be obtained to determine the effectiveness of the CAI.

2.6.5 Steps of Developing a Computer Assisted Instruction Package for Lessons

The CAI package can be based on one individual topic or it could be a large package consisting of several individual lessons. A team of developers is utilized in the production of a CAI lesson. A typical team consists of one faculty member, who is the designer/programmer, and a professional who is the CAI designer/programmer, and a student programmer who does the coding. The systems approach is used for development of a single lesson using CAI which consists of four (4) phases: planning, development, evaluation and dissemination.

- **Planning:** In the planning phase, a faculty member identifies a need for using CAI in a course. The faculty member, in consultation with a CAI specialist writes a proposal outlining the use of CAI in a topic. Identifying the target audience, defining the objectives, providing the content and flow of the lesson, and suggesting an evaluation plan.
- **Development:** During the development phase, the CAI professional works with the faculty member to best adapt the content to the interactive computer environment. A detailed display-by-display design of the lesson, referred to as a script, is produced on paper. Interaction on every display, with appropriate feedback for correct and incorrect responses, is written into the script, along with alternative paths that the user might see, based on their responses. The script is reviewed by the subject head teacher, by subject teacher as colleagues, and by a team of lesson designers, revisions are made based on the reviewer's suggestions. When the script is approved by the subject head teacher it is given to the student programmer to begin the coding.

While being programmed, the lesson undergoes a similar review and revision cycle. At various points, in its development, the lesson is reviewed by the CAI

professional and content experts. Major changes can be incorporated into the developing lesson at this stage. When the complete lesson is on the computer, it is formally reviewed by programmers, designers and content experts. A revised lesson is then readied for student testing.

- **Evaluation:** The lesson is usually assigned to the subject heads, students before the next term that the course will be taught. Formative data on users' responses, requests for help, and individual branching sequences are kept by the computer for each user. The programmer and designer use this information to further refine the lesson. The improved version is used with students in subsequent semesters while the lesson enters the next phase of the systems approach.
- **Dissemination:** The lesson is then ready to begin the publication process with a course-ware company. More reviews and revisions are required with emphasis on editing, style, format and consistency, publication and standards. It is published by the course-ware company and made available to the public (Vanaja and Rajasekar, 2010).

2.7 Types of Computer Assisted Instruction Aids Used in Teaching and Learning

Some Computer Assisted Instructional Aids used in schools today are lesson notes prepared on floppy diskettes, CD-ROMs, flash drives that can be played when needed. However, this has limited advantage due to the unavailability of computer systems that can go round the large number of students in the schools. Therefore, there is need to have other electronic media that can meet the demand of the teeming number of students such as projectors and white electronic boards in the classrooms.

Table 2.7: List of some Educational Technology and Computer Assisted Instruction Aids used in Teaching and Learning.

Flexible	Laboratory	Fixed/mobile	Mobile
Television	Scientific Tools	Computers	Mobile Phones
Satellite Receivers	Technical Instruments	Storage Devices	Memory Reader
Radio	Medical	Internet/email/social	iPod

Recorders	Apparatus Agricultural implements	media Smart Boards/Touch Screens	IPads
Cameras	Engineering Facilities	Plain screens	Androids
Videos/Picture/CCTV	Arts Costumes	Robots	Iphone
Projectors/Beams	Language Tools	Avatars	Calculators
Video Games	Books and Other Devices	Cables	PDA's
MP3-4 Players			

Source: *Torruam and Abur (2013). International Journal for Basic and Applied Science 1 (3), pp.512*

However, the various ICT facilities used in the teaching-learning process in schools according to Bandele (2006) and Ofodu (2007) include; radio, television, computers, overhead projector, optical fibres, fax machines, CD-Rom, internet, electronic notice board, slides, digital multimedia, video/VCD machines, etc., which can be used for teaching, learning, research and management of records.

2.7.1. Other Computer Devices Used in Teaching and Learning

Disk Driven: Disk storage is a general category of a computer storage mechanism, in which data is recorded on planar, round and rotating surfaces (disks, discs, or platters). A disk drive is a peripheral device used to collect information stored on a computer system. Examples are hard disks, floppy disks and optical discs. A storage device that holds, spins, reads and writes magnetic disks or optical (CD, DVD,) disks. It may be a receptacle for removable disk cartridges, floppy disks or optical media, or it may contain non-removable platters like most hard disk drives.

A Hard Disk Drive (HDD), commonly referred to as a hard drive, hard disk, or fixed disk drive, is a non-volatile storage device which stores digitally encoded data on rapidly rotating platters with magnetic surfaces.

CD-ROM: An abbreviation of “Compact Disc Read-Only-Memory” is a pre-pressed Compact Disc that contains data accessible but not writable by a computer.

While the Compact Disc format was originally designed for music storage and playback, the 1985 yellow book standard developed by Sony and Phillips adapted the format to hold any form of binary data. CD-ROMs are popularly used to distribute computer software, including games and multimedia applications, though any data can be stored (up to the capacity limit of a disc). Some CDs hold both computer data and audio with the latter capable of being played on a CD player, whilst data (such as software or digital video) is only usable on a computer (such as PC CD-ROMs).

Compact Disk Read Only Memory: This is a drive that reads aluminium-coated round plastic discs but is incapable to write any disc. The CD-ROM diskettes are 12x12cm with a thickness of 1mm. The disc is made of a polycarbonate wafer and is coated with a metallic film, usually an aluminium alloy. This aluminium film is the portion of the disc that the CD-ROM drive reads for information. The aluminium film (strata) is then covered by a plastic polycarbonate coating that protects the underlying data. A label will usually be placed on the top of the disc and data is read from the bottom of the CD. CD-ROM drives are generally used just to install a program or copy CDs, both of which are usually done rarely on most users' computers, the extra speed isn't usually very important. The speed can play a big role if you do a lot of CD burning at high speeds or some audio extraction from audio CDs (i.e. converting CDs to MP3s).

CD-R/RW (which stands for Recordable/ Re-Writable) drives (burners, writers) allow a user to create their own CDs of audio and /or data. These drives are great for backup purposes and for creating your own audio CD compilations. The floppy disk drive reads data from and writes data to a small disk. When the computer system needs to access data on the diskette, the read/write heads are stepped by signals generated by the computer system's floppy controller.

Projector: A data projector is a device that takes a signal from a computer, TV or Video source and produces a large image using projected light. Communication is a key learning skill and a data projector allows a teacher or student a whole new dimension in how they share ideas, information, charts, images, animations, audio or video. Learning is much more powerful if it offers support for a variety of intelligences such as visual-spatial, bodily-kinesthetic, musical, interpersonal, intrapersonal, linguistic, and logical-mathematic- a projector can also be partnered with an interactive whiteboard to offer additional teaching strategies. A good data projector can show a large clear image that is visible from all parts of the classroom.

2.7.2 Guidelines for Selecting Computer Assisted Instructional Materials

Technology can also be referred to as media; media include technology such as prints, radio, television, computer assisted learning, projectors, CD-Rom, video cassette, video cassette player, online instruction through the internet, etc.

Gertrude (2009) stated some guidelines for selecting Computer Assisted Instructional materials as follows:

- a) **Educational Media must be Purposeful:** The media chosen should help to achieve the instructional objectives- cognitive, affective and psychomotor domains. The media must be carefully harmonized to the content of the lesson.
- b) **Availability:** Instructional media should be accessible to the teachers and learners, when materials necessary for the lesson is not available, teachers should learn to improvise or borrow from other schools.
- c) **Characteristics of the Media:** Adequate consideration should be given to flexibility, simple to manipulate/operate, storage, portability, repair and maintenance of the media.

- d) **Learners:** The teacher should consider the age, level, interest, background, learning styles and individual differences of the learners.
- e) **Learning Environment:** Environment where the school is located and the classroom should be considered when selecting instructional media. For example, if the school is located in an environment where there is no power supply, there would be no use thinking of a television, computer or projector unless a generator is provided.
- f) **Teacher's Knowledge:** The teacher should have knowledge about the instructional media before introducing it to the students.
- g) **Cost:** The teacher must consider the financial implication of the media selected.
- h) **Visibility:** Instructional media presented should be visible and that students can view it from any angle of the classroom.
- i) **Durability:** Instructional media selected should stay in good condition for a long period of time after the lesson.

The above guidelines for selection do not mean that the availability of Computer Assisted Instructional aids in itself is sufficient to enhance teaching-learning process, if it is not well planned and fully integrated into learning environment. According to Condie and Munro (2007), technology in itself does not support learning but rather, it depends on the ability of the teacher to integrate or embed ICT into the learning experience of students in such a way that the full potential of technology is fully realized.

2.7.3 Guidelines and Requirements for the Utilization of Computer Assisted Instructional Aids in the Classroom

The use and utilization judge the value of Computer Assisted instructional aids, process or personnel by the degree they singly or collectively satisfy the derived

instructional needs. The foresight instructional behaviour controls, to a large extent, the means for achieving them. Instructional materials are not ends in themselves but means of attaining specific instructional functions.

However, once materials have been selected, careful preparation must first be carried out by the user. Anyanwu (2003) identifies three ways by which the teacher should prepare for the use of Computer Assisted instructional aids in classroom, these are as follows:

- a) **By previewing** – before any Computer Assisted Instructional aid is brought to the class, the teacher has to have a first knowledge by using it herself before the class,
- b) **First knowledge** – the teacher should have a full knowledge of the parts, names and operational level of the intended Computer Assisted instructional aids,
- c) **Actual presentation** – this is the period the teacher operates and uses these materials in instructing the children.

However, the followings are the basic guidelines and requirements for utilization and use of Computer Assisted Instructional aids:

- a) **Specification of objectives:** clear objectives which are behaviourally stated are user ring guides in ICT-driven instructional aids using process, they direct the sequence, methods, content and techniques of instruction in subject matter. They provide scientific basis of valid evaluation instruments construction and administration.
- b) **Maximal fit with instructional tasks:** Computer Assisted Instructional aids must be appropriate to situational, determined and individually responsive.

- c) **Preparation and preview:** for effective and successful use of Computer Assisted instructional aids for proper teaching-learning situation, the teacher must in advance prepare himself, the learners and the environment, the materials as a matter of must should be previewed by the teacher in order to follow its process of presentation sequentially.
 - d) **Multi-dimensional presentation:** proper and creative use of a variety of Computer Assisted Instructional aids at different level of lesson planning can be adequate in achieving various instructional objectives, because it will enrich variety of learners mind as they attain better goals more easily than with the use of a single medium.
 - e) **Environmental situation:** the environmental variables such as physical, cultural and social in which the Computer Assisted instructional aid are utilized for learning have significant effect on their effectiveness. Sound-motion films for instance with their attention-complex properties can be successfully presented in less quiet environment.
 - f) **Measure for outcomes:** Computer Assisted Instructional aids would be evaluated in terms of their suitability, practicability to the instructional objectives, appeal to the cost effectiveness, learner achievement level, consistency with content call for improvement in utilization techniques etc.
- (Adapted from Torruam and Abur, 2013)

2.7.4 Problems Associated with the Use of Computer Assisted Instructional Aids

Observation revealed that employing Computer Assisted instructional aid to facilitate teaching and learning process in respective subject is not always the issue but how to use it and its availability to use. Computer Assisted instructional aids are

available in large quantity and are producing a shift from the traditional audio-visual aids approach to the more comprehensive and efficient learning resource concepts.

Unfortunately, in spite of the bright prospect of Computer Assisted Instructional aid to the teaching and learning process, the ICT-facilities are still inadequate in Nigeria, let alone its circulation to the secondary schools across the nation. A lot of problems are confronting the use of Computer Assisted Instructional aids in Nigerian secondary schools which include:

a) Teachers' Professional Knowledge and Technical Know-how:

Information communication and technology (ICT) is a fairly new area of importance in education especially in developing countries like Nigeria. Due to the technicalities involved, there is the need for teachers to understand how it can affect the teaching and learning situation. The first aspect to understand is the operational functionality of the materials. As much as materials differ in terms of technical components, design and set-up, they also differ in terms of functionality. Some are multi-dimensional; capable of various functions such as giving logical outcomes, manipulating information, etc. Without the teacher being knowledgeable enough in the use of Computer Assisted Instructional aids, he cannot create change and make meaningful impact in his learners. Teachers' knowledge has a great impact on the effective application of Computer Assisted Instructional aids because the teacher needs to understand the sequential presentation of the instructional gadgets that will suit the interests of the learners and its appropriateness with the instructional tasks. For instance, a teacher who is not computer literate would find it difficult to operate the system and manipulate it to achieve his instructional objectives or even with partial knowledge of the operational function of the computer system, they might be wrongly used

thereby creating a wrong impression to the students. Okojie (2010) supported this view that old brigade teachers are unwilling to change to the ICT way of instruction but rather prefer the long age old method of instruction.

- b) **Lack of Computers: Computers are still expensive in Nigeria:** In Nigeria, a country with high rate of inflation, majority of the individuals and schools cannot afford to buy a computer while some consider it as a luxury item, more expensive than a T.V. set. Even some fairly used computer systems cost as much as N45,000, while branded new ones are being sold between N98,000 and above. Computers are still relatively expensive and despite spirited efforts by the government agencies, NGO's, corporate organizations and individual donations to some schools, there still remain a large percentage of the schools unable to purchase computers for use by their students due to the cost.
- c) **Lack of Constant Power Supply:** According to Urenyere (2012), there are still some schools not yet connected to electricity; Nigeria being a developing country, the government has not been able to connect all parts of the country to the national electricity grid. Consequently those schools that fall under such places especially in some rural areas which cannot afford to purchase a power generating set are left handicapped and may not be able to offer computer studies. It is quite embarrassing that even the urban centres are faced with the challenges of epileptic power supply.
- d) **Broken down computers:** While some schools have benefited from used computers donated to them, some have not been adequately equipped with the same on maintenance and repair, hence its very common to see a school's computer laboratory full of broken down computers; some repairable and some beyond repairs. This has actually been a major problem because the government

has not put strict measures on any persons, NGO or corporate bodies willing to donate computers to avoid donating the fairly used ones thereby making the schools to be seen as a dumping ground.

- e) **Burglary:** The fact that computers are still very expensive in Nigeria; this makes them a target for thieves who usually have ready markets to sell them. This has made many schools to incur extra expenses trying to secure the computer laboratories with burglar proof to prevent theft. These extra expenses therefore make some schools shy away from purchasing computers for their students.
- f) **Lack of Internet or slow connectivity:** Most schools are not able to connect to the World Wide Web (www), due to the high costs involved in the connectivity. On average, it may cost approximately \$150 per month to connect to about 15 computers on a bandwidth of 128/64 kbps. This is considered as very expensive in addition to the running cost of the school.
- g) **Increased moral degradation:** Internet pornography, chatting, cyber- crimes and other anti-social behaviours is a worrying emerging problem amongst youths today. These have led to increase in moral decadence among youths who spend much of their good time both during the day and at night on the internet.
- h) **Environmental factors:** Part of the application of Computer Assisted Instruction in the teaching-learning process is the target population for whom the materials are to be used and the setting or vicinity where the learning should take place. The degree of satisfaction derived by students in respect to comfort of the learning environment in a great deal will determine the effectiveness and efficiency of the instructional process in the classroom.

- i) **Time Constraints:** Time is also a serious problem or factor that impedes the effective use of Computer Assisted Instructional aids because the time that is allotted for a particular lesson like economics on the timetable might not be enough for the teachers to present his contents alongside with judicious use of the materials provided will affect the wholesome delivery of the content.
- j) **Poor Maintenance Culture:** Materials available for the teaching sometimes are poorly mal-handled by both the teachers and school authority. Non-availability of well spacious resource room for the proper keep of both the locally manufactured and the commercially purchased instructional facilities limits the durability and life span of those materials. Very many of the teachers use materials occasionally without the proper servicing of those materials after used for the future use. (Adapted from Torruam and Abur, 2013)
- k) **Inadequate Funding:** Nzewi (2009) pointed out that the cost of obtaining a good computer is still expensive to purchase in adequate number for schools, most schools cannot even afford to maintain internet connections. Despite the fact that Nigeria is blessed with resources that make it rich, the problem of corruption and fraudulent practices has bedevilled the nation resulting to poor development of the education sector.

2.8 Conventional Mode of Teaching Supported with Computer Assisted Instruction

Computer assisted instruction, also referred to as computer based instruction and computer-enriched instruction, can be used to support conventional mode of classroom

teaching and learning process. The software typically includes problems generated algorithmically, videos of each lesson, online tutoring, and website with additional resources (Kinney and Robertson, 2003). It is designed to support but not to replace the teacher. In this mode of instruction, students receive instruction in conventional classrooms, but the computer changes how they learn outside the classroom. The computer facilities is made available twenty-four (24) hour a day from any computer system that has internet facilities, as each student can decide when, where and how long he or she works outside the classroom. Teachers can design an electronic homework, quizzes, and exams that are graded and recorded by the software. Drill and practice software leads the student through exercises designed to build accuracy and speed, assuring the student has received prior instruction (Kulik and Kulik, 1985; Olusi, 2008).

Interactive tutorials include guided practice problems which motivates students to be actively engaged with the learning process (Mahmood, 2006; Merisotis and Phipps, 2000). Software can provide student with an individualized study plan based on his or her scores on homework and quizzes (Cotton, 1991; Hannafin and Foshay, 2008). There is an element of competition as the student competes against his or her own previous score. Software can be programmed for mastering the current one. Computer assisted instruction permits the student to work at his or her own pace and to receive immediate non-judgemental feedback on assignments (Cotton, 1991; Hannafin and Foshay, 2008; Merisotis and Phipps, 2000). Computer assisted instruction encourages a student to take responsibility for his or her learning, acquire effective study habits, and persist until he or she has mastered the content (Brothen and Wambach, 2000). He or she can control when he or she works and how much time he or she spends on each lesson (Reagan, 2004).

2.8.1 Comparison between the Conventional Mode of Teaching and Computer Assisted Instruction

Several studies have been conducted on the effects of computer assisted instruction on students' achievement, attitudes, learning rates, and other variables. Meta-analysis, reviews of literature, and individual studies generally indicated that computer assisted instruction has a positive effect on student learning. A meta-analysis combines the results of numerous studies that were conducted in different conditions and therefore can give a better indication of the effects of a treatment than an individual study can. A series of meta-analysis by James Kulik and his associates at the University of Michigan, compared the achievement levels of students using computer assisted instruction with students who receive conventional mode of instruction. They reported significant effect sizes in elementary (0.47), secondary (0.26), and college instruction (0.36) in a variety of courses (Bangert-Drowns, Kulik and Kulik, 1985; Kulik and Kulik, 1986; Kulik, Kulik and Bangert-Drowns, 1985). In a study of 123 colleges and Universities, the use of computer as a tutor to support conventional mode of instruction was associated with more learning in less time, slightly higher grades on post-test, and improved attitudes towards learning (Kulik and Kulik, 1991).

An updated meta-analysis of 254 studies comparing outcomes of computer instructed and conventionally instructed classes was consistent with the earlier studies (Kulik and Kulik, 1991). The study included students of all ages, kindergarten through adult, who used Computer Based Instruction (CBI) in mathematics, social studies, sciences, reading and language, and vocational training. The computers were used for drill and practice, tutoring, and programming. In overall, there was a small positive change in student's attitudes towards computers and learning, a reduction in the amount of time needed for instruction, and an increase in examination scores of 0.3 standard

deviations. It should be noted that the results were not consistently and overwhelmingly in favour of CBI. Out of 81% of the studies, the CBI classes had the higher average on end-of-course examinations, and the remaining 19% conventionally taught classes had the higher average.

However, computer software has changed rapidly in recent years, so it is important to examine more recent studies on the effectiveness of computer assisted instruction to determine if the positive effects indicated by earlier studies as stated above still persist.

2.8.2 The Role of CAI Usage by Teachers in Classroom Instructions

ICT in classroom instructions can have a considerable impact on the practice of teachers, most especially when CAI is conceptualized as a tool that supports a real change in the pedagogical approach. The teachers need to change their roles and classroom organization, they also need to invest in preparing; introducing, managing new learning arrangements, and likewise need to acquire basic ICT skills.

Teachers determine the applications that will add value to instructions in their subject area, putting in mind that they need to be aware that, this is not a one-time activity, as the information environment changes continuously, (Atts and Dent, 2002). Teachers can be encouraged to share resources with others, locate good practices on the web and adapt these to their local circumstances. Teachers can take their time to discover that computers do not mean extra work, rather they are intended to actually make their work easier and competent (Hyslop – Margrison, 2002). Teachers who use ICT for classrooms instructions have to demonstrate the levels of energy, hard work and perseverance, often in the face of considerable odds. Teachers who early adopted the use of ICT are required to be resourceful and being able to overcome many barriers to make things work.

Planning lessons involving computers can take considerable time and demands complex scheduling and resources and teachers using computers in the classroom should not act in isolation from each other. Computers have great potential in classroom instructions and hence, ICT also presents teachers with additional obstacles to overcome. However, Laurillard (1990); Mishra and Koehler (2006) and Unwin (2007), for example, have cautioned against the use of ICT facilities without a conceptual framework or without a clear understanding of why and how the ICT will contribute to students' learning. These insights have led some education institutions to realise that pedagogically, sound integration of ICTs in teachers' teaching requires more than technical support; it also needs professional development for teachers to use ICTs in their teaching and learning process.

2.8.3 Advantages and Disadvantages of Using Computer Assisted Instructional aids in Classroom Teaching and Learning Process

The use of Computer Assisted Instructional aids enhances traditional classroom instructions in a teaching and learning process. It develops the student's oral and written communication skills and covers subject topics like within a limited time (Becta, 2004). Computer Assisted Instruction accommodate students with different learning styles, provides varied and more convenient learning environments and work around the constraint curriculum time faced by both teachers and learners. CAI can help to overcome two enemies of learning: "isolation and abstraction" (Vision 2020). This is because teaching and learning process is all about interaction between teachers and learners, more so learning is more meaningful when the activity method is used thus; learners centred. CAI becomes of great importance due to the various roles it plays in classroom interactive process. The classroom situation and the evaluation of the degrees of effectiveness of their teaching method can encourage teacher to re-think their current

methods of teaching and help them appreciate the supportive importance of CAI in enhancing their delivery of instruction. CAI has great potential to enhance students' achievement and teacher learning thereby resulting to better performance.

Information and Communication Technology have influence in changing the way we work and the way we live. CAI is used to encourage students to learn more independently, to learn actively, CAI plays an important role in students' skill motivation. Most teachers use technology tools such as e-mail, the internet and other software applications in our daily lives to help us create, obtain and communicate information effectively from one person to another. The use of information and communication technology for classroom instructions is no longer a luxury but common resources used by many educators as it improves the students quality of learning and enhance employability, (Braak and Tondeur, 2004).

In education, CAI has enabled instructions to be delivered and received anytime and anywhere, providing students with more varied and convenient learning environments. Teachers, with their learners can distribute and access course materials in virtual environments as well as communicate outside traditional classroom. Teachers should use (CAI) classroom based instructional methods for their instructions to report the participants view on the instructional activities carried out. CAI incorporated in classroom instructions can evaluate students varying degrees of effectiveness their performance and can encourage teachers to re-think their current methods of teaching and help them appreciate the role of CAI in enhancing their instructional delivery. CAI should provide teachers with access to a wide range of computer networks, teaching and hearing resources for instructional purposes. Teacher should use both classroom based and CAI-based instructional methods in the delivery of their instructions.

Furthermore, Ikwumelu (1992) in Torruam and Abur (2013), in his view states the following points on the need why teachers must employ CAI in classroom:

- CAI helps to concretize abstract issues and topics
- They motivate pupils' interest in topics being discussed
- They develop continuity of reasoning and coherence of thought which augurs well with the inter-disciplinary nature of other subjects
- CAI saves time and as things presented are almost self-explanatory
- Energy is saved in too much talking and writing and;
- They help to appeal to pupils interests and this is because, they tend to appeal to children's difficulties as well as take care of children's individual differences.

The importance of CAI is also evident from the educational perspectives. The chalkboards, textbooks, have been used for educational purposes but none has quite impacted on the educational process like computer and other ICT equipment (Aduwa-Ogiegbaen and Iyamu, 2005). This is due to the fact that computer and other ICT facilities are capable of activating the senses of sight, hearing and touch of the users.

A personal computer is the best known example of ICT in education, but the term multimedia is also frequently used. Multimedia can be interpreted as a combination of data carriers, for example video, CD-ROM, floppy disc and Internet and software in which the possibility for an interactive approach is offered. However, there are numerous importance, and uses of CAI in classroom teaching. These are enumerated below:

- a) CAI can be used as an "assisting tool", for example while making assignments, assignment submission, assessment and feedback, collecting data and documentation, communicating and conducting research.
- b) CAI is used as a medium for teaching and learning. This refers to CAI as a tool for teaching and learning itself, the medium through which teachers can teach and learners can learn. For example, teachers can look up syllabuses on what to teach and also upgrade their existing knowledge about a particular topic.

- c) CAI can be used as teacher support materials, for example self-tests, project guides, note on accreditation requirement, or other aspect of courses, bibliographies and materials or comment passed between learner and educator.
- d) It is also useful in presentation of information and knowledge, interactive exercises and assessment; e.g. using power point presentation in teaching.
- e) It is useful in video conferences, telephone conferences, see-you-see me conferences.
- f) CAI as a tool for instructional material intended for use in conjunction with other technologies e.g. audio or video cassettes, printed materials, newspapers, journals, periodicals, newsletters and magazine.
- g) A teacher can teach thousands of students in different classes across the globe without him/her being present physically. Discussions, submission of assignments, assessing student performance can take place without teacher/student contact. This is possible using discussion groups on the internet.
- h) Students can come to class with an existing knowledge base and pre-existing conceptual framework thereby making the work of the teacher a lot easier.
- i) CAI permits accommodating different teaching and learning styles, communicating high expectations and providing a high challenge, low threat environment.

In spite of all the benefits associated with the use of CAI for teaching in classrooms, there are also some disadvantages in using CAI for teaching. The disadvantages are enumerated below:

- a) Studies have found that CAI can make a learner lazy and encourage them to skip classes in situation where attendance is not mandatory.
- b) Teachers would often read their power point slides out loud instead of teaching from them and frequently move too quickly through the material.
- c) Power point can be too fast. It is possible to get too much information and then you end up not paying attention to the teacher.
- d) Increases out of class contact. It decreases personal contact with teachers thereby making learning impersonal. CAI can serve as a barrier for a student who is

supposed to look up to a teacher as a role model which requires personal contact with such a teacher in order to emulate his character.

Newhouse (2002) identified the implications for teachers using computers in classroom and this is tabulated as follows:

Table 2.8.3: Implications for Teachers Using Computers in Classroom Teaching

Potentials	Implications for Teachers
Dynamic learning	Students may learn outside the teacher's area of expertise. More difficult to direct and manage student learning.
Student motivation	Students are easier to manage and direct towards the tasks. Students may be distracted by the computer from the tasks the teacher has intended.
Removing tedious task	More satisfying for teachers to direct less tedious task. Some teachers may prefer students to complete tedious routine tasks as "busy" work.
Instruction to fit the learner	Relieves the teacher for needing to spend a lot of time with student who need extra practice, catch-up or extension work.
Independent learning	Learning may not direct itself towards the teacher's objectives. Additional coordination of the classroom, students and material required.
Extending student Thinking	Students thinking may go beyond teacher's experience or capabilities which may reduce the confidence of the teacher.

Source: Literature review by C. Paul Newhouse for Western Australian Department for Education.

2.8.4 Evaluation of the Computer Assisted Instructional Package Used in Classroom

According to Vanaja and Rajasekar (2010), to measure the effectiveness of the CAI instructional design and pedagogical as well as technical soundness, the following criteria can be followed:

- a) Teaching strategy was matched to students' needs.
- b) Presentation did not confuse the students.
- c) Readability and difficulty were at an appropriate level for students.
- d) Graphic fulfilled important purpose.
- e) Appropriate feedback for correct answers.
- f) Feedback reinforced more for correction than for incorrect responses.
- g) High degree of interactivity.
- h) High degree of user control.
- i) Comprehensive teaching sequences and instruction was self-contained and stand alone.

j) Good documentation available on the program.

To measure the soundness of the content used in the CAI package, the following criteria can be used:

- a) The content was reliable.
- b) Correct use of grammar.
- c) Current and error-free information.
- d) Concepts and vocabulary relevant to students; abilities.
- e) Information relevant to curriculum.
- f) Information of sufficient scope and depth.
- g) Logical progression of sub-topics.
- h) Content matches required curriculum objectives.
- i) The content was structured in clear and understandable manner.
- j) The structure allowed students to move around freely in different units.

To measure the Technical soundness of the CAI package, the following criteria can be followed:

- a) Program loaded consistently without error.
- b) Program did not halt regardless of the response from the students.
- c) Online links worked as indicated.
- d) Animations worked as indicated.
- e) The courseware is recommended for instructional use (adapted from, Vanaja and Rajasekar, 2010).

In view of the above evaluation strategy, Computer Assisted mode of instruction employed by teachers in the classroom, teaching and learning process can be monitored for functionality and effectiveness thereby resulting in improved academic performance of students. Likewise, the above evaluation strategy of CAI if adopted will help the teacher to identify areas of difficulties of both teachers and learners with the hope of finding solutions to them.

2.9 The Roles of Secondary School Teachers in the Use of CAI in Classroom instruction

The use of CAI in classroom instructions makes instructional delivery very useful and teaching and learning easier and CAI can contribute to universal access of education, equality in education, the redelivery of quality learning and teaching, teachers' professional development and more efficient education management,

governances. The use of CAI for instruction in JSS classes improves the equality of subject in the teaching and learning process. CAI if used appropriately can be an effective tool in supporting classroom instructions. CAI is used as the major way of providing the instructional experience of classroom teaching.

Teachers are one of the main pillars of a sound and progressive society. They bear the weight and responsibility of teaching and apart from parents, are the main source of knowledge and values for children. The role of a teacher in society is significant and valuable. It has a lot of influence on the society and no other personality can have such influence than that of a teacher. Students are deeply affected by the teacher's love and affection, his character, his competence, and his moral commitment. A good teacher becomes a model for his students. The students try to follow their teacher in his manners, costumes, etiquette and style of conversation and even surprisingly sometimes the way the teacher walks and behave generally. Therefore, teachers need to have access to resources that will supply ideas and materials for different classroom applications. These resources may include CAI facilities. ICT gives teachers access to information through on-line journals, joining discussion forums, downloading lesson ideas and plans, exploiting teaching resources and record keeping (Haddad, 2002).

Teachers who use CAI in classrooms have to demonstrate high level of energy, hard work and perseverance. If they are early adopters, they are required to be resourceful and overcome many challenges to make things work. Therefore, teachers using computers in the classroom should work in collaboration with each other. They need to have access to resources which will supply ideas and materials for different classroom applications. Schools need to subscribe to relevant journals and have publications which will enable teachers to gain ideas for classroom uses.

CAI tools are machines or devices (hardware) in that they occupy space, need to be operated, can be switched on and off etc. CAI tools are like a person in that they interact in a two-way relationship with students and teachers. This has implications for teachers in deciding to use CAI in the classroom. The teacher and perhaps students need to know how to operate the CAI tool and know how to overcome problems which may occur when using it. For many teachers, CAI implementation may require changes in attitudes and classroom practices.

However, Jegede (2008), on attitudinal characteristics and teachers' ICT use level, discovered that each of the attitudinal construct such as self-efficacy, competence and level of usage are significantly related and they predict ICT usage among teachers. Teachers constitute the facilitators and entrepreneurs in CAI learning environment. Teacher's level of ICT awareness and usage depends upon teachers' related factors and related behaviour that will impact its use. It is, therefore, mandatory for teachers to acquire the necessary ICT skills to enhance ICT usage in the classroom. However, most teachers do not make use of the potential of ICT to contribute to the quality of learning environments, although they might seem to value this potential quite significantly. Harris (2002) conducted case studies in three (3) primary and three (3) secondary schools, which focused on innovative pedagogical practices involving ICT. He concludes that the benefits of ICT will be gained "...when confident teachers are willing to explore new opportunities for changing their classroom practices by using ICT". Obviously, the use of ICT will not only enhance learning environments but also prepare next the generation for future lives and careers (Wheeler, 2001).

2.10 The Need for Computer Assisted Instructional Aids in Enhancing Quality Education in Nigeria

The need for Computer Assisted Instructional Aids in teaching and learning process cannot be overemphasized. According to Alabi (2004), there is need for changes in the learning process from teacher-centred which renders the students passive to a process that makes the students play active roles. CAI aids media have enhanced teaching and learning through its' dynamic, interactive, and engaging content. Benefits such as: ability to accelerate, enrich, and deepen skills' motivate and engage students in learning; help to relate school experiences to work practices; help to create economic viability for tomorrow's graduates; contribute to radical changes in school; help to strengthen teaching, and provide opportunities for connection between the school and the world. ICT can make the school more efficient and productive, thereby engendering a variety of tools to enhance and facilitate teachers' professional activities (Yusuf, 2005). As reported in the This Day Live magazine of 9th May, 2013; the Osun state deputy governor and also the Minister of Education Mrs. Grace Laoye-Tomori said "in a bid to develop an efficient knowledge economy and the state's desire to build a knowledge-based society, have provided secondary students with Tablet of Knowledge called "Opon Imo" inform of a mini iPad. It contains 63 e-textbooks covering seventeen (17) WAEC core subjects, sex education, extra-curricular subjects, etc. Also, on it are 40,000 past examination questions of WAEC and NECO for private simulation practice and self-development. A study aid having fifty-one (51) video tutorials was also installed on it. These could further enhance independent learning skills among students in senior secondary schools, and hence, improved academic performance.

2.10.1 Ways in Which Computer Assisted Instruction can Improve Teaching and Learning of Economics in Schools

The use of Computer Assisted instruction aids in any educational processes becomes imperative due to its supportive role in achieving pedagogical aims and objectives of the subject matter. Abujaber (1987) cited in Torruam and Abur (2013) said that the importance of instructional materials for both teachers and students cannot be overemphasized because they help in covering some deficiencies on the part of the teacher. The use of Computer Assisted Instruction aids is essential to support teaching and learning because some phenomenon cannot be easily expressed by the teacher without the support of graphics maps, video, pictures, etc., in the classroom.

In concrete terms, Computer Assisted instruction aids have enhanced teaching and learning of Economics through its dynamic, interactive, and engaging content; it has provided real opportunities for individualized instruction (Torruam and Abur, 2013). Information and communication technology (ICT) driven instructional aids has the potential to accelerate, enrich, and deepen skills; motivate and engage students in learning; help to relate school experiences to work practices; help to create economic viability for tomorrow's workers; contribute to radical changes in school; strengthen teaching, and providing opportunities for connection between the school and the world. Information communication technology (ICT) can make the school more efficient and productive, thereby engendering a variety of tools to enhance and facilitate teachers' professional activities (Yusuf, 2005).

Torruam and Abur (2013) pointed out the importance and usefulness of Computer Assisted instruction aids in pedagogical process as explained under the following headings:

- a. **Stimulation of students' interest:** In teaching-learning process, there is the need to generate, arouse, motivate and maintain students' interest in classroom. If the

learners' interest is built properly, learning can take place effectively. Computer Assisted Instruction has the potentials if effectively used for regulating the pace of information flow among different class of learners under the same classroom. Computer Assisted Instruction also addresses individual differences among learners. Students are aroused and attracted with the nature and the beautiful appearance of the materials which will make them to settle down and learn what the teacher had prepared to teach. Onyejemezi (1981) cited in Anyanwu (2003) agreed and based on investigations that pictures-stimulates and help further study, helps children to take active interest in the topic presented.

b. Concretize abstract issues or topics in Teaching and Learning Process:

Employing Computer Assisted Instruction in teaching and learning process makes learning real, practical and more permanent in the learners. It makes conceptual abstraction more meaningful. Esu (2004) in Medayese (2010) states that; instructional materials are valuable assets in learning situations because they make lessons practical and realistic. They are the pivots on which the wheels of the teaching-learning process rotate. Since CAI concretizes issues, it then facilitates revision (recall) activities and provides very unique opportunities for self and group evaluations for the teacher and the students alike. It captures the student intellect and eliminates boredom; make the work easier, neater, boosting clarity and more appealing.

c. Creating of effective communication: Computer Assisted instruction if properly integrated allows for a flow and transmission of ideal from the teacher to the students and likewise from the students to the teacher or from one group to other. The learners will be able to see, touch, spell what is been talked about by the teacher and be curious to ask questions that would be very helpful for effective evaluation (formative) of the teacher and instructions in subject matter.

d. **Use of mass instruction and taking care of a wide audience:** With the use of projected and electronic materials such as television, overhead transparencies and computer especially, instructions are packaged in a very broad manner and which take care of a wide range of learner in a classroom with less stress and time. Many students will be able to learn faster as the package takes care of various learners' interest at the same time. Teacher can handle a very large class conveniently as the teacher is guiding and displaying the instructional materials on the wall with the use of projector.

e. **Providing meaning and useful sources of information to teachers and learners:** Teachers are kept abreast and able to provide for reliable and useful information for the learners with the use of Computer Assisted Instruction, it can effectively be used to ultimate, shorten information from various sources for the purpose of comparison and contrasting ideas. It also helps in perception and retention of information or knowledge in the learners.

f. **It helps in developing a continuity of reasoning and coherence of thought:** Discipline is that integrated course of study which incorporates ideas from different disciplines, the employing of Computer Assisted Instruction helps the learners on providing integrated experiences, which may vary from, disciplines which make the end product of education more productive. Since students are exposed to the real nature of those concept or body of knowledge they tend to analyse and synthesize the body of knowledge for the proper application in their daily lives.

g. **It saves time and reduces verbalism or repetition of words:** Emma and Ajayi (2006) assert that "figurative speaking", instructional materials enable the teacher to be in more than one place at a time and to address several issues at a time. For example, a video material could be on while the teacher moves around to explain to individual students the subject contents in response to requests based on individual differences on

problems. While the video material continues, providing details of the assignment the teacher also becomes part of the listening audience. It reduces verbalism or repetition of word by the teacher without knowing their meaning and also adds variety in reinforcing verbal messages by providing a multi-media approach. This is because words or verbalization has been found to be inadequate for effective teaching. Computer Assisted Instruction, frankly speaking reduce the level at which the teacher should strive himself in the process of talking rather he guides the process of the instructions, and as a result saves his time in process of teaching.

h. **It is used to improve teaching methods:** The teachers of respective disciplines perfect not only their methods of teaching but also perfect contents and situations (activities) to be taught through employing of Computer Assisted Instruction. With the use of instructional materials, the teacher is able to edit, try and retry, alter and delete his activities to fit the standard of the students and also to effectively address the curriculum objectives. Instructional materials if properly utilize helps in giving direct contact with the realities of the learners both social and physical environments.

i. **To promote closer relations between the community and school:** The purpose of employing Computer Assisted Instruction is for the students to internalize the situational issues happening around their totality, the students will be able to identify crucial issues and address these issues if properly inculcated with the use of instructional materials.

2.11 Impact of ICT on Students' Academic Performance

The Information and Communication Technology age is driven by knowledge economy. This incites the education system to make considerable investment towards teaching and learning strategies by introducing the CAI in order not to be left out in the

trend. More so, there has been interest on how ICTs can be used to support teaching methods in order to enhance motivation towards learning and to measure the impact on students' academic performance. Based on studies conducted by researchers on the use of ICTs in social science subjects, of which Economics is one, their outcomes reveal that there is both direct and indirect effects of ICTs on learning based on students' and teachers' characteristics (Mbaeze, Ukwandu and Anudu, 2010).

According to Ben-Youssef and Dahmani (2010) based on several researches, there have being mixed results on the effects of ICT on students' academic performance. Coates and Humphreys (2004) and Astin (1999) compared the use of face-to-face method of teaching with on-line teaching of Economics after taking into account students' characteristics and selection bias. It was reported that the students in the traditional method class scored 15percent higher than those in the on-line class. Also, Terry, Lewer and Macy (2003) and Leuven, Lindahl, Oosterbeek and Webbink (2004) comparing three methods of: on-line, on-campus and hybrid methods of teaching, reported that there is no evidence of a relationship between increased educational use of ICT and students' academic performance. In fact, they found a consistently negative and marginally significant relationship between ICT use and some students' achievement measures. In addition, Brown and Liedholm (2002) surveyed students in a match pair of on-line and face-to-face principles of Economics course taught by the same teacher. They reported that exam scores after controlling for differences in students' characteristics are approximately 6percent higher for the on-campus format than for the on-line format. They attribute the relatively better performances in the on-campus class to the benefit of in-person teacher-student interactions, and also attribute the relatively poorer performance of the on-line students' class to the lack of self-discipline necessary for successful independent learning in the on-line environment.

However, Kulik (1994) reported that using meta-analysis study, the average students who use computer-based instruction scored higher than students without computers with an added advantage that the students also learnt more in less time and liked their classes more when computer-based instruction was involved. According to Li, LeBoeuf, Basu and Turner (2003) firstly, web-based instruction presents information in a non-linear style, allowing students to explore new information via browsing and cross-referencing activities. Secondly, web-based teaching supports active learning process as emphasized by constructivist theory. Thirdly, web-based education enhances understanding through improved visualization and finally, the convenience of using it anytime and anywhere.

Fuchs and Woessman (2004) used international data from the Programme for International Student Assessment (PISA). They show that while the bivariate correlation between the availability of ICTs and students' performance is strongly and significantly positive, the correlation becomes small and insignificant when other student environment characteristics are taken into consideration. The analysis of the effects of these methodological and technological innovations on students' attitude towards learning process and on students' performance seems to be evolving towards consensus according to an appropriate use of digital technologies in higher education, which can have significant positive effects both on students' attitude and achievement.

Furthermore, Sosin, Blecha, Agrawal, Bartlett and Daniel (2004) construct a database of 67 sections of introductory Economics, enrolling 3,986 students taught by 30 instructors across 15 institutions in the United States of America during the spring and fall semesters of 2002. They found significant but small positive impact on students' performance due to ICT use. But they show that some ICT seem to be positively correlated to the performance while others are not. A research conducted by

Anyamene, Nwokolo, Anyachebelu and Anemelu, (2012), Paul and Babaworo (2006), Karper, Robinson, Casado-Kehoe (2005), Egunjobi (2002) and Okoro and Etukudo (2001), on the effect of computer-assisted packages on the performance of senior secondary students in Mathematics, Chemistry, Geography and Counselling Education respectively indicated that students taught using CAI package performed significantly better than the control group in retention test. However, some of the studies conducted revealed that, the use of ICT significantly improves students' performance in respective subject areas while some proved otherwise. This study on the "Effects of ICT on Secondary School Students' Economics Performance in Kaduna State" will help in determining the current state of their findings.

2. 11.1 Students' Characteristics

There is a link between students' socio-economic characteristics and their educational performance. Socio-economic differences in terms of: age, gender, family structure, level of parents' education, geographical area, etc., have shown to have effect on the students' academic performance (Ben-Youssef and Dahmani, 2010). Several studies carried out by (Bratti, Checci and Filippin, 2007; Pozo and Stull, 2006; Coger, Conger and Elder, 1997; Haveman and Wolfe, 1995; Wilson, 1987) reveals that students who come from underprivileged socio-economic milieu have worse school performances than the less underprivileged students. The present study seeks to compare the performances of students in both the rural and urban centres to determine the impact of their socio-economic background on the learning of economics using ICT-Driven Instructional aids. Based on the foregoing, it can be deduced that ICT have impact on students' academic performance, if some other variables like age and gender that could affect it are controlled.

2.11.2 Teachers' Effectiveness in Using Computer Assisted Instructional Aids

Computer Assisted Instructional aids possess some inherent advantages that makes it unique in teaching and learning process. They provide the teacher with interesting and compelling platforms for conveying information since they motivate learners to want to learn more and more. Also, by providing opportunities for private study and reference, the learner's interest and curiosity are increasingly stimulated. Furthermore, the teacher is assisted in overcoming physical difficulties that could have hindered his effective presentation of a given topic. Bolick, Coutts and Heinecke (2003) asserted the good relationship between effective teaching and using of instructional materials such as CAI. He argued that "..... while some educators have been fascinated by the potential of instructional materials to enhance teaching and learning, teachers lagged behind in using instructional materials during teaching and learning process. Instructional materials are integrated components of teaching-learning situation; it is not just to supplement learning but to complement its process. It then shows that, if there must be an effective teaching-learning activity, utilization of instructional materials by teachers becomes necessary. Ema and Ajayi (2006) opined that " without the teacher who is knowledgeable, instructional materials cannot create change and progress but impact can be made only when the teacher begins to make use of it and allows it to take over its values". This portrays the professional attributes of the teacher and general knowledge or his creativity selecting, developing and use instructional materials effectively. Also, Brewster and Railsback (2001) in their review concluded that schools that provided high level of support for beginning teachers retained more teachers, recorded higher students' achievement test scores, higher quality teaching and increased teacher effectiveness. Anagolu, (2006) observes that students have problems on how to study mathematics. These problems emanate as a result of ineffective teaching strategies

adopted by teachers in teaching and learning process of mathematics at all levels of Nigerian educational institutions (Bankolere, 2006). This is further supported by Okafor (2002) and Okeke (2006) that major factors contributing to the poor performance of students in mathematics were identified amongst others are poor teaching methods used by teacher. According to Egbowon (2008) effective teaching needs full complement of supplemental resources to assist the teacher in every facet of preparation of his/her lessons and equally enhance learner' comprehension.

Further classifications of the outcomes expected of the teacher in using ICTs to enhance teaching were made by Selinger and Austin (2003) as personal, subject and teaching competencies. Personal competencies entail the skills, knowledge and understanding of when, when not and how to use ICT effectively in teaching a particular subject; i.e. skills in functions, operation, use and capability of ICT which supports teaching. Additional teaching competencies deals with the ability to plan, prepare, teach, assess and evaluate lessons in which ICT could be seen to be supporting a range of suitable learning outcomes. Several studies reveal that teacher's characteristics play a greater role on the use of ICT. Teacher characteristics refer to the educational level, teaching and computer experiences, age, gender, and financial position. A study by the National Centre for Educational Statistics (2000) in Berhane (2012) reported that teachers with fewer years of teaching experiences use computers than teachers of longer teaching experience. The report quantified it this way: teachers with three or less teaching experience use computers 48percent of their time, four to nine years of experience use 45percent of their time, ten to nineteen years of teaching experience use 47percent of their time and teachers with more than 20years of teaching experience use computers only 33percent of their time. The researcher reported that old teachers are technophobic towards the use of computers and some teachers because of

their beliefs consider the use of computer as a sin (Collis and Jung, 2003). Effectiveness of teachers in ICT integration can help to extend and explore their subject area, plan and prepare an effective lessons, enhancing their pedagogical expertise, adapt with the expansion of technology, increase their competence, skills and confidence, change their beliefs, make teaching a fun, promote digital education, stimulate student learning, generate fast information, build a body of knowledge and computer experience (Berhane, 2012).

2.11.3 Impact of Computer Assisted Instruction on Gender

The world of today promotes gender equity by improving access to education especially to females through girl-child education programmes. Based on the advantages of ICT in education, it becomes pertinent to consider its impact on gender performance. Several studies conducted on gender performance shows divergent opinions. For instance, the findings of Idowu, Adagunodo and Idowu (2004) in a case study titled “Gender Differences in Computer Literacy among Nigeria Undergraduate Students” showed that there is gender difference in computer study and experience. Tomte (2011) pointed out factors such as: access to the use of internet, community, parents’ influence, peer influence, social media, gaming, etc., responsible for gender differences in the use of ICT. Abdu-raheem (2012) reveals that there is no significant difference between the mean achievement scores of male and female students in both the experimental and control group. Contrary to the findings of Schumacher and MorahanMartin (2001) showing that females are less experienced with ICT’s and are more likely than males to have negative attitudes towards computers. Furthermore, male students prefer to study courses that require computer use more than female students and they show interest in programming and games playing. They were also more

experience at the ICT's use than girls, apart from e-mails where no significant differences were reported. Moreover, Shashaani (1997) examined some males and females about their interest in internet use and discovered that there was a great difference on the interest level between the two groups. Male respondents showed to be more interested in internet services and use than women. This was supported by Colley and Comber (2003) in their study on age and gender differences in computer use and attitudes among secondary school students in the UK found out that boys reported to have higher frequency of use of computers than girls. The study carried out by Anyamene, Nwokolo, Anyachebelu and Anemelu, (2012), Dantala (2006), Ash (2005) and Basturk (2005) on the effect of CAI packages on the performance of senior secondary students in mathematics, history and physics respectively revealed that there is no significant difference in the post-test performance scores of male and female students taught using CAI package.

2.11.4 Impact of Computer Assisted Instruction on Skills Acquisition

ICT has transformation tools which when used appropriately can promote the shift to a learner-centred environment. The acquisition of knowledge and skills will enhance continuous learning amongst students over their lifetime (Thomburg, 2000). Several studies revealed that integrating Computer Assisted Instructional aids into teaching-learning process will enhance computer skills acquisition amongst students. For instance, Ajuzie and Akukwe (2013) in their studies on the appraisal of student's computer skills acquisition after using some computer packages revealed that: students taught additional computer skills performed better than students taught the use of computer packages only. Also, female students who were exposed to additional computer skills such as "hands-on-computer" performed better than male students. The

result was in agreement with the findings of Video Education Australia (2005) that show that female students interact with the computer more than the male students. On the contrary, other studies conducted shows male students performing better in some computer skills than female students. For instance, Broos and Keith (2006) in a study on computer self-efficacy skills such as: downloading, new software, programming, etc; shows that male students performed better than female students. Other studies carried out by (Volman, Eck, Heemskerk, and Kuiper, 2005; CERI, 2010) shows that girls are most positive towards communicative-oriented tools, like creative writing and team work applications, while boys are more explorative in their use of ICT.

2.11.5 Impact of Computer Assisted Instruction on School Location

Several studies in the past two decades revealed that educational aspirations of students who study in the rural areas lag behind those of their counterparts in the urban centres (Haas, 1992; Stern, 1994; Kampits, 1996, Khattri, Rilley and Kane, 1997; Kannapel and DeYoung, 1999; Hu, 2003; Arnold, Newman, Gaddy and Dean, 2005). These could be as a result of some factors affecting the school location and the teaching methodology adopted by the teachers which affects the students' academic performance. To buttress these, related findings from other research conducted indicates that student from rural schools place less value on academics (Stern, 1994; Ley, Nelson and Beltyukova, 1996).

Teaching of science related courses such as Economics for vivid and maximal understanding of content by students has been a problem to teachers and educators for years now (Okoro and Etukudo, 2001). The search for methods and procedures for effective pedagogical approach have engendered developing new strategies such as; computer assisted instruction. In a related study conducted by Bhatti, Pareek and

Dhamija (2013) shows that computer assisted instruction is more effective in attaining Matrix Algebra than the conventional method. Furthermore, the study revealed that there is no significant difference observed in attaining Matrix Algebra between the students and urban students.

Computer Assisted mode of Instruction plays a significant role in improving academic performance. Evidence strongly supports the use of computer assisted instruction in the place of teaching science through the conventional method (Purushothaman, 2013; Idayavani and Shanthi, 2007; Chun-Yen, 2002; Vaidya and Ragarajan, 2001; Sansanwal, 1992; Mullick, 1985). Another important study by Subhash (2000) on “Effectiveness of Computer Assisted Instruction on Achieving Higher Cognitive Skills” submitted that CAI has the tendency to eliminate lingual, regional and ethical biases between teacher and students. Furthermore, a study carried out by Dange (2013) revealed amongst others that Computer Assisted Instruction as a method of teaching Science is equally effective for both boys and girls and as well as does not differ in its effectiveness for rural and urban students in developing study habits. In other words, computer assisted instruction enhances students’ academic performance equally both in the rural and urban schools.

2.11.6 Impact of Computer Assisted Instruction on Independent Learning

Independent learning is described as “self-regulated learning” which includes students having an understanding of their learning; being motivated to take responsibility for their learning; and working with teachers to structure their learning environment (Gorman, 1998; Candy, 1991; Bates and Wilson, 2002; Perry, Phillips and Hutchinson, 2006). Independent learning does not mean students merely working alone but rather being enabled, supported and the teacher is seen as a facilitator (Alexander,

Rose and Woodhead, 1992, Boekaerts, 1997; Williams, 2003). Though the use of ICT to facilitate independent learning amongst students is under-researched, however, there are some evidence from the General Teaching Council for England (2007) which reveals that though there were no quantitative evidence for the impact of using ICT on students outcomes but it notes that teachers reported that the students were highly motivated and engaged with the learning tasks. However, (Van Grinsven and Tillema, 2006; Hinds, 2007; Schunk, 2005; Allan, Cook and Lewis, 1996) shows that independent learning improved academic performance; increased motivation and confidence (Van Grinsven and Tillema, 2006; Black,. 2007); the stimulation of lifelong learning (Williams, 2003); allowing students to become more aware of and better able to manage their limitations (Zimmerman, 2002); enabling teachers to provide differentiated tasks for students (Deeson, 2006); and promoting social inclusion by countering alienation (Weekes and Wright, 1998). In addition, Becker (2000) found that ICT increases students' engagement, which leads to increased amount of time students spend working outside class time. Although caution is needed in interpreting the evidence base for these studies because some of the research methods used involved case studies and observation rather than experimental studies. The present study being an experimental research seeking to find the effect of ICT on enhancing the rate of independent learning skills amongst students will be relevant in either to support or debunk the above reviewed studies.

2.12 Definition of Economics

Economics is like some other disciplines cannot be adequately defined in a concise form due to its very wide scope. Though there attempts made by some of the following authors:

According to Smith (1776) in Ekpo (2006), the father of economics saw economics as “an enquiry into the nature and the causes of the wealth of nations”. At this time, emphasis was on material wealth and the wealthy nations were regarded as strong.

According to Price (1878) in Ekpo (2006), states “all have agreed that economics is concerned with wealth”. His view is similar to that of Adams Smith which is based on finding out the available resources and how they are explored.

However, Robbins (1963) in Abedi (2008) gave the universally acceptable definition of economics as “a science which studies human behaviour as a relationship between ends and scarce means which have alternative uses”. His definition of Economics as a science that studies human behaviour registers Economics as a science studying human economic behaviour such as consumption behaviour, production behaviour, investment behaviour, distribution behaviour, etc. It also states relationship between ends and scarce means. Ends are wants, which we know are unlimited in life while Means are the resources (factors of production) for producing goods and services. Factors are limited in supply, thus goods and services cannot be produced in unlimited quantities, and hence prices are used to allocate the few goods available. From the above definitions, it can be deduced that Economics is a subject that tries to study and solve the problems arising from decisions and choices of human beings in the situation of unlimited wants and in the face of scarce resources available to meet them. For the purpose of this study, the researcher will focus topics like: The Theory of Production and The Theory of Cost and Revenue which will be taught using the Computer Assisted Instruction (CAI).

2.13 Objectives and Benefits of Economics as a Subject in Secondary School

The curriculum of economics is designed by the Comparative Education Study and Adaptation Centre (CESAC) to meet the requirements of economics in the new system (Osunnaiye, 2005 cited in Yusuf, 2012). The theoretical foundation of economics has been integrated with the practical application which is meant to equip graduates of senior secondary school with the basic knowledge and skills that will enable them appreciate the nature of economic problems in any society.

According to Obemeata (1991) says Economics as a subject has various values to the learners and these values includes:

- **The Cultural Values:** Economics has some intrinsic value that makes it appealing as a school subject, for example; there is a great logic in it. It connects learners to the essentials of everyday life and it is also concern with almost tropical events such as International Monetary Fund (IMF), Structural Adjustment Programme (SAP).
- **Intellectual Training:** Economics also contribute to intellectual training because it involves looking at issues in a way which foremost new to people. Economics is not primarily a body of knowledge, but rather it is a method than a doctrine, an apparatus of mind, a technique of thinking which helps its possessor to draw correct conclusion.
- **Vocational Training:** The vocational nature of economics made it readily acceptable to students. Economics as a subject is of direct utility in many branches of industries and commerce. It is also an essential part of most professional examination like banking, accountancy and secretariat.

In addition, Adu (2002), the study of economics serves useful purpose in modern life such as:

- It gives us facts and shows us what may be expected to be the outcome of certain lines of actions.

- It helps us to decide which of the several alternatives to choose.
- It charged its recipient to make wise choice that will satisfy their needs in the presence of unlimited wants and limited resources.

From the above stated values and importance of economics as a subject to be taught to students in senior secondary schools, it becomes imperative for all stakeholders in the education system to ensure that adequate attention is given to the teaching of economics and how it is being taught so as to achieve the stated objectives for equipping the students and for national development.

Going by the Chief Examiners' general report (see appendix D), it revealed that the candidates' performed only at an average level in Economics from the year 2007-2010, which was below expectation. Observed students' weaknesses are: inability of candidates to express their points grammatically; lack of in-depth knowledge of subject matter; inability to draw and label relevant diagrams and graphs; and lack of knowledge of simple mathematical skills. Suggested measures amongst others are that the candidates should be adequately prepared as well as economics teachers should be encouraged to cover every aspect of the syllabus before WASSCE examination. When ICT-Driven Instructional aid is used as an integral element within the new format of the teaching and learning process of Economics it has numerous advantages such as enhancing the quality of teaching and making learning more immediate. This view is supported by Adeosun (2010) that when ICT is integrated into pedagogy there is quality improvement in two important dimensions: increase in the amount of subjects covered by existing curriculum, and through better pedagogy process (changes in the learning process). The latter includes developing new types of learning; ability to gather and manipulate information, problem solving, higher order thinking, critical and creative thinking and other necessary skills to interact in knowledge based economy.

2.14 Challenges of Teachers and Students in Teaching and Learning Economics in Secondary Schools

There has been several factors militating against the effective teaching and learning of economics in secondary schools today. Some of the factors are follows:

- **Inadequate Commitment of Teachers:** It is generally stated that no education system can rise above the quality of her teachers. There is therefore, need for teachers to be dedicated and committed to the teaching profession for effective service delivery. Teachers as key implementers of educational policies must see their role as paramount to the realization the goals of education. The nonchalant attitude of some teachers to teaching is seen in their unpreparedness to pedagogical activities; such as not making their lesson interesting and lively with their learners in the classroom. Student's attitude to studying economics determines the degree to which they pass economics and negative attitude towards the subject and the teacher will result to mass failure.
- **Bias and Subjectivity:** Some economics teachers find it difficult to eliminate bias and subjectivity while teaching the students. They try to influence the decision of the students, to suit their personal interest. For instance, when teachers are teaching topics like consumer behaviour, division of labour, inflation, etc., this leads to a situation whereby teachers make students to believe that consumers must always behave the same way in every situation regardless of factors surrounding them.
- **Value Judgements:** Some students cannot distinguish between fact and opinion. Since economics is concerned mainly with means and ends, people are interested

with how best they can compete with unlimited wants in the face of the limited resources. At times it is difficult to make judgement about moral implication behind individual choice and sacrifices e.g. Law of demand i.e., increase in demand will lead to an increase in price. Therefore, it is argued that economics can be taught without bringing in subjectivity.

- **Logic:** This involves the teaching of economics in a way that it applies to real life situation of the learners. The teacher needs to apply some techniques to economics teaching to solve the problems encountered by the learners in a convincing manner.
- **Preference:** Some teachers do select topics based on personal interest and how best the topics appealed to them. The choice of topics to be taught is therefore, being influenced by their subjectivity.
- **Difficulty of some aspects of the Subject:** There had been controversies over the teaching of economics in secondary schools. This was based on the belief that economic is too difficult because it involves abstract thinking and deduction and it assumes that the power of deduction and abstract thinking do not usually develop much before the age of sixteen. Therefore, students cannot be effectively taught.
- **Need for Simplification of some Content:** At a lower level, economics should be based on selection to make it simple but care should be taken not to further create abstraction which may lead to the exclusion of some advanced theory from the syllabus if the tendency is to teach what the student would understand. For instance, oligopoly and monopolistic competition which exist in real life but involves analysis may be difficult for the students to understand might make the teacher to concentrate on perfect competition and monopoly which is does not exist anywhere.
- **Negative Attitudes of some of the Ministries of Education:** Some of the Ministries of Education in Nigeria exhibit lack of interest in economics subject. For

instance, a survey was taken when subject inspectors were appointed for Mathematics and English language by various State Ministries of Education, it was found that only three states; Edo, Rivers and Kwara had inspectors for economics.

- **Inadequate Specific Conferences or Workshops for Economics Teachers:**

Some Ministries of Education in the country have not thought it necessary to organize or sponsor refresher courses or workshops or even conferences for secondary school teachers of economics. If economics is given adequate priority like subjects such as mathematics, Nigerian languages and sciences, then workshops, conferences and seminars will be organized for economics teachers. More so, economics is a subject expected to be taught virtually by all school and sat for in examination at least by 90percent of the candidates.

- **Lack of Association of Secondary School Teachers of Economics in Nigeria:**

All secondary school subjects which are regarded as established and important have associations. For example, Science Teachers Association (STAN), Mathematics Teachers Association (MAN), teachers in French which is known to have few students in secondary school, have an association. The points highlighted above can be regarded as institution professional factors could be responsible for low recognition of Economics as a subject.

- **Inadequate Teaching and Learning Materials on Teaching of Economics:**

The teaching of economics is characterized by many inadequacies. Some Nigerian secondary school teachers of economics have few materials on the teaching of economics to work with. For example, audio-visual aids for the teaching of economics are either not available, insufficient in quantity or that what is available is inappropriate in some schools. It can be said with the exception of few

economics textbooks written in Nigeria, most are badly written, sketchy, and lacking in in-depth for economic analysis (Adapted from Yusuf, 2012).

2.15 Empirical Studies

Several scholars and researchers have carried out series of studies on or in relation to the “Effects of the ICT on Secondary School Students’ Economics Performance in Economics in Kaduna State” and some of the studies have been reviewed in this section to determine their relevance to this work and identify differences in their findings.

Cox, Preston, and Cox, (1999b), conducted a study on “What Factors Support or Prevent Teachers from Using ICT in their Classrooms? The purpose of the study was to ascertain those factors that motivate or hinder teachers in the effective and efficient use of ICT facilities in teaching-learning process. A survey design was employed and the instrument for data collection was a questionnaire. A total number of 135 copies of the questionnaire were administered of which, only 82 were returned. The result of the study indicated that: ICT makes learning to be more interesting, more diverse, increases learning, improves presentation of materials as well as increases motivation amongst students.

The above study is of relevance to this research because the current study seeks to determine if the use of Computer Assisted Instruction by teachers has any effect on students’ performance in economics. One of the research questions sought to determine if the use of CAI will enhance students’ academic performance in economics than the use of conventional method of teaching. The point of difference of the conducted research with this study is that, it was carried out in a primary school while this present

study is to be carried out in secondary schools. Also, a survey design was used in the above study while the current study seeks to use a quasi-experimental design.

Also, Ilomaki, Hakkarainen, Lakkala, Rahikainen, Lipponen, and Lehtinen, (2002), conducted a research on “Uses of New Technology across Genders and Generations: Comparing the Development of Students and Teachers’ ICT Skills and Practices of Using ICT”. The purpose of the study was to examine the development of skills and practices of using ICT among students and teachers in schools in Helsinki in 1997/1998 and in 1999/2000. The objective was to examine the use of ICT resources both at school and at home, self-reported ICT skills and ICT usage for learning and teaching. A self-reported questionnaire was constructed for assessment. The participants were 494 and 365 teachers from 32 Finnish schools, and 910 and 365 students from six (6) lower and upper secondary schools. The results indicated that the average level of both teachers’ and students’ self-reported ICT skills improved, but females’ self-ratings on several categories were lower than those of their male peers at both times of assessment.

The study above is related to this study because it seeks to find out if using ICT both at home and in school will enhance the teachers and students skills. While this study also seeks to find out if the use of CAI in teaching Economics will enhance the acquisition of independent learning skill amongst SS2 students. Therefore, the level of usage of ICT both at home and in school will influence their rate of independent learning skills because practice makes perfect. The area of difference is that the study above used self-reported constructed questionnaire while this study seeks to use an Economics Achievement Test (EAT).

Furthermore, Harrison, (2002), carried out a study on “The Impact of ICTs on Pupils Learning and Attainment”. The purpose of the study was to determine the effect

of ICT on pupils' performance. Analysing the use of ICT on their performance, National test and GCSE's (General Certificate of Secondary Education) was used. The project ran from 1999 until 2002 and involved 60 schools in England. The result shows that ICT has impact mostly in primary schools' English language and Science.

The study above conducted has much relevance to this on-going research that seeks to find out the effect of ICT on students' academic performance in economics. The point of departure from this study is that the above research was conducted in a primary school using pupils and also using all the subjects while the current study is based on SS2 students offering Economics alone.

Iloimäki, Lakkala, and Lehtinen, (2004), conducted a research on "A Case Study of ICT Adoption within a Teacher Community at a Finnish Lower-Secondary School". The purpose of the study was to investigate how teachers adopt ICT as a pedagogical tool, what consequences the intensive use of ICT has for teaching practices, and how the use of ICT diffuses in a teacher community through an instrumental case study. The result of the study indicated that the intensive use of ICT had several effects on the teacher community. Almost all the teachers acquired the necessary technical ICT skills, and the majority of teachers used ICT with students. The result also showed that the pedagogical practices varied, depending on the teachers' interest and pedagogical thinking.

The above study conducted has relationship with the on-going study because it seeks to find out how teachers are effective and efficient in the use of ICT instructional aid. This study intends to find out the "Effects of ICT on Secondary School Students' Economics Performance". Teachers' effective use of ICT in teaching will in one way or the other determine students' rate of learning and academic performance. The area of difference of the above study and this study is in terms of investigating the effect of the

use ICT by teachers on the pedagogical practices of teachers while the current study seeks to find out the effects of the use of CAI on students' performance. Also, the research instrument used above was an instrumental case study while this current study intends to use Economic Achievement Test "EAT".

In another study, Ilomaki, and Rantanen, (2007), conducted a research on "Intensive Use of ICT in Lower Secondary School: Development of Students' Expertise". The purpose of the study was to examine the effect of intensive use of portable computers on development of students' high-level computer skills in ICT. The data consisted of semi-structured interviews, self-evaluation questionnaires, and qualitative analysis of students' written production. The results of the study indicated that the intensive use of ICT and a process-oriented learning environment supported the development of students' expertise in ICT.

The study conducted above relates to the present one because it seeks to find out how the use of ICT will enhance a high level computer skill acquisition amongst students while the current study seeks to find out the effect of CAI on enhancing acquisition of independent learning skills amongst SS2 students. The point of difference here is that while the study above is investigating the students' level of skills in using ICT in learning in junior, this study seeks to find out how CAI will enhance acquisition of independent learning skills amongst SS2 students.

In addition, Ilomaki, (2008), conducted a comparative study on "The Effects of ICT on School: Teachers' and Students Perspectives". The purpose of the study was to find out how the various elements influence the school; elements such as students' and teachers' ICT skills and usage, ICT in teaching and learning practices, ICT adoption within a teacher community and an overall change process in school. Two (2) questionnaires were constructed as instrument. In general, the results showed that

students are capable and motivated users of new technology. The technical resources for using ICT both at home and at school are very good.

The study above conducted has relevance to the present study because it seeks to find out how the students' and teachers' skills in using ICT in teaching and learning process will influence the school. This study also seeks to determine the impact of CAI usage by teachers in teaching Economics and how it will influence students' performance based on school location. The point of departure of the above conducted study from this study is that it is a comparative study between students' perspectives and the teachers' perspectives and also, it seeks to find out the changes the use of ICT will bring to the school.

In a related study, Nwoke and Uzoma (2011) conducted a research on "Impact of Computer-Assisted Instruction on Students' Attitude to Mathematics" in Port-Harcourt, Rivers State. The purpose of the study was to determine whether students taught Mathematics with computer-assisted instruction will have improved attitude towards Mathematics. The researchers adopted the experimental research method using two groups; pre-test, post-test/control design. The data for the study were collected using a questionnaire titled "Computer-Assisted Instruction usage and Students Attitude towards Mathematics" (CAISAM). The result shows that calculated T value (0.96) is less than the table value (2.021), meaning that, the use of computer-assisted program in teaching of Mathematics enlivens the attitude of the students towards the subject.

The study conducted above is very much related to the on-going study because it deals with impact of computer-assisted instruction on students' attitude towards Mathematics of which SS2 students were the targeted population; while the present study is on the effects of ICT on the performance of students in Economics of which SS2 students are the targeted population. The points of differences are; the conducted

research took place in the south-south zone (Rivers State) of Nigeria while the on-going study will take place in the north-west zone (Kaduna State) of Nigeria. Furthermore, the conducted study was based on impact of computer assisted instruction on attitude of students towards learning Mathematics, while the on-going study is on the performance of students in Economics.

Nwike and Chukwudum (2011) carried out a study on the effect of Computer Assisted Instruction (CAI) on students' achievement in secondary school agricultural science. The objectives of the study were to determine the effect of CAI on students' achievement in selected topics in SS3 agricultural science and also, its effect on male and female students' achievement in selected topics in SS3 agricultural science. The research design was quasi-experimental and the instrument for data collection was Agricultural Science Achievement Test (ASAT). The result showed that the academic ability of the experimental and control groups were equal before treatment but differ after treatment, with the experimental group performing better and both gender performed equally. The point of relationship of the above study with this present one is that, both seeks to determine effect of computer-aided instruction on students' academic performance of male and female in senior secondary schools, while the studies differ from each other on the basis of the subjects used for the study.

Another study was conducted by Ezekoka and Okoli (2012), on the use of computer in teaching and learning in secondary schools in Imo state. The purpose of the study was to examine if the modern philosophy of education can be achieved through computer-aided instruction (CAI). It also set out to investigate the effect of the use of computer on the academic performance of secondary school students. An experimental research design was used and the instruments for data collection were multiple-choice questions designed by the researcher, and an oral interview held after the experiment

with some students. The result of the t-computed was 25.33, which is greater than t-critical of 2.064. The result shows that students taught with computer performed better than those taught without computer. The above study conducted is very much related to this research because it is based on finding out the effect of the use of Computer-aided instruction on academic performance of secondary school students; while the current study seeks to find out the differences in performance between SS2 students taught Economics with the use of CAI and those taught without the use of CAI. The only point of departure of the conducted study from this present one is that it was carried out on oral English while this study is on some topics in Economics.

Similarly, Anyamene, Nwokolo, Anyachebelu and Anemelu (2012) carried out a related research on the “Effect of Computer-Assisted Packages on the Performance of Senior Secondary Students in Mathematics in Awka, Anambra State, Nigeria”. The purpose of the study amongst others was to determine the retention achievement scores of students taught using computer-assisted instruction and those taught using conventional method. A quasi-experimental (pre-test-post-test) group research design was adopted for the study. The research instrument was made up of Algebra Achievement Test (AAT). The results indicated that students taught using computer assisted instruction package performed significantly better than their counterparts taught using the conventional method of instruction in the retention test. Furthermore, the study revealed that there is no significant difference between the mean achievement scores of male and female students taught Mathematics (Algebra) with CAI package. The above study conducted which seeks to find out the “Effect of Computer Assisted Instruction Packages on the Performance of Senior Secondary students in Mathematics” is very much related to the present study which seeks to investigate the “Effects of Computer Assisted Instruction on the Performance of Students in Economics in

Secondary Schools” and likewise the differences in performances of male and female SS2 Economics students taught with the use of CAI. The point of departure from the on-going study is that while the above conducted research was based on Mathematics students, the on-going study is based on Economics students. More so, while the above conducted study was carried out in Anambra state, the present study is carried out in Kaduna state.

Yusuf, Kajuru and Musa (2013), conducted a study on the “Effect of a Computer Mediated Systems Teaching Approach on Mathematics Achievement of Engineering Students in Nigerian Polytechnics” in Kaduna Polytechnic, Kaduna State. The purpose of the study was to determine the Mathematics Achievement Level (MALs) of students taught Mathematics using the Computer Mediated System Teaching Approach (CMSTA) and those not taught with the same approach and secondly, to determine whether the MALs of the male and female students taught mathematics using the CMSTA differ. A quasi-experimental research design was adopted to carry out the study. The instrument for data collection was the Mathematics Achievement Test I and II (MATs I and II). Pre-test and post-test of Non Equivalent Groups Design (NEGD) was used in line with the guidelines and based on steps outlined by Gall (1996). The result showed that students taught mathematics using the CMSTA significantly outperformed those not taught with the same approach. Secondly, the result revealed that the male students taught mathematics using the CMSTA significantly outperformed their female counterparts. The above study conducted has relevance to the on-going research because it’s based on the effect of computer mediated systems teaching approach on learning mathematics, while the on-going research is also based on finding the effect of CAI on the performance of male and female students in Economics in senior secondary schools. The point of difference is that the above conducted study was

on mathematics while the on-going research is on Economics as a subject. Secondly, the above conducted research was carried out using Polytechnic students as population while the on-going research seeks to use Senior Secondary School Students.

In a related research, Yusuf, Maina and Dare (2013) conducted a study on “Assessment of the Availability, Utilization and Management of ICT facilities in Teaching English Language in Secondary Schools in Kaduna State, Nigeria”. The purpose of the study amongst others was to ascertain the level of use of ICT facilities in teaching English Language in Secondary Schools. A descriptive research design was used for the study. The instrument for data collection was a structured questionnaire for teachers tagged “Availability, Utilization and Management of Information Communication Technology in Teaching English Language in Secondary Schools” (AUMICTSS). Descriptive statistics, frequency count and simple percentages were used for data analysis. The result shows amongst others that schools with computers do not have the relevant educational software required by their students.

The study conducted above is closely related to this current study because the conducted study seeks to ascertain the level of use of ICT facilities in teaching English Language in Secondary Schools in Kaduna state while the present study seeks to investigate the effect of the use of Computer Assisted Instructional aids on the performance of SS2 Economics students in Kaduna State.

The point of departure was that while the research conducted was based on availability, utilization and management of ICT facilities in teaching English Language and hence used a descriptive research design, this on-going research is based on effects of the use of ICT on SS2 Economics students and hence, a pre-test post-test quasi-experimental research design

2.16 Summary

This chapter has attempted to review works related to the research area. The study is built on the Technological Pedagogical and Content Knowledge (TPACK) theoretical framework developed by Mishra and Koehler (2006). The theory captured the essential qualities of knowledge required by teachers for technology integration into teaching and learning process. Likewise, it addresses the complex multifaceted nature of teacher's knowledge. The objectives of ICT in education were stated, such as using ICT tools to increase efficiency and effectiveness of the school system amongst others. The study revealed argument of some researchers that computer alone cannot make the difference in teaching-learning process, but rather, the difference is made in the pedagogical methods employed by the teachers with the use of ICT facilities. The review shows that computer is only a supporting tool to teachers' traditional method of teaching. The study reviewed teaching Economics as a subject and the challenges facing the teacher in a classroom situation as well as students' performance in Economics at final examinations. Furthermore, the chapter looked into how Computer Assisted Instructional Aids can enhance effective pedagogy in the school system.

This chapter was concluded by reviewing empirical studies carried out by some researchers which revealed that ICT tools have significant impact on students' learning ability, thereby resulting to better performance academically. It was obvious that using ICT-driven Instructional facilities enhance skills acquisition in learners although female students were lower in rating than the male students in assessment but there were cases also where both gender performed equally. Some teachers are found to have "technophobia" attitude due to factors that makes them think computer is difficult to learn or otherwise seen as an additional burden to their work amongst others. Lastly, the review showed that many schools lacked CAI facilities, while some having the CAI

facilities are not making effective and efficient use of them due to factors such as poor maintenance and lack of professional development on the part of the teachers in integrating CAI into the classroom teaching and learning process.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter discusses the methodology used to carry out the study. The methodology is in respect of: research design, population, sample and sampling technique, research instrument, validity of the research instrument, pilot study, reliability of the instrument, method of scoring, and methods of data analysis.

3.2 Research Design

The research design for this study is the two by two pre-test, post-test quasi experimental control group. The quasi experimental method involves the manipulation of one or more of the independent variable (Effects of ICT on Secondary School Students' Economics Performance in Kaduna State) (Kolo, 2003). The pre-test-post-test equivalent group design involving four (4) cluster groups of intact classes having co-educational students was used.

3.3 Population

The population of the study comprises all senior secondary school students in year two (2) in the twenty-three (23) Local Government Education Areas (LGEA's) of Kaduna State. Obeka (2011) asserted that population is made up of all conceivable elements, subjects or observations relating to a particular phenomenon of interest to the researcher. Hence, the population comprises all year two (2) Senior Secondary School students offering Economics in all the Public Secondary Schools of Kaduna State.

Kaduna State which is made up of twenty-three (23) Local Government Educational Areas (LGEAs) is divided into twelve (12) Educational Zones. Therefore, the total population of Public Senior Secondary School two (2) students in Kaduna state is twenty-three thousand four hundred and sixty students (23,460). The breakdown of the twelve (12) Educational Zones and statistics of the population are shown in Table 3.1.

Table 3.1 Breakdown of Educational Zones in Kaduna State

Birinin Gwari	Birinin Gwari
Rigachikun	Igabi
Sabon Tasha	Chikun
Kaduna	Kaduna North and South
Anchau	Makarfi, Ikara, Kudan, Kubau and Kajuru
Zonkwa	Zangon Kataf
Kachia	Kachia and Kagarko
Giwa	Giwa
Zaria	Zaria and Sabon Gari
Godogodo	Gwantu and Kaura
Lere	Saminaka, Soba and Kauru
Kafanchan	Jema'a and Jaba

Source: Office of DPRS; Kaduna State Ministry of Education, 2014.

Table 3.2 Population of Public Senior Secondary School Two (2) Students by Gender in LGEA's in Kaduna State

LGEA	Boys	Girls	Total
Birnin Gwari	210	130	340
Chikun	654	714	1,368
Giwa	169	40	209
Igabi	888	401	1,289
Ikara	318	82	400
Jaba	344	240	548
Jema'a	884	602	1,486
Kachia	416	281	697
Kaduna North	793	1,279	2,072
Kaduna South	706	1,281	1,987
Kagarko	969	704	1,673
Kajuru	368	218	586
Kaura	527	415	942
Kauru	326	194	520
Kubau	363	207	570
Kudan	342	59	401
Lere	647	414	1,061

Makarfi	400	73	473
Sabon Gari	1,972	2,341	4,313
Sanga	185	140	325
Soba	89	28	117
Zangon Kataf	456	367	823
Zaria	711	513	1,224
Total	12,737	10,723	23,460

Source: Ministry of Education: Kaduna State School Census Report 2011/2012

3.4 Sample and Sampling Technique

A sample size of two hundred (200) students was drawn from the total population of twenty-three thousand four hundred and sixty (23,460) economics students in senior secondary schools two (2) in Kaduna State. Jen (2002) asserted that sampling is drawn on the basis of phenomenon spread over a wide area for the purpose of getting clearer understanding. He further clarified that 10% or less could adequately be used to represent a group, if it covers the characteristics intended to be investigated. A stratified random sampling technique was adopted to select groups in the population and for schools with Computer Assisted Instructional aids for adequate representation and meaningful comparison to be carried out (Gay, 2000). The sampling was based on only senior secondary schools in the state having Computer Assisted Instruction facilities for classroom instruction. Kaduna State has twenty-three (23) LGEA's which is divided into twelve (12) Educational Zones. A total of four (4) co-educational schools from two (2) Educational Zones with intact classes were selected: Two (2) in the urban centre and Two (2) in the rural settlement (see appendix v, vi & vii). The sampled population of four (4) schools was divided into four (4) groups A, B, C & D i.e.; two experimental groups (A and C); and two (2) control groups (B and D). Hence, one public urban school (Group A) served as experimental group (i.e. Government Commercial College, Zaria) while one public school (Group B) in the rural area served as control group (i.e. Government Secondary School, Kudan). On the other hand, one public school (Group C) in the rural area served as the experimental group (i.e. Yusuf

Aboki Secondary School, Shika) and another public school (Group D) in the urban area served as the control group (i.e. Barewa College, Zaria), and hence, intact SS2 classes was used in all the schools. This was done to ensure that every student have equal chances to participate actively in the study; secondly, to obtain unbiased assessment of students' performance and thirdly, the study can have a good varied ability groups among the subjects under study. This grouping was supported by the categorization used by Mahmood (2006) and Obeka, Lakpini and Gadzama (2012). Both the experimental and the control groups were first administered with a pre-test on the theory of production and theory of costs and revenue. The two (2) experimental groups were taught by the researcher these topics in Economics (The Theory of Production and The Theory of Cost and Revenue) for a period of eight (8) weeks, using Computer Assisted mode of Instruction (CAI) as a supplementary strategy while the control groups was also taught the same topics in economics using the conventional method of teaching being guided by a structured lesson plan in the classroom (see appendix iv). During the experiment period, the experimental group received the treatment of independent variable, i.e. Computer Assisted Instruction. The four (4) groups after a period of eight (8) weeks teaching were administered with an achievement test in Economics to observe the students' performance. Hence, a total number of two hundred (200) sampled Economics students were used. The breakdown of the sampled schools and students is shown in Table 3.4.1.

Table 3.4.1 List of Sampled Senior Secondary Schools with CAI Facilities in Zaria and Giwa Educational Zones of Kaduna State

Name of School	Zone	Pop. of Male SS2 Students	Pop. of Female SS2 Students	Total No. of Students	Sampled No. of Students
Govt. Comm. College	Zaria	35	15	50	50

Barewa College	Zaria	460	-	460	50
YASS Shika	Giwa	109	57	166	50
GSS Kudan	Giwa	180	40	220	50
Total		784	112	896	200

3.5 Instrumentation

The research instrument used for the purpose of this study is: Economics Achievement Test (EAT) which served as pre-test and post-test instrument (see appendix ii). Economics Achievement Test which contains fifty questions in all consists of forty multiple choice items and ten items of fill in the blank short answers were used to derive answers to research questions and to test hypotheses one to six (1-6). The EAT questions were teacher-made test on two selected units in Economics: The theory of production, the theory of costs and revenue were both structured from the Federal Capital Territory Senior Secondary School Two (2) Teaching Schemes (see appendix viii). Hence, the main instrument used for the treatment and control groups is the EAT for data collection.

3.5.1 Validity of the Instrument

To ensure face and content validity of the instrument, the research instrument: “Economics Achievement Test” questions were given to the three (3) supervisors and some experts in educational measurement and statistics who are computer literate for vetting. To ensure content, face validity and appropriateness, some questions were modified and re-structured to reflect the nature of the work. More so, some questions were compressed and modified, while some were expatiated for comprehensiveness by the supervisors and experts.

3.5.2 Pilot Study

A pilot study using the pre-test and post-test was conducted in one (1) selected public co-educational senior secondary schools (Government Day Secondary School, Aminu) in Zaria educational zone of Kaduna State . Students in SS2A intact class were used as the experimental group and students in SS2B intact class were used as the control group to determine content validity and reliability. The experimental group was taught by the researcher using the Computer Assisted Instructional aids and also the control group was also taught by the researcher (to control variation in instruction, lesson material and topic coverage) for a period of two (2) weeks .This was supported by Angrist and Lavy (2002) study on testing for relationship between class size and students' performance of which the need to control variation in instruction, lesson material and topic coverage by using the same instructor was adopted. Economics Achievement Test (EAT) was administered to both the experimental and control groups on the Theory of Production for data collection. With the trial test, the researcher was able to determine the appropriate timing (duration) for each test as well as identify any problem which may affect the effective administration of the instruments during the actual experiment. The "EAT" took about one hour (1hr). This is the average of time it took the first and last students to finish the paper during the pilot testing.

3.5.3 Reliability of the Instrument

The reliability of the instrument is to help ascertain the consistency of the results obtained over a period of time. The reliability of the instrument yielded a Pearson's Product Moment Correlation co-efficient of 0.87 which was considered reliable.

3.6 Administration of the Instrument

In order to carry out a proper administration of the instruments, the researcher sought permission from the Ministry of Education (Honourable Commissioner for Education) through the Zonal Inspectorate Divisions of Zaria and Giwa educational zone. Based on approval, the researcher carried out a briefing session with the research assistants to intimate them and train them on how the EAT is to be administered. The “EAT” was administered immediately at the end of the periods of teaching to students that made up the sample by the researcher, with the help of the research assistants in respective schools. The instrument was retrieved on spot or immediately to avoid loss.

3.7 Method of Scoring

The pre-test and post-test results were scored over one hundred (100). Two marks were awarded to each correct answer to the Economics Achievement Test (EAT). The pass mark used was forty (40) marks (see appendix iii).

3.8 Methods of Data Analysis

The data collected for this study were analysed using various statistical methods among which were summary statistics of means and standard deviations (descriptive statistics) used to answer the research questions. The hypotheses were tested with inferential statistics. Specifically, hypothesis I was tested with the Covariance analytical procedure because of the need to eliminate the influence of any exogenous variable in the finding. The remaining hypotheses II, III, IV, V and VI were tested with the two sample t-test because of the two independent groups involved. All the hypotheses were tested at 0.05 level of significance for acceptance or rejection

CHAPTER FOUR

DATA ANALYSIS, RESULTS AND DISCUSSIONS

4.1 Introduction

This chapter presents the data analysis and results of the statistical analysis of data from the experiment on “Effects of Information and Communication Technology (ICT) on Secondary School Students’ Economics Performance in Kaduna State”. The presentation of results revolved round the research questions of the study and the hypotheses. Two groups of students were involved in the study. One group was taught with the conventional method (Control) while the other group was taught with the Computer Assisted Instructions (Experimental). Three major variables of academic performance by the two groups of students were measured. These were the academic performance, the speed of completing the selected assigned task and the rate of acquisition of independent learning skills. Four senior secondary schools selected from urban and rural areas of the state were involved in the study. One each from urban and rural served as experimental and control. Two schools were therefore, involved in each of the two groups. Data on performances were collected before and after the experiment. While the data on speed and the rate of acquisition of independent learning skills were collected after the experiment. Findings from the test are presented with discussions at the end.

4.2 Answers to Research Questions

Effects of Information and Communication Technology (ICT) on Secondary Schools Students’ Economics Performance in Kaduna State.

The major objective of this study is to determine the effects of Information and Communication Technology (ICT) through the Computer Assisted Instructions (CAI) on the performance of students in Economics at the Senior Secondary Schools level of Kaduna State. This objective was broken down into six specific objects which were investigated with the following research questions:

Research Question one: What is the effect on the performance of SS2 students taught Economics with the use of Computer Assisted Instruction and those taught without the Computer Assisted Instruction? In determining whether SS2 students taught Economics with the use of Computer Assisted Instruction performed better than those taught with the conventional method, the mean performance scores of the two groups after the experiment were computed and compared as shown in Table 4.1.

Table 4.2.1: Mean scores of SS2 Economics students in the selected Economics concepts before and after exposition to the Computer Assisted Instruction.

Status in the experiment	N	Mean	Std. Deviation	Std. Error
Control	100	34.64	10.812	1.081
Experimental	100	61.79	10.317	1.032

The table 4.2.1 revealed that students who were exposed to the Computer Assisted Instructions performed better in Economics when compared with their counterparts who were taught with the conventional method. This higher score gain clearly shows that the Computer Assisted Instructions has more effect on students' performances in Economics in the selected Senior Secondary Schools than those who were taught with the conventional method. It could, however, be said that Computer Assisted mode of

Instruction has major impact in enhancing the academic performance of students in Economics.

Research Question two: What is the effect on speed of solving questions in Economics amongst SS2 students taught with the use of Computer Assisted Instruction and those taught without Computer Assisted Instruction? The examination of the difference between the use of Computer Assisted Instruction and the conventional method of instruction on improving the speed of solving questions in Economics among SS2 students in Economics was carried out by looking at the reduction of time spent in solving the questions in Economics and comparing the speed of the students in the experimental group in the selected Economics concepts and those in the control group who were taught using the conventional method. The mean scores of the students in the two groups on the speed attained in solving the problems in Economics are tabulated in Table 4.2.2.

Table 4.2.2: Mean scores of the two groups of SS2 students on speed of solving questions in Economics.

Status in the experiment	N	Mean	Std. Deviation	Std. Error
Control	100	56.50	6.041	0.604
Experimental	100	41.35	4.430	0.443

The table revealed that the time reduction of students who were exposed to the computer assisted instruction was lower than those who were taught with the conventional method. The variability in the time spent in solving the questions in Economics among students exposed to the Computer Assisted Instructions was 15.15 minutes lower than the time spent by their counterparts in the control group. This means that the use of Computer Assisted Instructions could be said to have greatly improved

the speed by which students in the experimental group completed their tasks. In other words, the computer Assisted Instruction method helped to reduce the amount of time spent by Economics students in solving specific Economics tasks.

Research Question three: What is the effect on the rate of independent learning skill acquisition between SS2 Economics students taught with Computer Assisted Instruction and those taught without the Computer Assisted Instruction? The examination of the effect of the use of Computer Assisted Instruction on improving independent learning skills among SS2 Economics students was carried out by looking at the ability of the students to manipulate the computer system to learn through the programmed lesson by their Economics teacher and comparing the skills with those who were in the control group who learnt through the teacher with the use of conventional method. The scores of the independent learning skills were rated on a five points rating scale with 5 for the highest score (see appendix ix). The mean scores of the students taught with the Computer Assisted Instruction and those in the control group are presented in Table 4.2.3 along with their corresponding standard deviations and standard errors.

Table 4.2.3: Mean scores of SS2 Economics students in the experimental and control groups on the rate of independent learning skill acquisition

Status in the experiment	N	Mean	Std. Deviation	Std. Error
Control	100	1.47	1.068	0.107
Experimental	100	4.23	0.886	0.089

From the mean scores in the table, it could be said that almost all the students who were taught with the Computer Assisted Instructions performed better practically because they could operate the devices to source for more knowledge and practice some questions in Economics after the experiment, compared with the students in the control group who depended more on the information provided by the teacher in the

conventional classroom teaching process. This fact is clearly indicated with the score where those taught with the CAI had 4.23 with a standard deviation of 0.886 compared with their counterparts in the control group with a mean score of 1.47 with a standard deviation of 1.068. The mean scores clearly indicated that the Computer Assisted Instruction had a major enhancement in the acquisition of independent learning skills among students in the experimental group. In other words, the use of CAI in the teaching of Economics has the potential of increasing students' rate of independent learning skill acquisition in the Senior Secondary Schools of the State.

Research Question four: What is the effect of the use of Computer Assisted Instruction on gender mean performance scores of SS2 students in Economics? To find out the effect of Computer Assisted Instruction on gender mean performance scores of SS2 Economic students, the performances of students in the experimental group who were taught with the CAI were compared on the basis of sex after the experiment. In Table 4.2.4, the mean performance scores of the male and female students who participated in the Computer Assisted Instructions are presented along with the respective standard deviation and standard errors.

Table 4.2.4: Mean performance scores of male and female SS2 Economics students who participated in the Computer Assisted Instructions

Sex	N	Mean	Std. Deviation	Std. Error
Male	51	62.41	11.111	1.556
Female	49	61.14	9.493	1.356

There is not much variability in the observed mean in the table. This is a clear indication that the two groups (male and female students) benefited equally in the use of the Computer Assisted Instructions for teaching the subject in the selected schools.

However, the significance of the observed variability in the mean is subjected to statistical test in the related hypothesis. From the scores, it could be said that the use of Computer Assisted Instructions for teaching Economics has equal enhancement on the academic performance of male and female students in the selected Senior Secondary Schools.

Research Question five: What is the effect on the mean performance scores of rural and urban SS2 students taught Economics with Computer Assisted Instruction? To find out the differences in the mean performance scores between rural and urban SS2 students in Economics with respect to the use of Computer Assisted Instruction, the performances of SS2 students taught Economics with Computer Assisted Instruction after the experiment were compared on the basis of their school location. Only the experimental group were involved in this comparison. The mean scores of the groups based on their school location along with the corresponding standard deviation and standard error are presented in Table 4.2.5.

Table 4.2.5: Mean performance scores of SS2 students in Economics taught with Computer Assisted Instruction based on the location of their Schools

Location	N	Mean	Std. Deviation	Std. Error
Urban	50	61.80	10.757	1.521
Rural	50	61.78	9.968	1.410

The mean scores by the two groups in the table are basically equal. This is a clear indication that location of schools does not really have significant effect on the impact of the Computer Assisted Instructions in enhancing students' performances in the subjects when they are exposed to the method. It could, therefore, be concluded that the efficacy of Computer Assisted Instructions on students' academic performance in

economics has no bearing on the school location. In other word, whether a school is located in urban or rural area, once the students are exposed to the use of the CAI, the impact on their performances is likely to be of the same magnitude.

Research Question six: Is there any effect of the use of Computer Assisted Instruction on the rate of acquiring independent learning skills between male and female SS2 students in Economics? To find out the difference between male and female SS2 students' rate of acquiring independent learning skills in Economics with the use of Computer Assisted Instruction, the scores on independent learning skills acquisition by students in the experimental group were selected and compared on the basis of sex. As earlier pointed out, the independent learning skills acquisition was rated on a five point scale (see appendix ix). Table 4.2.6 shows the mean scores of the groups with their corresponding standard deviations and standard errors.

Table 4.2.6: Mean scores of male and female SS2 students on independent learning skill acquisition in Economics when exposed to Computer Assisted Instructions

Sex	N	Mean	Std. Deviation	Std. Error
Male	51	4.25	0.935	0.131
Female	49	4.20	0.841	0.120

The mean score of the male (4.25) in the table is almost the same with that of the female (4.20) with only 0.05 as the observed variability in the mean scores. This would indicate that the rate of independent learning skills acquisition by the two groups (male and female students) was practically the same. This means that the acquisition of independent learning skills enhanced by the use of the Computer Assisted Instruction was not seriously influenced by their gender. In other words, the male and female students did not perform differently in their acquisition of independent learning skills

when exposed to the use of the CAI method of teaching Economics in the selected schools.

4.3 Hypotheses Testing

The hypotheses formulated to test the effects of Information and Communication Technology on Secondary Schools Students' Economics Performance as well as on their speed and independent learning skills acquisition are carried out in this section. The hypotheses testing were conducted as follows:

Hypothesis I: There is no significant difference between the performance of SS2 students' taught Economics with the use of Computer Assisted Instruction and those taught without Computer Assisted Instruction

This hypothesis was tested with the covariance procedure because of the need to find out the effect or influence of exogenous variables on the efficacy of the Computer Assisted Instruction on the obtained result of the post-test performances of students in the experimental group. The pre-test performance of the students was therefore, used as the covariate factor. The summary of the mean scores from the test by students in the experimental and control group was presented in Table 4.2.1. The post-test performance was used as the dependent variable while the two groups (experimental and control) serve as the independent variables. In Table 4.3.1 a summary of the analysis of covariance model for the test is presented.

Table 4.3.1: Analysis of covariance on performance of SS2 students in Economics using status in the experiment

Source	Sum of Squares	DF	Mean Square	F	Sig.
PRE	1.109	1	1.109	.010	.921

Status in experiment	32264.768	1	32264.768	287.472	.000
Error	22110.521	197	112.236		
Corrected Total	58967.755	199			

From the observed F-value (287.472) and the corresponding level of significance (Sig.), the two groups were significantly different in their performances after the experiment ($P < 0.05$). Table 4.3.2 shows the pairwise comparison of the mean scores by the two groups. The pairwise comparison was carried out on the mean scores using the Least Significant difference procedure.

Table 4.3.2: Pairwise comparison of the two group’s performances after the experiment

(I) Status	(J) Status	Mean Difference (I-J)	Std. Error	Sig.(a)	95% Confidence Interval for Difference(a)	
					Lower Bound	Upper Bound
Control	Experimental	-27.21	1.605	0.000	-30.3717	-24.0426
Experimental	Control	27.21	1.605	0.000	24.0426	30.37166

Based on estimated marginal means

The result showed that the students in the experimental group were significantly different in their performance from those in the control group who were taught Economic with the conventional method. By these observations, there is enough evidence to reject the null hypothesis which states that there is no significant difference between the performance of SS2 Economics students taught with the use of Computer Assisted Instruction and those taught without Computer Assisted Instruction. The implication here is that the Use of Computer Assisted Instruction in the teaching of Economics has the tendency of improving academic performance of students in the subject better than the use of the conventional method of teaching it. Hence, the hypothesis one is hereby rejected.

Hypothesis II: There is no significant difference in speed between SS2 students taught Economics with the use of Computer Assisted Instruction and those taught without Computer Assisted Instruction

The speed of accomplishing the task is determined by the time reduction out of the 60minutes allocated. The time used by the two groups is compared here for the hypothesis with the use of the two sample t-test. The two sample t-test was used because of the two independent groups (control and experimental) in the experiment. A summary of the test is presented in Table 4.4.2.

Table 4.4.2: Two sample t-test on speed of SS2 Economics students in the control and experimental groups after the experiment

Status	N	Mean	Std. Deviation	Std. Error	t-value	DF	P
Control	100	56.50	6.041	0.604	20.225	198	0.000
Experimental	100	41.35	4.430	0.443			

(critical value of t at DF(198) = 1.96)

The students who were exposed to the Computer Assisted Instruction method of teaching Economics have their time greatly reduced to 41.35minutes compared with the 56.50minutes score of the students in the control group who were taught with the conventional method. From the observed t-value of 20.225 and the level of significance of 0.000, it could be concluded that the students who were exposed to the Computer Assisted Instruction method performed significantly better in terms of speed than their counterparts who were in the control group and were not exposed to the CAI. With these observations, there is sufficient evidence to reject the null hypothesis which states that there is no significant difference in speed between SS2 students taught Economics with the use of Computer Assisted Instruction and those taught without the Computer Assisted Instruction. The result revealed that the use of Computer Assisted Instruction could significantly improve students' ability to answer questions within the specified

time and equally improve their performances in Economics in the senior secondary schools examinations. Hence, the Hypothesis two is hereby rejected.

Hypothesis III: There is no significant difference in the rate of independent learning skills acquisition between SS2 Economics students taught with Computer Assisted Instruction and those taught without the Computer Assisted instruction

This hypothesis was tested with the mean scores of the students who were able to acquire independent learning skills through the use of the Computer Assisted mode of Instruction and those in the control group who were taught with the conventional classroom method in Economics. The mean scores were compared with the aid of the two sample t-value at the post-test level of the experiment from the two groups. The two sample t-test procedure was used for the test because of the two independent groups (experimental and control) involved in the test. The summary of the result is presented in Table 4.4.3.

Table 4.4.3: Two sample t-test on the rate of independent learning skill mean scores of SS2 Economics students in experimental and control groups

Status	N	Mean	Std. Deviation	Std. Error	t-value	DF	P
Control	100	1.47	1.068	0.107	19.890	198	0.000
Experimental	100	4.23	0.886	0.089			

(critical value of t at DF(198) = 1.96)

The students who were taught with the Computer Assisted Instructions have higher mean score (4.23) of independent learning skills acquisition than students who were taught the subject with the conventional method whose score was 1.47. The observed t-value obtained in the test for the difference between the two scores is 19.890 and the level of significance obtained is 0.000. With these observations, there is enough

evidence to reject the null hypothesis that there is no significant difference in the rate of independent learning skills acquisition between SS2 Economics students taught with Computer Assisted Instruction and those taught with the conventional method. The result revealed that Computer Assisted Instructions method would significantly improve students' performances through the independent learning skills acquired than through the use of the conventional method of teaching Economics.

Hypothesis IV: There is no significant difference between the mean performance scores of male and female SS2 students taught Economics with the use of Computer Assisted Instruction

Only students in the experimental group were selected for this test. The hypothesis was tested with their performances at the post-test levels of the experiment. The two sample t-test was used to compare the performances in order to determine the significance of the effect of the Computer Assisted Instructions method of teaching on gender. The result of the test is summarized in Table 4.4.4.

Table 4.4.4: Two sample t-test on mean performance scores of male and female SS2 Economics students who were exposed to Computer Assisted Instructions

Sex	N	Mean	Std. Deviation	Std. Error	t-value	DF	P
Male	51	62.41	11.111	1.556	0.613	98	0.541
Female	49	61.14	9.493	1.356			

(critical value of t at DF(98) = 1.98)

The result revealed that the use of the Computer Assisted Instructions significantly improved the performances of both male and female after the experiment but with no variability between the two groups. This is indicated with observed t-value of 0.613 at 98 degree of which is lower than the critical value of 1.96 at the probability level of 0.05. The observed significant level in the test is 0.541 ($P > 0.05$). This means

that there is enough evidence to accept the null hypothesis which states that there is no significant difference between performance of male and female SS2 Economics students taught with Computer Assisted Instruction. The implication is that the effect of Computer Assisted Instructions in enhancing performances of students in Economics is not gender biased.

Hypothesis V: There is no significant difference between the mean performance scores of rural and urban SS2 students taught Economics with the use of Computer Assisted Instruction

The effect of school location on the efficacy of the Computer Assisted Instruction on the students' performance in the subject was tested here by selecting only students in the experimental group who were exposed to the method. The two sample t-test procedure was used for the test because of the two independent groups (Urban and Rural Students). A summary of the test is presented in Table 4.4.5.

Table 4.4.5: Two sample t-test on mean performance scores between rural and urban SS2 Economics students who were exposed to Computer Assisted Instruction

Location	N	Mean	Std. Deviation	Std. Error	t-value	DF	P
Urban	50	61.80	10.757	1.521	0.010	98	0.992
Rural	50	61.78	9.968	1.410			

(critical value of t at DF(98) = 1.96)

The result did not indicate that the urban and rural students involved in the experiment differed significantly on the effect of the Computer Assisted Instructions method based on their performances. The observed t-value (0.010) is lower than the critical value of 1.96 and the observed level of significance (0.992) is greater than the

fixed level of 0.05 ($P > 0.05$). This means that there is no evidence to reject the null hypothesis. Therefore, the null hypothesis which states that there is no significant difference between the mean performance of urban and rural SS2 Economics students taught with Computer Assisted Instruction is thus accepted. The implication here is that the use of the Computer Assisted Instructions is not influenced significantly by the location of the schools involved in the experiment.

Hypothesis VI: There is no significant difference between male and female SS2 Economics students' rate of acquiring independent learning skills with the use of Computer Assisted Instruction

This hypothesis was tested with the scores of the students in the experimental group only. Their scores on independent learning skills acquisition recorded in the experiment were compared here on the basis of sex. The two sample t-test procedure was used for the test because of the two groups (male and female students) of subjects involved in the test. A summary of the test is presented in Table 4.4.6.

Table 4.4.6: Two sample t-test on the rate of independent learning skill acquisition between male and female SS2 Economics students exposed to Computer Assisted Instruction

SEX	N	Mean	Std. Deviation	Std. Error	t-value	DF	P
Male	51	4.25	0.935	0.131	0.285	98	0.776
Female	49	4.20	0.841	0.120			

(critical value of t at DF(98) = 1.98)

The result did not reveal significant difference between the male and female students' who were involved in the experiment in their rate of acquiring independent learning skills through the use of CAI. This is deduced from the observed t-value of 0.285 compared to its critical value of 1.98 and an observed significant level of 0.776 (P

> 0.05). By this development, the null hypothesis which states that there is no significant difference between male and female SS2 Economics students taught with the use of Computer Assisted Instruction method in their rate of independent learning skills acquisition is, therefore, accepted since there is not sufficient evidence to reject the null hypothesis. The observation here is that the effect of the computer Assisted Instruction on independent learning skills acquisition does not differ with regards to gender of the students, and hence the hypothesis six is accepted.

4.4 Summary of Major Findings

The major findings from the data analysis and test of the hypotheses are summarized below. The study revealed that:

1. the use of Computer Assisted Instruction method has significant effect in improving the academic performance of students than the conventional method of teaching Economics at the senior Secondary School level in the state.
2. the use of Computer Assisted Instruction has significant effect in increasing the speed of solving questions in Economics among SS2 students than the use of the conventional method of teaching the subject.
3. Computer Assisted Instruction has significant effect in enhancing the rate of independent learning skills acquisition among SS2 students in Economics than the conventional method of teaching the subject.
4. the use of Computer Assisted Instruction in teaching did not have significant effect on gender performances in Economics among SS2 male and female students. This means that the use of CAI enhanced the performances of both male and female students in Economics.

5. the effect of Computer Assisted Instruction in the teaching of Economics is not significantly affected by the location of students' schools. This means the use of CAI is not influenced by the location of schools.
6. the Computer Assisted Instruction for teaching Economics has no significant effect on male and female SS2 Economics students' rate of acquiring independent learning skills such as keyboarding and browsing of information. This means male and female students did not differ in their rate of acquiring independent learning skills using computer Assisted Instruction.

4.5 Discussions of the Findings

The results of the data analysis from this experiment revealed among others that the use of Computer Assisted Instructions in the teaching of Economics is significantly better than the conventional method of teaching the subject. In the test of the first hypothesis, the effect of the Computer Assisted Instructions method on teaching the subject was tested by comparing the academic performance of the students who were exposed to the Computer Assisted Instructions (CAI) with those who were in the control group that were not taught with the CAI. The two sample t-test was used for the test. The result of the test showed that students who were taught with the CAI significantly performed better than students who were taught the subject with the conventional method of teaching. The null hypothesis was therefore rejected.

The finding here clearly revealed that the use Computer Assisted Instructions has better impact on students' academic performances in Economics than the conventional method. In support of the finding, Okoro and Etukudo (2001), Paul and Babaworo (2006), Egunjobi (2002) and Karper, Robinson, Casado-Kehoe (2005) agreed that students taught with Computer Assisted Instruction in Chemistry, Geography and

Counselling Education respectively performed better than those taught using the conventional classroom teaching. The finding is consistent with Nwike and Chukwudum (2011) who reported that Computer Assisted Instruction (CAI) is one of the products of computer technology and has proven to be a very effective method of instruction delivery. The finding is similar to the finding of Anyamene, Nwokolo, Anyachebelu and Anemelu, (2012) from a study on the effect of computer-assisted packages on the performance of senior secondary students in mathematics. They reported that students taught using CAI package performed significantly better than the control group in retention test. This finding is also consistent with Torruam and Abur (2013), where it was reported that the application of CAI in classroom helped students to concretize abstract issues and topics, motivate their interest in topics being discussed and help to develop in them the continuity of reasoning and coherence of thought which augurs well with the inter-disciplinary nature of other subjects. Other advantages enumerated as benefits of the CAI by the author was that it helped to appeal to students' interests and this is because, they tend to appeal to children's difficulties as well as take care of children's individual differences. Yusuf, Kajuru and Musa (2013), reported the same finding from a study conducted on the "Effect of a Computer Mediated Systems Teaching Approach (CMSTA) on Mathematics Achievement of Engineering Students in Nigerian Polytechnics" in Kaduna Polytechnic, Kaduna State. The result showed that students taught mathematics using the CMSTA significantly outperformed those not taught with the same approach.

The effectiveness of the Computer Assisted Instructions on the speed of solving economics questions by the students was tested by comparing the speed of students in the experimental group with those of the control group. The time reduction in accomplishing the set task in Economics among the experimental group was found to be

significantly lower than what was obtained among students in the control group. The null hypothesis was therefore rejected. This finding clearly revealed that the observed improved speed among students in the experimental group is attributable to Computer Assisted Instructions used in the experiment. The finding here is a reflection of Reagan, (2004) who reported similar finding from a study where it was reported that the application of CAI makes the student to control, when he or she works and how much time he or she spends on each lesson. This finding is in agreement with Torruam and Abur (2013), where it was reported that the application of CAI in classroom saves time and that as things presented are almost self- explanatory, energy is saved in too much talking and writing.

Hypothesis III tested for significant difference in the rate of independent learning skills acquisition between the students taught Economics with the Computer Assisted Instructions in the experiment and those in the control who were taught the subject using the conventional method. The result of the t-test used for the test revealed that students who were exposed to the use of the Computer Assisted Instruction method were significantly better through the independent learning skills acquired than those in the control group. The null hypothesis was therefore rejected. In a similar investigation, Brothen and Wambach, (2000), reported that Computer assisted instruction encourages a student to take responsibility for his or her learning, acquire effective study habits, and persist until he or she has mastered the content. The finding here clearly showed that the use of CAI could significantly enhance independent learning skills acquisition among Senior Secondary School students. The finding agrees with Wheeler, (2001) where it was pointed out that the use of ICT will not only enhance learning environments but also prepare the next generation for their future lives and careers. The finding is also consistent with Yusuf, (2005) where it was reported that CAI contributes to radical

changes in school; help to strengthen teaching, and provide opportunities for connection between the school and the world. ICT can make the school more efficient and productive. The findings of Becker (2000) show that ICT increases students engagement, which leads to increased amount of time spent by students working on computer system outside the classroom which might account for better performance than those students who were taught with the use of conventional method.

The effect of Computer Assisted mode of Instruction on gender academic performances of the students in Economics in the experimental group was tested in hypothesis four. The result of the test which was carried out with the two sample t-test did not reveal significant difference between the male and female students who participated in the Computer Assisted Instruction used in the teaching of the subject. The null hypothesis was therefore accepted. The observation here was that the CAI had equal impact on the performances of the male and female students involved in the study. The finding here contradicts Schumacher and MorahanMartin (2001) who reported that females are less experienced with ICT's and are more likely than males to have negative attitudes towards computers. The finding here agrees with Abdu-raheem (2012), Dantala (2006), Ash (2005) and Basturk (2005) investigations in the application of CAI in which it was revealed that there is no significant difference between the mean achievement scores of male and female students in both the experimental and control groups in mathematics, history and physics respectively. The result is a reflection of similar finding by Anyamene, Nwokolo, Anyachebelu and Anemelu (2012) from an investigation on the "Effect of Computer-Assisted Packages on the Performance of Senior Secondary Students in Mathematics in Awka, Anambra State, Nigeria". The results indicated no significant difference between the mean achievement scores of male and female students taught Mathematics (Algebra) with CAI package. This finding

however contradicts the report of Yusuf, Kajuru and Musa (2013), from a study conducted on the “Effect of a Computer Mediated Systems Teaching Approach on Mathematics Achievement of Engineering Students in Nigerian Polytechnics” in Kaduna Polytechnic, Kaduna State. The result revealed that the male students taught mathematics using the CMSTA significantly outperformed their female counterparts.

The effect of location on the efficacy of the Computer Assisted Instructions on the performances of the students in Economics was tested in hypothesis five by comparing the performances of students in the experimental group who were from rural and urban schools. The result of the test which was conducted with the two sample t-test did not reveal significant difference between the two groups. The null hypothesis was therefore accepted. The finding clearly indicated that the location of schools did not significantly affect the efficacy of the Computer Assisted Instructions enhancement of the students’ academic performance in the subject. This finding is consistent with the report of Bhatti, Pareek and Dhamija (2013) that computer assisted instruction has no significant difference in attaining Matrix Algebra between the rural and urban students. Furthermore, the finding of Dange (2013) supported this result reporting that computer assisted instruction has equal effect on both the rural and urban students in developing study habits. To buttress the above findings, Subhash (2000) submitted that computer assisted instruction has the tendency of eliminating lingual, regional and ethical biases between the teacher and the students.

The effect of Computer Assisted Instructions on male and female SS2 Economics students’ rate of acquiring independent learning skills as influenced by the sex of the students was tested in hypothesis six. The two sample t-test was used for the test of the hypothesis because of the two independent groups involved in the test. The result did not reveal significant difference between the male and female students in the

rate of the independent learning skills acquisition in the experiment. The null hypothesis was therefore accepted. This finding revealed among others that the improvement in the students' academic performance through the use of the Computer Assisted Instruction in developing independent learning skills is independent of the sex of the students. In other words, the advantages in the use of Computer Assisted Instruction for teaching Economics are independent of the students' gender. The finding here is a reflection of Ilomaki, and Rantanen, (2007), research on "Intensive Use of ICT in Lower Secondary School: Development of Students' Expertise". It was found that intensive use of ICT and the process-oriented learning environment supported the development of students' expertise in ICT irrespective of their gender. In addition, Dange (2013) report further supports this finding as it revealed that computer assisted instruction as a method of teaching Science enhances both boys and girls equally in developing study habits.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter summarizes the investigation into the “Effects of Information and Communication Technology (ICT) application on Secondary School Students’ Economics Performance in Kaduna State. The chapter consists of summary, the implication of the findings, recommendations and suggestions for further studies. Thus, the chapter is organized as follows:

- 5.2 Summary
- 5.3 Conclusions
- 5.4 Recommendations
- 5.5 Suggestions for further studies

5.2 Summary

The study investigated “Effects of Information and Communication Technology on Secondary Schools Students’ Economics Performance in Kaduna State, Nigeria”. The objectives of this study amongst others sought to investigate the performance of SS2 Economics students taught with the use of CAI and those taught with the conventional method of teaching. Six research questions and hypotheses were drawn from the objectives of the study. The theoretical framework of the study was based on the “Technological Pedagogical and Content Knowledge” (TPACK) theory which strives to capture some essential qualities of knowledge required by teachers for technology integration in their teaching. Areas related to the study such as impact of CAI on students’ academic performance, independent learning skill acquisition, gender and location, were reviewed. Some empirical studies were also

reviewed. Research design used was the two by two pre-test post-test quasi-experimental control group design. The targeted population was twenty-three thousand, four hundred and sixty Public Senior Secondary two (SS2) school students in twelve educational zones of Kaduna State. A stratified random sampling technique was adopted to draw two hundred SS2 Economics students from the rural and urban centres of two educational zones of the state. Economics Achievement Test (EAT) made up of forty items of multiple choice objectives and ten fill in the blank questions from two topics in Economics were developed and validated as test instrument for data collection. The six research questions were answered using statistical techniques such as: mean and standard deviation while the hypotheses were tested using ANCOVA and two sample t-test at 0.05 level of significance

The major findings from the data analysis and test of the hypotheses are summarized below. The study revealed that:

1. The use of Computer Assisted Instruction method has significant effect in improving the academic performance of students than the conventional method of teaching Economics at the Senior Secondary School level in the state. The mean difference between the experimental and control groups when compared were 27.21 and -27.21 respectively;
2. The use of Computer Assisted Instruction has significant effect in increasing the speed of solving questions in Economics among SS2 students than the use of the conventional method of teaching the subject. The experimental group spent 41.35minutes while the control group spent 56.50minutes in answering the EAT questions;
3. Computer Assisted Instruction has significant effect in enhancing the rate of independent learning skills acquisition among SS2 students in Economics than

the conventional method of teaching the subject. The experimental group had a mean score performance of 4.23 higher than the control group with a mean score of 1.47;

4. The use of Computer Assisted Instruction in teaching did not have significant effect on gender performances in Economics among SS2 male and female students. This means that the use of CAI enhanced the performances of both male and female students in Economics almost equally with mean scores of 62.41 and 61.14 respectively;
5. The effect of Computer Assisted Instruction in the teaching of Economics is not significantly affected by the location of students' schools. This means the use of CAI is not influenced by the location of schools because students in the experimental group in the urban and rural areas performed almost equally with mean scores of 61.80 and 61.78 respectively; and
6. Computer Assisted Instruction for teaching Economics has no significant effect on male and female SS2 Economics students' rate of acquiring independent learning skills such as keyboarding and browsing of information. This means male and female students did not differ in their rate of acquiring independent learning skills using computer Assisted Instruction with mean scores of 4.25 and 4.20 respectively.

Six null hypotheses were tested in the study; three were rejected while three were accepted. The test of hypotheses one, two and three, the effect of Computer Assisted Instructions (CAI) on the students' academic performance, speed and rate of acquiring independent learning skills were tested. Students who were exposed to the Computer Assisted Instruction were found to perform significantly better than those in

the control group in the three investigated variables. The three null hypotheses were therefore rejected.

In testing hypothesis four, five and six, the effect of Computer Assisted Instruction on students' academic performance based on gender, students' academic performance based on location and differences between male and female rate of acquiring independent learning skills among the experimental group exposed to the use of the Computer Assisted Instruction in the teaching of the subject were conducted. No significant difference was observed in the tests. These null hypotheses were therefore accepted.

5.3 Conclusions

On the basis of the findings of this study, the following conclusions were made:

1. The use of Computer Assisted mode of Instruction has significant effect on SS2 Economics students' academic performance. It can be therefore said that Computer Assisted mode of Instruction proved to be more efficacious than the conventional method of teaching used in some schools today.
2. The use of Computer Assisted Instruction has proved to be effective in reducing the rate of time spent by students in solving questions in Economics during test. This has enhanced students' ability to accomplish the task given during assessments faster than using the conventional method of teaching.
3. The use of Computer Assisted mode of Instruction enhanced independent learning skills acquisition amongst SS2 students in Economics when compared with the conventional mode of instruction. This has been effective in making students offering Economics to develop the spirit of personal study habit to cover up the syllabus.

4. In addition, it was discovered that the use of Computer Assisted Instruction enables male and female SS2 students taught Economics to compete favourably academically regardless of gender differences.
5. Furthermore, the researcher discovered that with the use of Computer Assisted Instruction, school location is not a factor in determining the students' academic performance. It can therefore be concluded that if CAI is adopted by all schools in teaching of Economics this will effectively eliminate school location factor to the barest minimum and enable SS2 students taught Economics in the rural schools to compete favourably with their counterparts in the urban schools as measured by the Economics Achievement Test (EAT).
6. Finally, it can be said that the use of Computer Assisted Instruction effectively reduces the gender barrier in the rate of acquiring independent learning skills (such as keyboarding and browsing of information) sometimes observed between male and female students.

Limitations of the Study

There were a few limitations or challenges to this study which might affect the generalisation drawn from this study's finding. The limitations are as follows;

1. The current curriculum approved by the Federal Ministry of Education in public schools restricted Economics to only students offering commercial/art subjects. Therefore, the subjects (SS2 students) used in the study did not involve students in the sciences, which might have affected the result of this study.

2. Computer software application packages such as power point were not installed on most of the mini computers / ipads supplied to some schools which imply that most of the subjects used have not been acquainted with Computer Assisted mode of instruction before.

5.4 Recommendations

The following recommendations are made on the basis of the outcome of this study.

1. There is a need for adequate provision of ICT-driven instructional devices that are functioning and their appendages for all Senior Secondary School students in Nigeria by the government just like the Osun State Government initiative of “Opon Imo” (Tablet of Knowledge). This will help Economics students to develop ICT independent learning skills to improve their academic performance and equally equip them to meet up the challenges of online system of examination currently adopted by some examination bodies.
2. Computer Assisted Instructional technique is relatively new and should be incorporated into the senior secondary school curriculum of Economics. Consequently, schools supplied with computer systems by Government and other non-governmental agencies require the need for computer assisted instructional packages in different subjects to be installed on them for use. This will help Economics teachers to develop their skills and competency in instructional delivery. In addition, there is need for proper maintenance culture to be incorporated in schools, in the handling of ICT-driven instructional facilities provided for effective functioning and utilization.

3. Teachers should be upgraded in their ICT compliance on the use of Computer Assisted Instructions (CAI) for teaching Economics and also to be trained as initiator of instructional packages. To equip this category of teachers, orientation, workshops, seminar and conferences could be organised by the Zonal Inspectorate Divisions through adequate sponsorship from the State and Education Authorities.
4. Teachers should ensure that male and female students are equally encouraged in the use of ICT-driven instructional facilities for learning and there should not be any form discrimination especially for those who feels computer system seems to be difficult to manipulate.
5. The computer system provided in some public secondary schools in the rural areas are out-dated and hence, should be upgraded to a higher pentium, so as to accommodate new study packages in some subjects and for effectiveness.
6. Funding is fundamental as the ability to acquire the ICT devices and appendages rest squarely on what is available to the school management. The Federal, State, Local, Non-Governmental Organizations as well as Philanthropists are encouraged to support secondary schools by providing ICT facilities to them.

5.5 Suggestions for Further Studies

A similar study could be conducted in pure science and arts subjects at senior secondary school level as this would make it easier for the application of the Computer Assisted Instruction in teaching and learning.

Furthermore, a study could be carried out to investigate the “Effects of the use of Computer Assisted Instruction on the Level of Retention of Economics students in Senior Secondary Schools” as this will help to determine retention level of students when compared with conventional method of teaching.

Lastly, “Effects of the use of Computer Assisted Instruction in Teaching and Learning of Economics among Students in Tertiary Institutions” could be carried out to determine the effect of CAI on students’ academic performance at higher level of learning.

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Appendix I

The Breakdown of WASSCE May/June Chief Examiners Report, Comments and Suggestions on Economics Paper2 Performance from the Year 2007- 2010

Year	General Comments	Candidates' Weakness	Suggested Measures
2007	<p>The paper compared favourably with those of the previous years. The questions were clearly worded and spread to cover most aspects of the syllabus.</p> <p>The rubrics were clearly stated and the marking scheme was comprehensive and quite generous.</p> <p>It was surprising that the performance of candidates fell below expectation and their overall performance average.</p>	<p>The poor performance of the candidates could be attributed to some weakness noticeable in their scripts included:</p> <p>Lack of basic mathematical skills to tackle the questions in the data response section.</p> <p>Disobedience of the rubrics.</p> <p>Mere listing of points without proper explanations.</p> <p>Outright misinterpretation of some of the questions.</p> <p>Inability to draw and label relevant diagrams properly.</p> <p>Inadequate coverage of the syllabus</p>	<p>Students should take mathematics more seriously.</p> <p>Endeavour to show all workings in their calculations.</p> <p>Should study the rubrics and adhere strictly to them.</p> <p>Should improve on their ability to communicate in order to develop their points logically.</p> <p>Avoid misinterpreting question, spend the first five minutes going through the question in order to understand the requirements.</p> <p>Devote enough time to practising the construction of diagrams before examination.</p>

			Teachers should at all times endeavour to cover every aspect of the syllabus before the examination so as to enhance the candidates' confidence.
2008	<p>The standard of the paper was good and did not deviate from those of the previous years. The questions were straightforward, unambiguous and spread to cover most aspects of the syllabus. The rubrics were clear.</p> <p>The marking scheme was clear and comprehensive enough to accommodate average candidates.</p> <p>However, there was no significant improvement in the overall candidates' performance compared with previous years.</p>	<p>Failure to expatriate the points listed;</p> <p>Poor knowledge of technique of plotting graphics;</p> <p>Poor power of expression in English language;</p> <p>Poor knowledge of terminologies peculiar to economics;</p> <p>Failure to understand the demands of some of the questions;</p> <p>Adoption of wrong approach to answering questions.</p>	<p>Candidates should be taught by their teachers the need to expatriate their points.</p> <p>Qualified teachers are employed in schools to teach the students all the necessary concepts and terms they should know.</p> <p>The candidates are advised to spend the first few minutes of their time studying the questions.</p> <p>The candidates should be exposed to reading textbooks, newspapers, journal, magazines, etc; with the view to improve on their written and spoken English.</p>

<p>2009</p>	<p>The standard of the paper compared favourably with that of the previous years. The questions were straight and within the scope of the syllabus.</p> <p>The rubrics were clearly stated and the marking scheme was comprehensive enough to take care of average candidates. However, there was no significant improvement in the overall candidates' performance when compared with the previous years.</p>	<p>Poor expression. Poor presentation of relevant materials. Some candidates misinterpreted the requirements of some of the questions. Inadequate knowledge of the subject matters. Poor knowledge of drawing good diagrams.</p>	<p>Students should read textbooks to improve on their expressions. They should also learn to arrange their points in orderly manner. Candidates should ensure that they cover the entire syllabus before the examination. Teachers should endeavour to teach the students the use of right terms required in answering questions on basic concepts.</p>
<p>2010</p>	<p>The standard of the paper was similar to those of the previous years. The questions were well framed, illustrations with clear language and devoid of ambiguity. No question was outside the syllabus.</p> <p>The marking scheme was well structured and comprehensive enough to cater for the various classes of candidates that sat for the examination. However, candidates' performance was not better than those of the previous years.</p>	<p>Poor grammatical expressions. Illegible handwritings. Scanty explanation of points. Poor knowledge of drawing graphs and simple calculations. Inadequate preparation for the examination due to lack of indepth subject matter.</p>	<p>Students should be encouraged to read textbooks, novels, newspapers, etc; to help improve on their grammatical expression. Students should be encouraged to write legibly. Candidates should explain their points adequately. Candidates should be encouraged to develop their skills in simple calculations and in drawing graphs using graph sheets. Teachers should be encouraged to cover the required syllabus before the examinations. Students on their own should read relevant and standard textbooks</p>

			and not summaries and key points.
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Sources: WAEC's Examiners Report (2007, 2008, 2009 and 2010 e-learning)

Appendix II

ECONOMICS ACHIEVEMENT TEST (EAT) for SS2 (pre-test and post-test)

Name of School:-----

Students' Name:-----

CLASS: SS2 A() B()

Time Allowed: 1hr.

Starting Time:-----

Time Submitted:-----

Instruction: Answer all Questions

Gender: Tick One Male()Female()

Circle the Correct Answer and Type in Correct Answers Where Applicable

- 1) Production is defined as
 - a. manufacturing of goods and services
 - b. creation of utilities
 - c. invention of new products
 - d. products of industries
- 2) One of these is not a type of production
 - a. Primary production
 - b. secondary production
 - c. manufacturing production
 - d. Tertiary production
- 3) One of these is not a factor of production
 - a. land
 - b. labour
 - c. Capital
 - d. investment
- 4) An entrepreneur is one
 - a. produces goods
 - b. distributes goods and services
 - c. coordinates all other factor of production
 - d. employs labour to work
- 5) The reward to land as a factor of production is called
 - a. rent
 - b. interest
 - c. loan
 - d. profit
- 6) Land is said to be
 - a. large in quantity
 - b. fixed in size and quantity
 - c. Endowed with resources
 - d. fertile for planting
- 7) An example of primary production is
 - a. carpenter
 - b. fisherman
 - c. tailor
 - d. shoemaker
- 8) The one who bears the losses and enjoys the profits in production is called the
 - a. manager
 - b. entrepreneur
 - c. director
 - d. sole proprietor
- 9) Labour can be defined as
 - a. physical manpower used to produce
 - b. workers in factory

- c. mental and human effort used in production
 - d. services rendered to people
- 10) An advantage of division of labour is all except one
 - a. saves time
 - b. increases output
 - c. increases efficiency
 - d. competition
 - 11) One of these is not a disadvantage of division of labour
 - a. monotony of work
 - b. risk of unemployment
 - c. loss of craftsmanship
 - d. specialization
 - 12) An example of secondary production is
 - a. extractive industry
 - b. manufacturing industry
 - c. constructive industry
 - d. Goods and services
 - 13) Direct and indirect services are classified as
 - a. manufacturing industry
 - b. tertiary industry
 - c. extractive industry
 - d. constructive industry
 - 14) One of these is not an example of capital goods
 - a. plant
 - b. machines
 - c. furniture
 - d. vehicles
 - 15) Consumer goods are those goods that are meant for
 - a. households
 - b. direct consumption
 - c. indirect consumption
 - d. utilities
 - 16) Labour includes all except
 - a. skilled labour
 - b. unskilled labour
 - c. mono-skilled labour
 - d. semi-skilled labour
 - 17) The two methods of production is
 - a. capital and physical intensive
 - b. capital and labour intensive
 - c. physical and structural intensive
 - d. labour and money intensive

Use the table below on production to answer questions 18-25

No. of Workers (input)	Total Product (TP)	Average Product (AP)	Marginal Product (MP)
1	8	8	8
2	?	10	12
3	36	12	?
4	48	12	12
5	?	11	7
6	60	10	5
7	60	8.6	?
8	56	?	-4
9	52	5.7	4
10	47	?	5

- 18) Calculate the marginal product when input is 3?
- 48
 - 12
 - 4
 - 16
- 19) What is average product when total product is 56?
- 7
 - 32
 - 52
 - 4
- 20) What is total product when marginal product is 7?
- 35
 - 77
 - 55
 - 11
- 21) What is average product when input is 10?
- 4.7
 - 2
 - 50
 - 9.4
- 22) Calculate the marginal product when input is 7?
- 0
 - 8.5
 - 1.6
 - 1
- 23) What is the total product when input is 2?
- 5
 - 20
 - 22
 - 6

- 31) Implicit costs are cost that has been imputed as part of
- variable cost
 - management cost
 - fixed cost
 - production cost

Use the table below on Cost to answer questions 32-40

Unit of Output	Labour	Total Fixed Cost (TC)	Total Variable Cost (TVC)	Total Cost (TC)	Total Output (TO)	Average Fixed Cost (AFC)	Average Variable Cost (AVC)	Average Total Cost (ATC)	Marginal Cost (MC)
5	0	150	0	150	0	Infinite	0	Infinite	-
5	1	150	25	175	10	15	2.5	17.5	25
5	2	150	50	200	25	6	2	8	1.6
5	3	150	75	?	60	2.5	1.25	3.75	0.71
5	4	150	100	250	100	1.5	1	2.5	0.62
5	5	150	125	275	127	1.18	?	1.77	0.92
5	6	150	?	300	140	1.07	1.07	2.14	1.92
5	7	150	175	325	150	1	1.17	2.17	?
5	8	150	?	350	167	0.90	1.20	2.09	1.47
5	9	150	225	375	168	0.90	1.34	?	25
5	10	150	250	400	173	0.87	1.45	2.3	5

- 32) Calculate total cost when labour input is 3?
- 3
 - 225
 - 75
 - 15
- 33) Find average variable cost when labour input is 5?
- 0.93
 - 1.77
 - 1.18
 - 25
- 34) Calculate marginal cost when labour input is 7?
- 1

- b. 1.07
 - c. 2.5
 - d. 2
- 35) Calculate total variable cost when labour input is 6?
- a. 150
 - b. 25
 - c. 290
 - d. 750
- 36) Find total variable cost when labour input is 8?
- a. 117
 - b. 200
 - c. 317
 - d. 40
- 37) Calculate average total cost when labour input is 9?
- a. 16.6
 - b. 30
 - c. 4
 - d. 2.23
- 38) At what level of input of labour did the firm incurred the lowest cost?
- a. 1st level of input
 - b. 2nd level of input
 - c. 3rd level of input
 - d. 4th level of input
- 39) Average Total Cost is derived by
- a. TVC / TO
 - b. TC / TO
 - c. TFC / TO
 - d. MC / TO
- 40) Marginal Cost is derived by
- a. change in $TC /$ change in Total output
 - b. $TFC + TVC$
 - c. $AFC + AVC$
 - d. change in TO / TC
- 41) Total Revenue is calculated as -----
- a. Price x Quantity
 - b. $AVC \times$ Quantity
 - c. $TC \times$ price
 - d. marginal revenue x cost
- 42) Marginal revenue is described as -----
- a. the cost of all commodity sold x quantity
 - b. price x quantity sold
 - c. an additional cost resulting from producing one more unit of a commodity
 - d. additional price that is added to the commodity produced

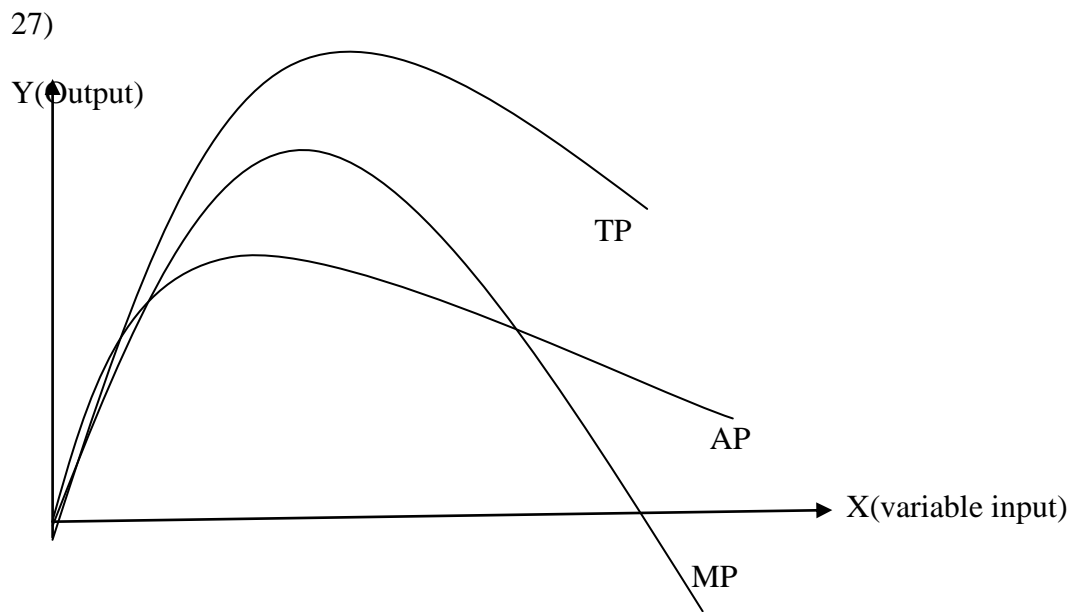
- 43) When total revenue remains unchanged as prices rises or falls, demand for the product is said to be -----
- perfectly elastic
 - inelastic
 - unitarily elastic
 - zero elastic
- 44) If the price of a product falls and leads to an increase in total revenue, the demand is said to be -----
- elastic
 - inelastic
 - perfectly inelastic
 - unitarily elastic
- 45) The reward to capital is-----
- profit
 - gain
 - dividend
 - interest
- 46) One of these is not an example of skilled labour
- doctor
 - lawyer
 - teacher
 - artisan
- 47) When labour is said to be capital-intensive it means -----
- labour is very expensive
 - it uses more people to work
 - it uses more machines to work
 - it uses more people on equipment
- 48) Long run means a period in production when a firms -----
- factor inputs are variable
 - factor outputs cannot be changed
 - factor inputs are fixed
 - factor outputs can be changed
- 49) Example of a fixed factor of production is -----
- capital
 - land
 - labour
 - entrepreneur
- 50) An example of a variable factor of production is -----
- land
 - labour
 - entrepreneur
 - capital

Appendix III

**MARKING SCHEME FOR ECONOMICS ACHIEVEMENT TEST FOR SS2
(pre-test and post-test)**

Each Question carries two (2) marks

- 1) B
- 2) C
- 3) D
- 4) C
- 5) A
- 6) B
- 7) B
- 8) B
- 9) C
- 10) D
- 11) D
- 12) B
- 13) B
- 14) C
- 15) B
- 16) C
- 17) C
- 18) D
- 19) A
- 20) C
- 21) A
- 22) A
- 23) B
- 24) C
- 25) C
- 26) A



28) B

29) A

30) B

31) D

32) B

33) A

34) C

35) A

36) B

37) D

38) D

39) B

40) A

41) A

42) C

43) C

44) A

45) D

46) D

47) C

48) A

49) B

50) B

Total marks= 2 x 50 = 100

Appendix IV

LESSON PLAN FOR TEACHING PRODUCTION USING COMPUTER ASSISTED MODE OF INSTRUCTION.

SUBJECT	:	ECONOMICS
TOPIC	:	PRODUCTION
CLASS	:	SS2
TIME	:	45Minutes
SEX	:	Male and Female

Instructional Materials: Computer System, CD-ROM, Server, Projector and screen

Instructional Technique: Computer Assisted mode of Instruction (Drill and Practice)

Objective:

It is expected that by the end of the lesson, the students should be able to:

1. Define the meaning of production
2. Mention two (2) types of production
3. Explain the factors of production with each of their reward.
4. Differentiate between capital intensive and labour intensive mode of production.

Instructional Procedure:

Step 1

- i) **Introduction:** The teacher presents the topic by asking question on how some common household commodities used at home are produced to serve as a previous knowledge.

Step 2

- ii) **Presentation:** The teacher defines what production is and other concepts using the Computer Assisted Instructional packaged on a CD-ROM with programme on production downloaded on every student's computer system.
- i) The students are allowed to interact with the Computer Assisted programme on their computer system freely to learn the types of production, factors of production and capital intensive and labour intensive mode of production while the teacher guides and assist them.
- ii) The students are giving the task to give examples of capital intensive and labour intensive mode of production.

Step 3

- i) **Debriefing:** The teacher makes final comments, raises issues and problems identified or not properly addressed.
- ii) **Summary and Conclusion:** The teacher will summarize the activity by asking the students some questions on what they have learnt on production.

Step 4

Evaluation: The students are asked by the teacher to attempt questions on the lesson taught on production that is programmed on their computer System as follows:

- 1 Production is defined as
 - a. manufacturing of goods and services
 - b. creation of utilities
 - c. invention of new products
 - d. products of industries
- 2 One of these is not a type of production
 - a. Primary production
 - b. secondary production
 - c. manufacturing production
 - d. Tertiary production
- 3 One example of factor of production is-----
- 4 An entrepreneur is one
 - a. produces goods
 - b. distributes goods and services
 - c. coordinates all other factor of production
 - d. employs labour to work
- 5 The reward to land as a factor of production is called-----
- 6 Land is said to be
 - a. large in quantity
 - b. fixed in size and quantity
 - c. Endowed with resources
 - d. fertile for planting
- 7 An example of primary production is
 - a. carpenter
 - b. fisherman
 - c. tailor
 - d. shoemaker

- 8 The one who bears the losses and enjoys the profits in production is called the --

- 9 An example of labour intensive mode of production is-----
- 10 Capital intensive mode of production is the use of one of the below:
- a. The use of tractor for farming.
 - b. The use cutlass and hoes for cultivation of farm.
 - c. The spending of money to purchase of raw materials.
 - d. The act of obtaining loan from bank to set up a business.

Appendix V

LIST OF SENIOR SECONDARY SCHOOLS IN GIWA LOCAL GOVERNMENT AREA OF KADUNA STATE

S/N	SCHOOL PSEUDO	SCHOOL NAME	SCHOOL ADDRESS	SCHOOL VILLAGE	LGA	STATE	EDUC. LEVEL/NAME
1	1903221140	GSS YUSUF ABOKI		SHIKA	GIWA	KADUNA	Senior Sec.
2	1903236161	GSS FATIKA	FATIKA	FATIKA	GIWA	KADUNA	Junior&Senior
3	1903237161	GSS GANGARA		GANGARA	GIWA	KADUNA	Junior & Senior
4	1903238161	GSS GIWA	Opposite Micro Finance Bank, Giwa	GIWA	GIWA	KADUNA	Junior & Senior
5	1903239161	Sokoto Rd			GIWA	KADUNA	Junior &Senior
6	1903271161	Abdullahi Model Islamic	Off Zaria Funtua Rd. GIWA	GIWA	GIWA	GIWA	Junior & Senior

Appendix VI

LIST OF SENIOR SECONDARY SCHOOLS IN SABON GARI LOCAL GOVERNMENT AREA OF KADUNA STATE

S/N	SCHOOL PSEUDO	SCHOOL NAME	SCHOOL ADDRESS	SCHOOL VILLAGE	SCHOOL TOWN	LGA	STATE	EDUC.LEVEL/NAME
1	1919010140	GGSS CHINDIT	Nigeria Army Depot	Chindit Barracks		Sabon Gari	Kaduna	Senior Secondary
2	1919011140	GGSS DOGON BAUCHI	Behind Rex Cinema	No 9 Jaafaru Street	Dogon Bauchi	Sabon Gari	Kaduna	Senior Secondary
3	1919015140	GSS AMINU	No 13 Prince Rd. S/ Gari	Maramara		Sabon Gari	Kaduna	Senior Secondary
4	1919016140	GSS BASSAWA ZARIA	KM 2 Along Old Kado Rd. Off Sokoto Rd	Bassawa Zaria		Sabon Gari	Kaduna	Senior Secondary
5	1919017140	GSS BOMO	KM 2 Off Sokoto Rd By School of Agric	Bomo Samaru		Sabon Gari	Kaduna	Senior Secondary
6	1919019140	GSS CHINDIT BARRACKS BOYS	Nig. Army Depot	Chindit Barracks		Sabon Gari	Kaduna	Senior Secondary
7	1919020`140	GSS KWANGILA	Hanwa			Sabon Gari	Kaduna	Senior Secondary
8	1919021140	GSS MUCHIYA	C/O PO Box 231	Hayin Ojo		Sabon Gari	Kaduna	Senior Secondary
9	1919023140	GGSS SAMARU	Bassawa Rd. Hayin Dogo Samaru	Samaru		Sabon Gari	Kaduna	Senior Secondary
10	1919158161	GOVERNMENT COMM. COLL	Hayin Ojo Sabon Gari	Hayin Ojo		Sabon Gari	Kaduna	Junior & Senior Secondary
11	1919159161	GSS JAMA`A	Along Samaru Rd After College of Aviation	Koraye Jama`a		Sabon Gari	Kaduna	Junior & Senior Secondary

Appendix VII

LIST OF SENIOR SECONDARY SCHOOLS IN ZARIA LOCAL GOVERNMENT AREA OF KADUNA STATE

S/N	SCHOOL PSEUDO	SCHOOL NAME	SCHOOL ADDRESS	SCHOOL VILLAGE	SCHOOL TOWN	LGA	STATE	EDUC. LEVEL /NAME
1	1923011140	GSS MAGAJIYA	Magajiya Village	Magajiya		Zaria	Kaduna	Senior Secondary
2	1923013140	GGSS PADA	Alu Dansidi Rd.	Kwarbai		Zaria	Kaduna	Senior Secondary
3	1923016140	GSS ZARIA	Kofar Kibo Rd	Ungwan Zaria		Zaria	Kaduna	Senior Secondary
4	1923253140	GSS KAURA	Kaura Zaria City	Rimindo		Zaria	Kaduna	Senior Secondary
5	1923151161	GGSS ZARIA	PMB 1055 Kongo T./Wada Zaria	Zaria	Zaria	Zaria	Kaduna	Junior & Senior Sec
6	1923152161	SHEIK IBRAHIM ARAB SEC SCH. KARAU KARAU	Gaskiya Rd.	Tudun Jukun		Zaria	Kaduna	Junior & Senior Sec
7	1923153161	GSS KOFA KUYANBAN A	Kofan Kuyanbana	Rafin Albasa		Zaria	Kaduna	Junior & Senior Sec
8	1923156161	GGSS KOFAN GAYAN	Kwagwaro	Kofan Gayan	Zaria	Zaria	Kaduna	Junior & Senior Sec
9	1923157161	GSS TUDUN JUKUN	Gaskiya Rd.	Tudun Jukun		Zaria	Kaduna	Junior & Senior Sec
10	1923158161	ALHUDAHU DA COLLEGE	Kofan Doka	Kofa Doka		Zaria	Kaduna	Junior & Senior Sec
11	1923159161	BAREWA COLLEGE	Along Gaskiya Rd.	Tukur Tukur	Tukur Tukur	Zaria	Kaduna	Junior & Senior Sec
12	1923160161	GSS DAKACE	Behind NTA Zaria	Dakace	Dakace	Zaria	Kaduna	Junior & Senior Sec

13	1923161161	GSS KUGU	KM 15 Old Zaria Kaduna Rd.	Kugu		Zaria	Kaduna	Junior & Senior Sec
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Appendix VIII

EDUCATION RESOURCE CENTRE

FEDERAL CAPITAL TERRITORY, ABUJA

FCT SENIOR SECONDARY SCHOOL TEACHING SCHEMES

ECONOMICS SS2- THEORY OF PRODUCTION, COST AND REVENUE

WEEKS	TOPICS/CONTENTS
8	Theory of Production i. Meaning of production ii. Types of production iii. Factors of production
9	Theory of Production i. Division of labour and specialization (advantages, disadvantages and limitations of division of labour) ii. Scale of production (advantages and disadvantages of large scale production)
10	Cost Concepts i. Basic cost concept, total cost, average
11	ii. Basic cost concept, short-run and long-run. iii. Distinguish between Economist and Accountants views of cost.
12	Revenue Concept i. Concept of revenue:- total, average and marginal revenue ii. Revenue schedules and curves.

Source: ERC, FCT, Abuja (2011) Edition

Appendix IX

Five Points Rating Scale for Independent Learning Skill

Independent learning skill for this study is the ability of the students to manipulate the computer system with little or no assistance. Ten (10) questions, i.e. from 41-50 in the “EAT” requires the students to type in the correct answers in the space provided. A five (5) points rating scale was adopted to score students who were able to type in the answers correctly from question 41-50 as rated below:

No. of Questions Answered Correctly	Rating Scale Points
9-10	5
8-7	4
5-6	3
3-4	2
1-2	1