RELATIONSHIP BETWEEN INFORMATION AND COMMUNICATION TECHNOLOGY USAGE AND ACADEMIC PERFORMANCE AMONGFCT COLLEGE OF EDUCATION STUDENTS, ZUBA, NIGERIA

BY

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RELATIONSHIP BETWEEN INFORMATION AND COMMUNICATION TECHNOLOGY USAGE AND ACADEMIC PERFORMANCE AMONG FCT COLLEGE OF EDUCATION STUDENTS, ZUBA, NIGERIA

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A DISSERTATION SUBMITTED TO THE SCHOOL OF POSTGRADUATE STUDIES, AHMADU BELLO UNIVERSITY, ZARIA IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF DEGREE OF MASTER OF EDUCATION IN EDUUCATION PSYCHOLOGY

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APRIL, 2017

DECLARATION

I hereby declare that this dissertation titled: Relationship between Information and Communication Technology usage and Academic performance among students of FCT College of Education, Zuba Nigeria, is a record of my research work under supervision of Dr. U. Yunusa and Dr. I.A. Mohammed. This work has never in any way or means been presented elsewhere for the award of higher degree. All sources of information used for the study were duly acknowledged by references.

_____ _____

Anna IDI Date

CERTIFICATION

This dissertation titled: Relationship between Information and Communication Technology Usage and Academic Performance among Students of FCT College of Education Zuba, Nigeria by Anna IDI with Registration NO. P13EDPC8040 meets the regulations governing the award of master's degree (Education Psychology) in the Department of Educational Psychology and Counselling of Ahmadu Bello University, Zaria and is approved for its contribution to knowledge and literally presentation.

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DEDICATION

This dissertation is dedicated to my beloved husband Mr. Emmanuel Gabriel Tajan and my loving parents Mr. and Mrs. Idi Awaje without whom I would not have been whom I am now.

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OPERATIONAL DEFINITIONS OF TERMS

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

Academic Performance: Student semester result for 2014/2015 Academic session.

ABSTRACT

This study employed correlational research design in investigating the relationship between Information and Communication Technology Usage and Academic Performance among Students of FCT College of Education Zuba, Nigeria. One hundred and eight (108) male and female NCE II students made up the sample of this study. ICT usage scaleand Academic Performance Scale were the instrument used for data collation. The data collected were analysed using and PPMC (r) and t-test. The findings of this study revealed that ICT usage has significant relationship on the students' academic performance as the higher the ICT usage, the higher the students' academic performance ($r = 0.771$, $p= 0.011$), significant relationship existed between those using ICT tools for academic purpose and those that are not using ICT tools among students ($r = 0.689$, $p = 0.037$), significant differences exists between male and female ICT usage among students ($t = 7.971$, $p = 0.0061$) and significant differences existed between male and female ICT usage and academic performance among students of FCT Federal College of Education, Zuba ($t = 5.821$, $p = 0.007$). Based on the findings and conclusion, recommendation were made that the school management should make ICT usage compulsory to all student to improve their academic performance, teachers should be encourage to teach and set a high standard, aspiration and expectation to students' who don't use ICT tools for studies to adopt it and make use of them so as to come out with an excellent academic performance and prepare them for future practice, the school management should make ICT tools available in school for students to make use of them in respective of gender so as to make good result outcome, seminars on how to make use of ICT effectively and positively should be organized to students in respective of male and female in order to have equal higher academic performance.

`CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

The students in Nigerian tertiary used various media and objects such as drums, flutes, gongs etc; for communication and the class rooms' discussion was not left out. Objects such as stones and sticks were used to count as stones and sticks were used to count numbers. The use of writing and invention of printing materials transformed the type and context of recorded history communication in a tremendous progression. Through the utilization of books, new-papers, magazines and radio; instructions were given to students at different level of education. Education is now supported and enhanced with the application of information and communication Technology (ICT) in learning process.

The world is being reduced to a global village through the use of ICT. This ICT is characterized by the revolutionary advancement. However, ICT promotes national development and better relationship with other nations. The use of ICT by the Nigerian students' in institutions is increasing and dramatically growing whereby increasing the students' academic performance. Learning by the use of ICTs seek to improve students' performance. However, there is a great deal of knowledge about how ICTs are being used by students. The new emerging technologies (ICTs) challenges the traditional process of learning and the way education is managed ICT usage provides instance access to vast array of data, challenging assimilation and assessment skills. Rapid communication plus increased accessed to ICTs in the and in Educational sector for learning because a truly lifelong activity and activity in which the pace of technology changes forces constant evolution of learning (Fowowe, 2006).

The advancement in technology has facilitate in the development of meant ICT tools that is necessary and useful in education. The knowledge of ICT usage improves human capacity in every field of human endeavor such as educational programs and activities. In the last two decades, the higher institutions have invested heavenly in ICT tools by procuring facilities such as projectors, installation of internet, facilities importantly the purchase of computers for teaching and learning process (Oye,Obi &Moh'd, 2012).

The provision of ICTs to schools and its use for Educational purpose can enhance students' academic performance in two ways; first, the availability of ICT in the classroom shift the level of educational input and could thus affect students learning outcome. Secondly, explosive to ICT tools may increase the cognitive abilities of students, allowing them to learn faster. The current issue is the ICT usage in relation to students' academic performance which is in the heart of an extensive literature in this work. Several studies have freed to explain the roles, the added values of those technologies in learning and students' academic performance. Since the internet revolution, there is a shift in the literature that focuses more on the impact of online activities; use of internet; use of educative on line platforms; digital devices such as phones. Calculators etc in education. These new technologies are central to contemporary society and therefore referred to this era as information Technology age. However, the use of ICTs by students in learning is just the beginning to gain popularity and researches in the area that have just started emerging. Emphatically, the use of ICTs by students is highly advantageous. This is because it enables them demonstrating understanding of opportunities and implications of the uses for learning in open and flexible learning environment (UNESCO, 2004).

Rockoff, (2010) pointed out that the education community is not left out in the consequences of ICT usage utilization on academic performance of students. He highlighted the benefit of ICTs in learning process as follows:

- Increase students' motivation towards learning
- Encourage the use of peer coaching and peer group discussion.
- Improve students' quality of work
- Develop student communication and vocational skills.
- Improve poor handwriting and language skills through word processing.
- Enhance students assimilation through graphics (pictures) and audio-visual application that shapes educational outcomes
- Enhance academic performance due to the reinforcement and practice that ICT afforded. It is revealed than an average students who use computer- based instruction scored higher than student without computer and the students also learnt more in less time.

ICT refers to electronic and communication devices associated with human interactive materials that enable users to employ them for a whole range of learning process (Cox, Preston and Cox 1999). ICT 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 microphones, camera, loudspeaker, telephone/mobile phones (Osu, and Akpan, 2010). Information and communication Technologies (ICTs) are indispensable and have been accepted as part of the contemporary world, expectant of giving a new phase to the education

system in terms of pedagogical approach (Ololube, 2006). According to Fari (2010), ICT 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, ICts 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) state that, the policy provides the needed guidance on what is expected in the entire process of ICT integrating in education to all stakeholders in education. It's implementation, therefore should lead to a speedy transformation of education. This in turnfoster the production of graduates in the education system that can survive in the contemporary society, sustain national development and competence globally. The realization of this policy statement lies basically in the capability of the key implementers of the nation's educational policy, that is, teachers to integrate ICT. Driven instructional aides effectively through computerAssisted 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

aspect. The aspect relevant to this study is ICT- Driven instructional aide basically, the "Computer Assisted Mode of Instruction (CAI).

According to Nwike and Chukwudum (2011) 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 individual instruction by presenting varied and flexible experiences to the individual learner and takes care of learners' in difference. 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 students' academic performance until they are effectively utilities in the teaching and learning process. Ojafor (2009), states that, in applying the CAI mode of instruction, the computer is fed in sequential manner with what to teach, the step to follow, how to evaluate success, how and when other classroom activities are to be carried out this informs the basis of investigating into the ICT usage and student academic performance in FCT, Federal College of Education Zuba, Abuja.

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 goal 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 wind of change in day's education sector have made ICT 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 endeavor, which calls for an awakening in teaching and learning process. As an information handling tools, ICT can be used in producing, storing, processing, distributing and exchanging of information. It therefore, implies that ICT could help students to be more serious using ICT tools and be resourceful. Hence, this will make learners to become less cumbersome and productive thereby improving students academic performance. Basically, the utilization of the ICTs is meant to serve as an orientation stimulus to support the students in learning process.

The benefits of ICT as an important tool in teaching and learning of school subjects such as mathematics, English language, psychology etc. 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 school subjects in recent decades. He further stated that passive learning based on the traditional form of "chalk and talk" has widely characterized by the 20th century style of teaching of school subjects in the Maldives in Asia. According to Jephcote (2004) the teaching of school subject as well as how it is being learnt has been very much under-researched in many part of the world. In like manner, Jegede (2002), noted that society is too as low in its enormous advantage. This in –turn could pose a. threat to development of a 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 teacher (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 because pertinent that a

study on the “relationship between ICT usage and Academic performances among students of FCT, college of Education Zuba- Abuja” be conducted to ascertain its impact on the learners.

Academic performance is the attainment obtainedby a students in the lesson taught, which may include, experience, knowledge, skill and like. The knowledge and skills and manipulates with the use of ICTs resources.Cohen & Garcia (2006) defines academic performance as “knowledge attaining ability or degree of competence in school. Task usually measured by standardized test and expressed in grade or unit based on students’ performance.

Academic performance refers to what the students have learned and usually measured through assessment and portfolio assessment (Santrack, 2006). Academic performance is the observable or measureable behavior of a person in a particular situation, the observed behavior or expectation of achieving a specific statement of or statement of educational in tensionin a scores obtained from teacher-made test so on. For example. The academic performance of a student in a particular school subject or course that astudent offer includes observable and measurable behavior of a student at any point in time during a course (Simpsai and Weiner, 2004).

Performance of students in the classroom and college or education (institution) takes a central role in the academic development of the student. Parent, teacher and school administrator alike take cognizance of the academic well-being of the student. Yardskicks are seat by school authority to measure performance, the standard set by the institution will determine whether a student is performing well or not. In the assessment of performance Pekrum &Elliot (2006) argued that achievement is the behavior of an individual that can be directly observed by another individual, therefore academic

performance has been seen as a term used for student based on how well they are doing in studies and classes. This definition tends to see academic activities of student in the school. Academic performance for student in higher institution is also seen as the extent to which a student has achieved his educational goals. This means the student academic performance is measured by the extent to which educational goal he has set for hero/ himself. The institution measures academic performance in continuous assessment test (CAT), Assignment and examination. By this method, areas of strength and weakness in a students' academic performance on using ICTs is determine and evaluated in order to improve on the learning process of the student. (Pekrun and Parry, 2007).

1.2Statement 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- centered (Ezekok and Okoli, 2012). This learner- centered approach makes materials and pace of learning, which places them in the center of the learning process and enhances independent learning (Collins and O'Brien, 2003). Student in the FCT, College of Education Zuba –Abuja have interest of using ICT tools for learning at home and in classroom for research and study purposes. Using ICT tools like computers, phones etc give them access to internet and this has really help them, improve in school subjects learning with excellent academic performance. Students who have access to a computer for educational purpose (not circular purpose) demonstrates improve scores in school subjects. This acquisition help the students to develop the technological skills in problem solving process, increase students motivation toward learning, Encourage use of peer coaching and peer review, improve teacher- students quality of work, Develop communication and vocational skills through word processing and enhance academic performance due to the reinforcement and practice that ICTs afforded.

The interest of the research in this work has been on how to use ICT tools based on previous knowledge on ICT usage to support learning and teaching process in order to enhance motivation in learning which improves academic performance. The research also sees whether this technological advancement which involves application of computers to study affects students' academic performance in a positive way. The uses of computers are now integrated with teaching and learning process which in-turn yields a greater outcome in students' academic performance.

The finding indicates that participating in a net-work community of learners improve educational outcomes for at-risk students. This studyhave even suggested that recent students in institutions increase in academic test score which attribute to exposure to the proliferation of many in ICT usage.The need to make use of modern ICT tools in learning/teaching process therefore, arises because this study is designed to find out the relationship between ICT usage and Academic performance among students. The researcher also assess the difference between male and female ICT usage and academic performance among the students of FCT, college of Education Zuba, Abuja.

1.3 Objectives of the Study

The objectives of the study were to:

1. find out the relationship between ICT usage and academic performance among students of FCT College of Education Zuba,.
2. investigate differencebetween students using ICT tools for academic purpose perform better than those who are not using ICT tools among students of FCT College of Education, Zuba.
3. determine gender difference in ICT usage amongstudent of FCT Federal College of Education Zuba.

4. assessgender difference in ICT usage on academic performance among computer students of FCT Federal College of Education Zuba, Nigeria.

1.4 Research Questions

1. What is the relationship between ICT usage and academic performance among students of FCT College of Education Zuba?
2. What is the difference between students using ICT tools for academic purpose perform better than those who are not using ICT tools among students of FCT College of Education, Zuba?
3. What is the gender difference in ICT usage among student of FCTCollege of Education,Zuba?
4. What is the gender difference in ICT usage on academic performance among computer students of FCTCollege of Education Zuba, Nigeria?

1.5 Research Hypotheses

1. There is no significant relationship between ICT usage and academic performance among students of FCT College of Education Zuba.
2. There is no significant differences between students using ICT tools for academic purpose perform better than those who are not using ICT tools among students of FCT College of Education, Zuba.
3. There is no significant differences between male and female in ICT usage among student of FCT Federal College of Education Zuba.
4. There is no significant differences between male and female in ICT usage on academic performance among computer students of FCT, Federal College of Education Zuba, Nigeria.

1.6 Basic Assumptions

For the purpose of the study:

1. It is assumed that, relationship may exist between ICT usage and Academic performance among the students of FCT College of Education Zuba.
2. It is assumed that, significant relationship of ICT usage may exist between students using ICT tools for academic purpose and those that are not using ICT tolls among students of FCT, Federal College of Education Zuba.
3. It is assumed that, significant differences may exist between male and female ICT usage of students in school of science and social science among students of FCT, Federal College of Education Zuba.
4. It is assumed that, differences may exist between male and female ICT usage and Academic performance among student of FCT, Federal College of Education Zuba, Nigeria.

1.7 Significance of the Study

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

The study hopes to help view possible factors hindering the effective implementation of ICT policy in education especially in higher institution with the aim of solving them and improving students academic performance. The study will hopefully made the Federal, States and Education Authorities to know the extent to which ICT facilities are available in the institutions for learning process as well as know the level of usage of these facilities by students for learning process.

More so, it has hoped that the study will bring out areas of inadequacies of the ICTsin the institutions with the hope that the authorities will help them to overcome challenges to increase learningamongst students. The school administrators are expected to have maximum benefits from this study because it is targeted towards knowing how to useICT in relation to students Academic Performance. This will help the students to know the important of computers and its relevance to effectiveness for better performance academically and this will inturn boost the image of the school in the community. Teachers will find this study helpful in so many ways. Specifically, some teachers who are reluctant to embrace this innovation or illiterate in the teaching profession and also ensure the success of their students academically.

- ICT usage will be of helpful to student who are exposed to these ICTs, they will learn how to use them independently to explore information in school subjects and this will in turn increase their skills and performance in examination. Learning became easier, real and concrete for students on their own parts who have knowledge of ICT can engage in individual learning at home for better understanding of concepts.
- The NGOs and philanthropic organization who are interested in educational advancement of the nation will see possible areas that requires ICT facilities in schools and the need for their support and donations.
- Most interestingly, the curriculum planners will benefits from the study because some aspects of the school subjects curriculum which are out-dated will require a review and new methodology may be adopted in pedagogy such as incorporating/ integrating the use of ICTs to meet present global best practice.
- It is hoped that schooners and future researchers carrying out studies in the field of ICTs usage and learning school subjects will find this work useful and the

finding will increase the contribution to the body of knowledge by taking up research work on some suggested areas recommended for future studies toward the nation's developments at large.

1.8 Scope and Delimitation of the Study

The study is limited to the investigation of the ICT usage in relation to students academic performance among students of FCT, college of educationZuba. The researcher hopes to carry out an in-depth study basically on how ICT usagehave enhanced the performance of the students. Hopes to cover all studentsof NCE II of school of Sciences and school of Art and Social Sciences in the same college. However, the study is delimited to School of Sciences and School of Art and Social Science in FCT, College of Education. Likewise, it is delimited to only NCE II students that have ICTs 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 use of ICT and students academic performance in FCT, College of Education Zuba. In specific terms, the chapter deals with the following amongst others:-

2.2 Conceptual Framework

2.2.1 Concept of Information and Communication Technology(ICT)

2.2.2 Concept of Academic performance.

2.3 ICT usage and Academic performance

2.3.1 Relationship between ICT usage and Academic performance

2.3.2 ICT in Education

2.3.3 Approaches of Integrating ICT into the Education System

2.3.4 Objectives of ICT in Education

2.3.5 Importance of ICT usage in learning

2.3.6 Stages of Teaching/learning using ICT Tools

2.3.7 Classification of various Types of ICTApplication in Education.

2.4 Concept and techniques of Computer Assisted Instruction

2.4.1 Characteristics of Computer Assisted Instruction

2.4.2 Uses of Computer Assisted Instruction

2.4.3 Preparation of Computer Assisted Instruction Package for Lessons

2.4.4 Types of Computer Assisted Instruction Aids

2.4.5 Problems Associated with the use of Computer Assisted Instructional Aids

2.4.6 The needs for Computer Associated Instructional Aids in enhancing quality Education in Nigeria institutions

2.4.7 Ways in which Computer Assisted Instruction can improve Teaching and Learning of school subjects

2.5 Impact of ICT Usage on Students Academic Performance

2.6 Theoretical Framework

2.6.1 Laird Sensory stimulated Theory

2.6.2 Mishra-Koehler Technological Pedagogical Content Knowledge Theory

2.6.3 Cognitive Flexibility Theories by KirkPatrick

2.7 Review of empirical studies

2.8 Summary

2.2 Conceptual Framework

2.2.1 Concept of Information and Communication Technology (ICT)

Researchers have commented immensely in the use of ICT aids in any educational processes, that the use cannot be over-emphasized. Moreover, links have been made between ICT usage and constructivist, collaborative, and inquiry-based learning and also pedagogical change. Some researchers suggest ICT technology can overhaul education, serving as an agent of change. Generally, it is accepted that ICTs have the potential to enhance teaching and learning and provide students with a learning experience that other strategies cannot provide.

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. According to Nkem (2006), information is a term with many meanings depending on context, but is as a rule closely related to such concept as meaning, knowledge, instruction, communication, representation, and mental stimulus. It is seen as organized data, which is understood to have significance and meaning or data that have been processed and presented in a form suitable for human interpretation, often with the purpose of revealing trends or patterns. In order words, it is an organized data that has been arranged for better comprehensive or understanding.

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). Communication is a generic process of translating information from one domain to one or more other domains through a medium, a domain can be either the mental world of a person, or the computational domain of the computer or even the economic domain of a market etc. but each medium structure the information as it translate (Nkem, 2006).

According to Olorundare (2005), technology is a form of knowledge that uses concepts and skills from other disciplines, and the application of this or solve a specific problem using materials, energy and tools, including computer and structures. The method of technology, therefore consists of inventing or modifying devices, structures, systems or processes. Technology extends the ability of humans to change the world around him; it enables him to cut, shape or put together materials, move things around and to utilized

the five natural sense (of sight, smell, taste, touch and hearing) in a most unusual and far reaching manner. Technology simply implies the application of knowledge to meet the goals, goods and services desired by people. Technology is innovation, change or modification of the natural environment to satisfy perceived human needs and wants. As Schick (1999), may say, it is the process of applying established knowledge to meet identified needs. 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), ICT 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).

Information and Communication Technology (ICT) therefore, is a technology that support activities involving information. Such activities include gathering, processing, storing and presenting data. It also involve collaboration and communication. ICT contributes at various points of human endeavour in education, the key activities involve includes knowledge, experience and products. Using ICT involve matching ICT to ones purpose and this in turn requires a rationale. ICT as a technology that provides an enabling environment for physical infrastructural and services development of applications for generations, transmission, processing, storing and disseminating information in all forms, including voice, text, data, graphics and video (Norman, 1997). ICT on the web; is the catch-all phrase used to describe a range of technologies for gathering, retrieving, processing, analyzing and transmitting information. *www.fraw-org.uk/library/005/ng-irt/glossary.html*. ICT is the term used to describe exciting and innovative ways to provide lifelong learners with global access to information, learning and support (*www.asp2.w/v.sc.uk/its/website/everyone/its jargon. html).*

The concept of ICT depends on the local culture and particular ICT available and how it is configured and managed. In rural area, for instance, ICT network is made up of chain of computer linked together by radio communication that are independent of any infrastructure. One of the internet network mode is linked to the worldwide internet network via a satellite connection or a local Internet Service Provider (ISP). This internet connection is then shared by all the computers linked to the network.

Understanding, management and configuration of the available technology might vary the concept ICT. Therefore, ICT can be seen as;

An organized set of equipment for working on information and communication. 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 into teaching and learning process for efficient and effective learning and attaining best academic performance.

2.2.2 Concept of Academic Performance

Academic performance refers to what the student have learned and is usually measured through assessments and portfolio assessment (Santrack, 2006). Academic performance is the observable or measurable behavior of a student in a particular situation, the observed behavior or expectation of achieving a specific statement of or statement of educational intention in a research. Academic performance consist of scores obtained from teacher-made test, first term examination, mid-semester test, first term examination and so on. For example, the academic performance of a student in computer studies includes observable and measurable behavior of a student through the use of ICTs at any point in time during a course or in learning process (Simpsai and Weiner, 2004).

Academic Performance, which is measured by the examination results, is one of the major goals of school. Hoyle (1986), argued that schools are established with the aim of imparting knowledge and skills through the use of ICT toolsand those who go through them and behind all this is the idea of enhancing good academic performance.Academic

performance is the engagement in educationally purposeful activities, satisfaction, acquisition of desired knowledge, skills and competence, persistence attainment of educational outcomes and post-college performance (Kuh, 2006).

Academic performance is how well or boldly something is done. Its relevance stands out because of significance it holds to the society. In the educational parlance, performance manifest through academic achievement, which is the manifestation of a student's hard work and they in turn are formed and strengthened through education .The development of student hard work and ICT Usage in learning process is equally relative and helpful not only in academic work but in career actualization.

2.3 ICT Usage and Academic Performance

ICT enhancing academic performance of student based on the extensive usage of ICTS in education. The need appeared to unravel the Myth that surrounds the use of ICT as an aid to learning and the impact it has on students' academic performance. ICTs are said to help expand access to education, strengthen the relevance of education to the increasingly digital workplace and raise educational quality. ICT helps student to their learning by improving the communication between them and the instructors (Valasidon and Bousiou, 2005).

According to Kulik's (1994) Meta-analysis study revealed that, an average students who used ICT based instruction scored higher than students without computer. The students also learned more or less time and liked their classes more when ICT-based instruction was included. Attwell and Battle (1999), students who have access to a computer at hand for educational purposes, have improved scores in reading maths. Becker, (2000) found that, ICT increases students engagement, which leads to an increased amount of time students spend working outside class. ICTs especially

computers and internets technologies enable new ways of learning rather than simply allow students to do what they have done before in a better way.

The use of ICT in educational settings by itself acts as a catalyst for change in this domain. Students using ICTs for learning/research purpose became immersed in the process of learning and as more and more students' use computers as information sources and cognitive tools (Reaves and Jonassen, 1996). Students use of ICT system can be in the form of communicating or posting of information or materials by way of electronic mail, bulleting boards, world wide web (internet), or other such electronic tools (Mischnick, 1998). In recent years, the use of electronic information has become prominent in the drive for making information and data transfer available to users especially students in the higher institutions. They need for ICTs for the purpose of research and learning in various institutions has posed challenges in relation to system connections, working ability and access. ICTS has many functions and benefits which can be of immense use to students in schools and educational sectors, particularly research institution once the user is connected to the internet, the user can link up with any part of the world for whatever purpose the user intends (Osunrinde, Adkiya, &Adeyemo, 2002).

ICT serve as a motivating factor to students as it provides the opportunity to transmit, acquire or download, process and disseminate information on a subject of interest. ICTs sources offer today's students opportunity different from their predecessors (Bartle and Day, 1998. Brophy (1993) details the advantages of networking for the user as being "the information need which can be delivered from the most appropriate sources to the user; the user can re-specify his/her needs dynamically; the information is obtained when it is wanted, so become 'just in time' rather than 'just in case'; the user selected

only the information needed to answer the specific question and finally, the information is only stored should user wish" the use of ICTs by students enhance their performance in academic activities. Among the ICTs system students use to get most of their information in internet email, electronic journal, bulletin board telephone, talex CD-ROM, data base, electronic books.

In education and learning ICT is seen as a power tool for learning as it transfers knowledge to the person most likely to achieve effective dissemination. ICT has the potential to increase the availability of quality educational materials through interactivity and global reach, and by sharing knowledge, materials and database quickly and cheaply independent of geographic distance (World Bank, 2003). Using ICTs in the learning process have created changes in education. These changes according to (DEEP; 2005) are:

- provides students with professional equipment and enabling them to use it for professional learning thereby, raise their knowledge's
- empower students to use ICTs purposefully and effectively in their studies research work.
- students work together and share laptops which result in effective peer support, create more enthusiasm and ensure high level of equipment usage some student have the opportunity to develop more than the basic skills in the use of ICT, fever have developed confidence and self-efficacy of the usage of ICT in their studies, research etc. (Orhun, 2002; Albion, 2003).

While ICT receives wider acceptance in the field of education than in the other fields like industry, same students still exhibits a certain degree of anxiety toward computer as a tool used in the field of education and learning. Kersaint, (2003) found that students who have positive attitudes toward ICT, feel more comfortable with using it. Woodraw

(1992) asserts that any success requires the development of positive user attitude toward the ICT.According to Attwell, (1996), ICT has fundamentally changed the practices and procedures of nearly all forms of endeavor within education business and governance, and have become commonplace entities in all aspect of life. The use of ICT in education lends itself to more student-centre learning settings. But with the world moving rapidly into digital media and information, the role of ICT in education is becoming more and more important in this 21st century.

The field of education has been affected by ICTs, which have undoubtedly affected learning and research (Yusuf, 2005). A great deal of research has proven the benefits to the quality use of ICT in learning and research (Al-Ansari, 2006). ICTs have the potential to innovate, accelerate, enrich and deepen skills, to motivate and engage students, to help relate school experience to work practice, create economic viability for tomorrow's workers, as well as strengthening students and helping schools change (Davis and tearle, 1999; Lemke and Coughlin, 1998, cited by Yusuf, 2005). As Hpp, hinostroza, laval and rehbein (2004) claim in their paper "technology in schools: education, ICT and the knowledge society" that ICTs have been utilize in education ever since their inception, but they have not always been massively present. Although at that time computer have not been fully integrated in learning of traditional subject matter, the commonly accepted rhetoric that education systems would need to prepare students for lifelong learning in an information society boosted interest in ICTs (Pelgrum and Law, 2003).

2.3.1Relationship between ICT Usage and Academic Performance

The effectiveness computer usage for instruction and learning has found positive relationship between computer usage and students' academic performance (Fuch&Woessman, 2004; Salerno, 1995). This is support the argument that

instructional activities that involve of students' which facilitates their understanding of the content and provides different ways of expressing knowledge and therefore have a positive influence on students academic performance. ICT resources for educational purposes can increase students academic performance in at least two ways; first, the availability of ICT in the classroom shift the level of educational inputs and could thus affect students learning outcome. Second, exposure to ICT may increase the cognitive abilities of students, allowing them to learn faster.

Programs that provide computer-aided in school subjects instruction can positively influence students' test scores. Barrow et al. (2009) found that an instructional computer program for pre-algebra and algebra in the United State had a positive effect on test scores. Moreover, computer aided instruction as being used not only to facilitate learning of mathematics but also other core subjects such as Language, History and Social Sciences.

Hurds et al (2005) as cited by Fuller and Clark (1994) state that, an increase in educational resources such as book and instructional materials has a greater effects on students performance than an increase in teachers or a reduction of class sizes. It is based on this premise that governments have resources for schools with the intent of increasing the use of ICT in learning (Hurds et al; 2005). Learning environments that are rich in ICT exhibit integrated lessons that are differentiated, inquiry-based and learner-centered allowing students to develop knowledge based on experiences or hands-on initiative.

Kulik's (1994) meta-analyss study revealed that, an average, students who used ICT-based instruction scored higher and perform well that students without computers. The students also learned more in less time an liked their classes more when ICT-based instruction was included.Sosin et al, (2004) found out that, there is positive impact on

students performance due to ICT usage. The analysis of the effects of these methodological attitude towards the learning process and on students performances seems to be evolving towards a concensus, according to which appropriate use and availability of tools of digital technologies in higher education can have significant positive effects both. On students attitudes and their academic performance.

Li et al. (2003) pointed out: "First, Web-based instruction present information in a non-linear style, allowing students to explore new information via-browsing and cross-referencing activities.

Second,web-based teaching support active learning process emphasized by constructivist learning theory.

Third, Web-based education is enhanced understanding through improved visualization and finally, the convenience, it could be and used any time, at any place"

Fuchs and Woessman (2004), states that ICT constitutes an input in the students learning process that should help produce better learning output. ICT use can enhance learning by making education less dependent on differing teacher quality and by making education available at home throughout the day. The use of ICT on students can positively transmit knowledge to students. Furthermore ICT use can help students exploits enormous possibilities for acquiring information for schooling purpose and can increase learning through communication.

ICT resources for educational purposes can increase students academic performance in three ways; first, the availability of ICT resources, second accessibility of ICT resources and thirdly user-ability of ICT resources.

i. **Availability of ICT resources**

The availability of modern computers, peripherals, networking and resources within an increasingly diverse range of technologies is an essential part of learning in the 21st century. The availability of ICT resources can enhance learning by making education less dependent on students' quality throughout the day (Mbwesa, 2002). Bonnet (1997) argues that the use of ICT can positively transmit knowledge to students. Furthermore, the availability and use of ICT can help students exploit enormous possibilities for acquiring information for schooling purposes and can increase learning through communication (Riel, 1998).

According to the Swedish National Agency for school improvement (2008), ICT provide a positive impact on learning and student performance when it becomes an integrated element in the classroom and teaching. Bonnet (1997) argues that the availability of visual digital technology (such as animation, simulation and moving images) involves students and reinforces conceptual understanding. ICT use also encourages development from a teacher-led model to a more student-focused model in which students work together, make their own decisions and take an active role in learning (Swedish National Association for school Improvement, 2008).

Furthermore, students should have confidence in these facilities, which is in turn reliant on the facilities reliability or degree to which students are sure that they will have access to them at all expected times and utilize them at predictably work (Pelgrum, 2001)

The lesson here is that computers are but a subject of the information communication technology facilities necessitated have to be furnished with

quality accessories, installed with appropriate software and linked to necessary network to allow access to rich resources beyond the school rather than serve as a resources for minor typesetting and other word processing activities.

ii. **Accessibility of ICT resources**

Effective integration of ICT in schools would call for a whole institution to be networked to ensure access to multimedia and learning rich resources via the school's internet and the internet wherever students are, in or out of school. The computer labs and classroom computers need to be sufficient in number and allow ready access by students in most subjects across the school. A wide range peripheral and remote working devices, including video-conferencing, is provided and integrated into the curriculum. Large and small group presentation facilities are readily available (School net Africa, 2004).

Many academic developers of educational multimedia have focused primarily on information access and presentation (Singh, 1993). However, it is easy to see that multimedia has tremendous potential to enhance the vividness with which information can be presented and ease with which it can be accessed.

Accessibility and use of ICT allows students to investigate more thoroughly the real world (Reginald Gregoire Inc., Bracewall&Laferriere, 1996; Riel, 1998). They can move readily access information sources outside the classroom and can use tools to analyse and interpret such information. Information may be accessed through online system or through data logging system (Riel, 1998). The technologies allow the student to receive feedback, refine their understanding, build new knowledge and transfer from school to non-school settings (Committee on Developments in the Science of Learning, 2000).

Dewey (1989) argues that information that is accessed but never put to use during that process, may be difficult to retrieve and use when need arises in the real world. Equal attention must be paid to ensuring that the technology is actually being used by the largest learners and in ways that truly serve their needs (Solomon, 1994).

iii. **User-ability of ICT resources**

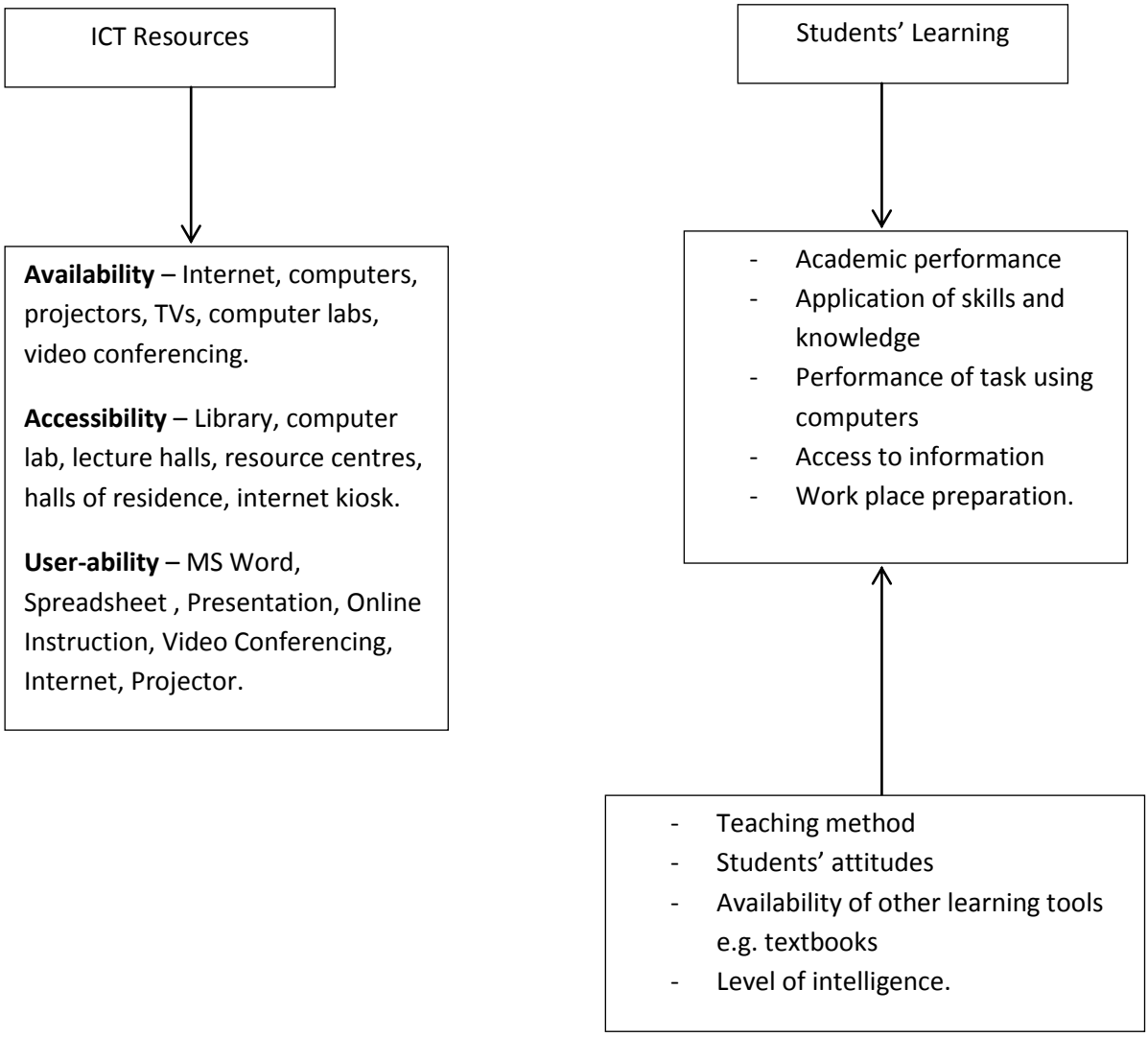
Recent research by British Education Communication and Technology Agency (BECTA) has highlighted user-ability of ICT resources as one of the five key pillars of successful integration of ICT in schools (National Council for Curriculum and Assessment UK, 2004). It is the skill and attitude of students that determines the effectiveness of technology integration into the curriculum (Bitner&Bitner, 2002). Once students developed skills, they could begin to find ways to integrate technology into the learning process and demonstrate it use to others.

If learning was the impetus that drove the use of technology in the school, students could be partners in the learning process, altering traditional paradigm of the teacher providing wisdom and the student absorbing knowledge. Motivation to endure the frustration and turmoil of the process of change needed to be intrinsic.

Newhouse (2002) and Loveless (2002) notes that ICT if used positively enhances learning processes and excellent academic performance. Findings assert that both the learning environment and curriculum pedagogy and content are central to the effective use of ICT. However, students need to be confident in their subject knowledge as well as in basic ICT literacy so that they can

effectively integrate ICT into learning programs. A large number of studies have found that students are often more engaged and motivated to learn when using ICT to support specific intentional learning. Students learn more quickly, demonstrate greater retention, and are better motivated to learn when they more often use computers (Richmond, 1997). Richmond continues that since technology use is fully integrated into the larger learning system, it is very difficult to isolate the technology variable and determine whether any observed gains are due to technology use or to some other factor or combination of factors.

Fig: 2.1: Conceptual Framework showing relationship between ICT usage and learning by students



Source: Adapted from Spiro et al, 1992.

The presence and use of ICT resources by the students and lecturers provides an avenue of interaction. These interactions provide feedback which acts as a reinforce towards the learning process. Multimedia applications like games, drills, animation and other graphical applications provide practices that take the form of questions (stimulus) and answers (response) frames which exposes the students to the subject in gradual steps consequently more interest in the subject matter which in the long run affects their

academic performance and gives them desire to try and use these acquired knowledge in a different setting.

2.3.2 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 believes 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).

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).
    - 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.

2.3.3 Approaches of Integrating ICT into Education System

UNESCO (2002) report identified about four main approaches through which educational systems and institutions 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 institutions 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 employs 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.

2.3.4 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 students to become more effective and competent in using ICTs 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 students 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.

2.3.5 Important of ICT Usage in learning

Kamba (2011) added that, the importance of instructional materials for both teacher and students cannot be over emphasized. The use of computer-driven instructional aids is essential to support teaching and learning because other phenomenal cannot be easily expressed without the support of graphics maps, video, pictures etc.

A. ***Stimulation Of Students' Interest***

In teaching-learning process, there is the need to generate, arouse, motivate and maintain students' interest. Anyanwu (2008), agreed and based on investigations that pictures stimulates and help further study, helps students to take active interest in the topic presented.

B. ***Concretize abstract issues or topics in teaching and learning Process***

The use of computer in teaching and learning process makes learning real, practical and more permanents to the learners. Ogunsola (2008) stated that, instructional materials were valuable assets in learning situations because they make lesions practical and realistic. They are the pivots on which the wheels of the teaching-learning process rotate.

C. ***Creating of effective communication***

Computer-driven instructional aids if properly used allow 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.

2.3.6 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.

- Discovering ---------- ►

  A ---------- »ICT tools

- Learning how ---------- ►

  B ----------to use tools

- Understanding how and when _____ ^
- C ---------- (to achieve a particular purpose
- Specializing ----------
- D----------(the use of ICT tools

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

2.3.7 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)

2.4 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

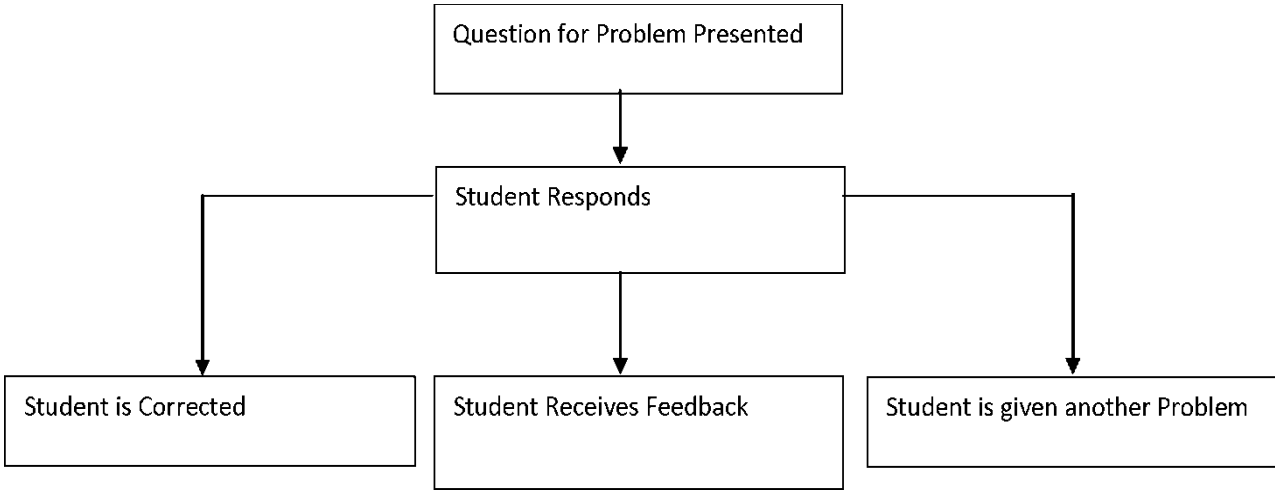
Drill and Practice: This is the commonest used CAI application during the advent of computer use in education due to its simplicity and the program could show off

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 concept 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:

Fig. 2.2: *Drill and Practice Program Steps*



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 materialused 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 because 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 keep track records of students performances.

2.4.1 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.

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. However, teaching and learning of school subjects should portray an active and dynamic classroom which enables the students' thinking, hearing and applying what they have learnt.

2.4.2 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.

2.4.3 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.

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).

2.4.4 Types of Computer Assisted Instruction Aids

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.

Table2.1: List of Some Educational Technology and Computer Assisted Instruction Aids used in Teaching and Learning.

Flexible	Laboratory	Fixed Mobile	Mobile
- Television - Satellite - Receiver - Radio - Recorder - Camera - Videos/Pictures/ CCTV facilities - Projectors/Beams - Arts costumes Robots - Video Games - Language Tools Avatars - MP3-4 players - Books and other cable devices	- Scientific Tools - Technical Instruments - Medical Apparatus - Agricultural Engineering	- Computer storage devices - Internet email/social media - Smart Boards/Touch ipads screens - Plain screens	- Mobile phones - Memory Reader - I pod - Androids - I phone - Calculator

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.

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 player 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 width of 1cm. 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 drive 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.

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.

2.4.5 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 slit 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 it 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 ₦45 000, while branded new ones are being sold between ₦98 000 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 aides because the time that is allotted for a particular lesson like psychology 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

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

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 the school/institutions to students with Tablet of Knowledge called "Opon Imo" inform of a mini iPad. It contains 63 e-textbooks covering core subjects, sex education, extra-curricular subjects, etc. Also, on it are 40,000 past examination questions of school subjects 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 the institutions/schools, and hence, improved academic performance.

2.4.7 Ways in Which Computer Assisted Instruction can Improve Teaching and Learning of Schools subjects

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 permanents 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 ofprojected and electronic materials such as television, overhead transparencies and computer especially, instructions are packaged in a very broad manners and which take care of 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.

d. **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.

d. **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.

e. **It saves time and reduces verbalism or repletion of words:** Emma and Ajayi(2006) assert that "figurative speaking", instructional materials enable the teacher to being 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 individuals 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.

f. **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.

g. **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.

2.5 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 necessaryfor 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 Psychology, 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 “Relationship between Information and Communication Technology Usage and Academic Performance among Students of FCT,College of Education ,Zuba-Abuja” will help in determining the current state of their findings.

i 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.

ii 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.

iii 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 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.

iv 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.

2.6 Theoretical Framework

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

2.6.1 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 "relationship between ICT usage and students academic performance". ICT instructional aides 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.

2.6.2 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:

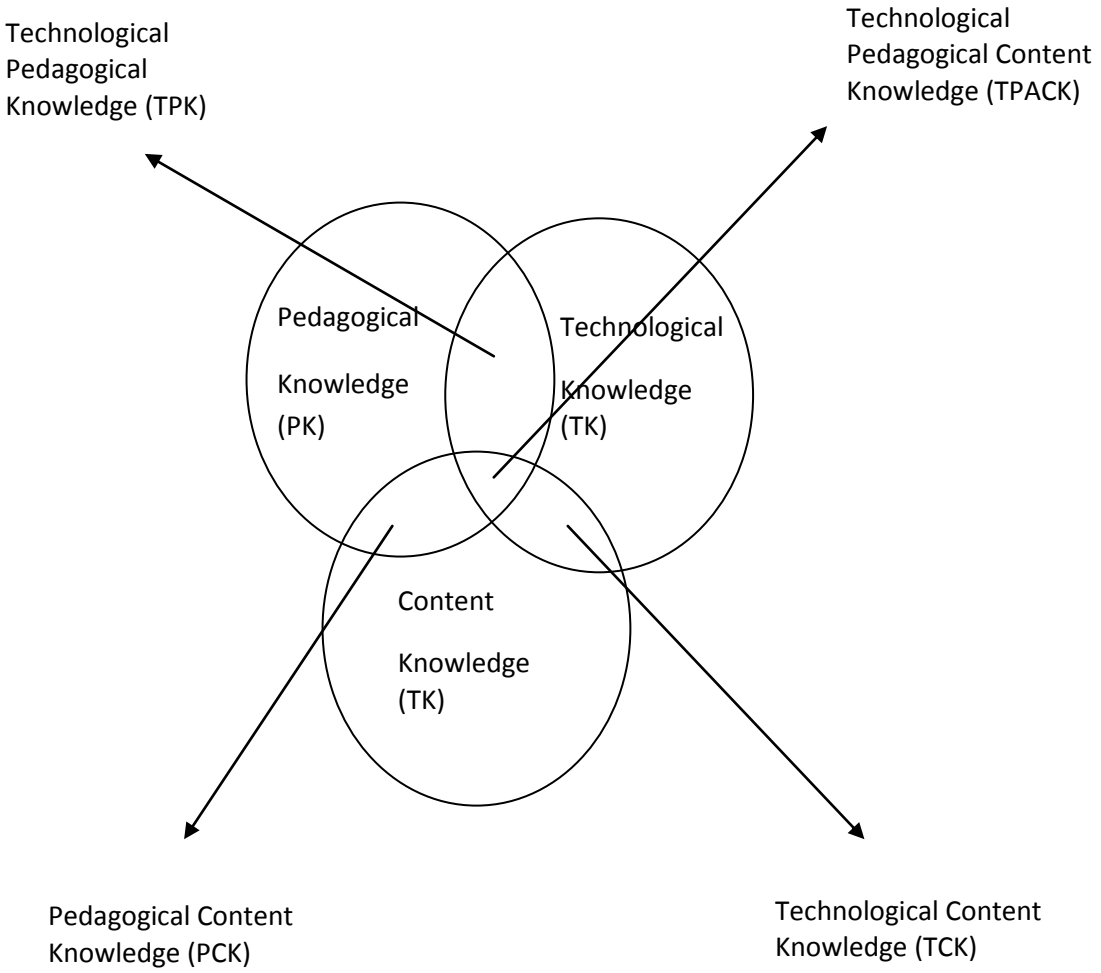


Fig 2.3: The TPACK Model (Koehler & Mishra, 2006)

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, "the use of ICT on Students' academic Performance in FCT, College of Education, Zuba" 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 semester examination report. This was advanced as the reason for the failure in school subjects 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 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, Teachers are knowledgeable in some subject concepts taught at NCE 11 and 111 such as: The Theory; The types and processes, 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 subject. 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 school subjects, thereby resulting to skill acquisition, enhancing performance and independent learning amongst students.

2.6.3 Cognitive Flexibility Theory

The theory of Cognitive Flexibility (Spiro, et al, 1992), emphasized by Kirkpatrick's four level of evaluation (Kirkpatrick, 994). Kirkpatrick emphasizes reactions, learning, transfer and results.

Level one is reactions and just as the word implies, learning at this level measures how participants in a training program react to it. It attempts to answer questions regarding the participants in a training program react to it. It attempts to answer questions regarding the participants' perceptions – did they like it? Was the material relevant to their work? In addition, the participants' reactions have important consequences for learning level two, although a positive reaction does not guarantee learning; a negative reaction almost certainly reduces its possibility (Winfrey, 1999).

At level two, teaching moves beyond learner satisfaction and attempts to assess the extent to which students have advanced in skills, knowledge and attitudes to determine the amount of learning that has occurred. Level three is transfer; this level looks at the transfer that has occurred in learners' behaviour due to the teaching program. Teaching at this level attempts to answer the question – are the newly acquired skills, knowledge, or attitude ready to be used in the everyday environment of the learner?Level four is results, frequently thought of as the bottom line, this level looks at the success of the program in terms that managers and executives can understand – increased production, improved quality, reduced frequency of accident, and even higher profits or return on investment.

Cognitive flexibility means the ability to spontaneously restructure one's knowledge in many ways, in adaptive response to radically changing situational demands. The theory largely concerns with transfer of knowledge and skills beyond their initial learning situation. Skill transfer can be described as students desire to use the knowledge and skills mastered in the training program on the job (Noe& Schmitt, 1986 in Yammill& McLean, 2001). Behavioural change would likely occur for student who learn the material presented in training and desire to apply that new knowledge or skills to work activities. Two different types of transfer have been proposed, near transfer and far transfer. Near transfer is applying the learnt information or skills in a new environment that is very like the original one. Teachers need to design ICT instruction that teaches the steps of a task that are always applied in the same order. The advantage of tis is that the skills and knowledge are easier to train and transfer of learning is usually a success. Far transfer is being able to use learned knowledge or skills in very different environments (Allessi and Trollip, 2001). With far transfer teachers need to design ICT instruction where learners are trained to adapt guidelines to changing situations or environments. Thus, once the skills and knowledge are acquired, the learner is able to make judgements and adapt to different situations. This is most ideal for the dynamic ICT evolution in the world today. To support the degree of transfer of knowledge desired, it is important to understand that it is every learner's wish to apply the trained skills acquired in doing their works. But this applies only when the learner acknowledges the relevancy of the skills to his/her nature of work expected of him in the field.

2.7 Empirical Studies

Several scholars and researchers have carried out series of studies on or in relation to the "Relationship between ICT Usage and Academic Performance among students of FCTCollegeof Education, Zuba" and some of the studies have been reviewed in this section to determine their relevance to this work.

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.

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.

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.

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.

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.

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.

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.

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 counterpartstaught 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.

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.

In a related research, Yusuf, Maina and Dare (2013) conducted a study on "Assessment of the Availability, Utilization and Managementof 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.

2.8 Summary

The review of related studies has revealed and adds to the growing body of the literature about the ‘‘relationship between ICT Usage and Academic Performance of students’. This chapter has discuss the concept of ICT and Academic Performance. The chapter also reviews the relationship between ICT Usage and Academic Performance, the approaches of integrating ICT into Education system, importance of ICT in learning, concept of Computer Assisted Instruction (CAI), and the impact of ICT Usage on students Academic performance. The theories of ICT usage and Academic Performance were also reviewed.

ICT was defined as 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- confe). Academic performance is the observable or measurable behaviour of a student in a particular situation, the observed behaviour or expectation of achieving a specific statement of or statement of educational intention in a research. Theories such as the sensory stimulation, Technological pedagogical and content knowledge theory and lastly, Cognitive Flexibility by KirkPatrick were review along with their impacts on academic performance. Evidence from empirical studies indicates that there is positive relationship between ICT Usage and Academic Performance among students.

Finally, the researcher explain the gap that was not attended to the previous researchers, in an attempt to upgrade the decision and current methods, and techniques that can enhance the use of ICT and academic performance of students at various department in FCT, College of Education Zuba-Abuja.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter presents the methodology under the following headings; research design, population of the study, sample and sampling techniques instrumentation, validity and reliability of the instrument, procedure for data collection and procedure for data analysis.

3.2 Research Design

The research adopted correlational survey research design to find out the relationship between Information and Communication Technology Usage and Academic Performance amongstudents of FCT, Federal College of Education Zuba-Abuja. The correlation research design was used to describe the relationship between two or more naturally occurring variables. Correlation survey research design refers to studies in which the purpose is to discover relationship between variables through the use of correlation statistics (Belue, 2005). This research design will thus be adopted because the researcher seek to find out retrospectively, the relationship between ICT usage and studentsAcademic Performance among students of FCT, Federal College of Education, Zuba-Abuja.

3.3 Population of the Study

The population of this research comprised of all NCE II students of FCT, Federal College of Education Zuba-Abuja. The population of this study according to 2014/2015 students statistics by course registration stands at One Thousand Four Hundred and Fifty (1450), both male and female. This is the entire population of all NCE II students

across the five schools in the college. The table below describes the population of the study.

Table 3.1: Population of the Study

		LEVELS							
S/N	**School name**	**NCE I**	**NCE II**	**NCE III**	**NCE IV**	**NCE V**	**PRE-NCE**	**SPILLOVER**	**TOTAL**
1	School of Art & social sciences	746	665	557	0	0	0	415	2383
2	School of education	293	310	209	0	0	0	98	910
3	School of languages	256	200	180	0	0	0	176	812
4	School of sciences	332	446	297	0	0	0	186	1261
5	School of vocational and technical education	230	244	207	0	0	0	148	829
	Total	**1857**	**1450**	**1865**	**0**	**0**	**0**	**1023**	**6195**

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3.4 Sample and Sampling Techniques

The Krejecie and Morgan (1970) recommendation a determining sample size was used to determined the sample size for the research. The recommendation specifies that for a population of one thousand four hundred and fifty (1450), One Hundred and Eight is (108) is appropriate. Purposive sampling techniques will be used to select the number of students appropriately. Purposive sampling is based on experienced.

3.5 Instrumentation

The researcher make use of one instrument for this research in order to measure the students ICT usage and Academic Performance.

3.5.1 ICT Usage Scale

ICT usage was measured in this research by using information and communication technology students questionnaire scale (ICTSQ) (Alharbi, 2014), each response will be score as thus; never 4, several time 3, at least onces, every day 1, The ICT usage scale is a 14- items 4 point Likert scale.

3.5.2 Academic Performance

Data on academic performance of the respondents were collected through the Academic Secretary of FCT, Federal college of Education Zuba-Abuja, requesting students Semester result for 2014/2015 Academic session. However, second semester result was issued to me for the purpose of this research.

3.6 Validity of Instrument

The instrument in this study were validated through content validity. Experts in the field of Educational Psychology and Guidance and Counseling evacuated contents of the items on the instruments, scrutinized them and made necessary correction and modification to ascertain their appropriateness and coverage with reference to the research objectives. Some of the corrections made during the validation of the instruments include reducing the number of items from fifty one to at least eighteen. The research effected the corrections and the number of the instruments were reduced and validated by experts in the same department. The outcome of the validation was satisfactory.

3.6.1 Pilot Study

The pilot study was carried out in Federal College of Education (FCE) Zaria, Kaduna State, with the purpose of establishing internal consistency of ICT usage on students academic performance after adaptation of the instrument. Thirty (30) copies was distributed among NCE II and NCE III students of various schools in FCE, Zaria Kaduna State. The students are not going to participate in the main study, but have similar characteristics with the general population of ICTQS data collected from pilot study. The data obtained from the pilot study were statistically analyzed for the purpose of reliability. The Cronbach alpha reliability coefficient was used to test the questionnaire. This reliability coefficient was considered adequate for the internal consistencies of the instruments. The result of Cronbach alpha reliability co-efficient of Information and Communication Technology Questionnaire scale (ICTQS) 0.819. This was a confirmation of test of reliability which according to Spiegel (1992);an instrument is considered reliable if it's reliability coefficient lies between 0 and 1, and that the closer the calculated reliability coefficient is to zero, the less reliable is the instrument, and the closer the calculated reliability co-efficient is to 1, the more reliable is the instrument. This therefore confirmed the instruments use for this study were highly reliable.

3.6.2 Reliability of the Instrument

The instrument is reliable which have an appreciable internal consistency. Information and Communication Technology Questionnaire scale has the internal consistency of 0.819.This reliability measures was used to determine by the use of cronbach's Alpha. These reliability show that the instruments is reliable to collect data for research.

3.7 Procedure for Data Collection

The researcher collected an introductory letter from the Department of Educational Psychology and Counseling to the Academic secretary of FCT, Federal College of Education Zuba, where the data of the semester result of 2014/2015 academic session was collected by the researcher. The researcher took the letter to the school again and subsequently was given permission by the Secretary and Head of Department to carry out the research among the students. The instrument were administered personally by the researcher and by some students where necessary. The students were required to voluntarily respond to the instruments. The respondents were require to fill it as soon as in cases where they could not respond immediately, the researcher left the instrument with them for completion and subsequently went back for the collection. The filled instrument were all collected by the researcher for further analysis.

3.8 Procedure for Data Analysis

The purpose of this study was to determine the relationship between information and communication technology usage and academic performance among students of FCT, College of Education Zuba – Abuja, Nigeria. One instrument and Data on academic performance of the respondents were collected through the Academic Secretary of FCT, Federal college of Education Zuba-Abuja, requesting students Semester result for 2014/2015 Academic session was used to determine the relationship between independents variables and dependent variable. This study employ two statistical tools which were Descriptive and Inferential statistics. Descriptive statistics was used to analyzed bio data and research questions with the used ofpercentage, mean, and standard deviation. For Hypothesis testing, Pearson Product Moment Correlation (r) wasanalyzed to test hypothesis 1 whileIndependent sample T-test was usedto analyzed Hypothesis 2, 3 and 4 respectively. SPSS 20th edition was used for data collection and storage.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 Introduction

The study is titled “relationship between ICT usage and academic performance among the students of FCT College of Education Zuba, Nigeria”. The statistical Package of the Social Sciences (SPSS) IBM 20th Edition was used for the analysis. A total of 108 students of FCT, College of Education, Zuba were used. The analysis of this study is presented in sections for easy comprehension. The first section presented the data analysis of the bio data variables in frequencies and percentages while Pearson Product Moment Correlation (r) was analyzed to test hypothesis 1 while Independent sample T-test was used to analyzed Hypothesis 2, 3 and 4 respectively.. All hypotheses were tested at 0.05 alpha level of significance. The summary of all the major findings were also presented as well as discussions on findings.

4.2 Results

4.2.1 Analysis of Distribution of Bio Data Variables

Table 4.1: Distribution of Respondents by Gender

Gender	Frequency	Percent
Male	61	56.7
Female	47	43.3
Total	**108**	**100.0**

On respondents gender status, 61 representing 56.7% are males and the remaining 47 representing 43.3% are females. This shows that both male and female students are well represented in this study.

Table 4.2: Distribution of Respondents by Name of School

Age	Frequency	Percent
School of Sciences	52	48.4
School of Social Science	56	51.6
Total	**108**	**100.0**

On respondent's name of school, 52 representing 48.4% were in school of sciences while 56 representing 51.6% were from school of social sciences. This shows that both school of sciences and school of social science are well represented in this study.

4.2.2 Testing of Null Hypotheses

Research questions were answered usingdescriptivestatistics, their corresponding hypotheses tested using inferential statistics at 0.05 confidence level with their corresponding hypotheses.

Hypothesis one: There is no significant relationship between ICT usage and academic performance among students of FCT, College of Education, Zuba.

Table 4.3: Pearson Product Moment Correlation (PPMC) Statistics on the relationship between ICT usage and academic performance

Variables	N	Mean	S.D	r	P
ICT Usage	108	44.891	7.371		
				0. 771	0.011
Academic performance	108	33.802	5.701		

Significant at the 0.05 level

An understanding of the above Pearson Product Moment Correlation statistics revealed a significant relationship between ICT usage and Academic performance among students of FCT College of Education, Zuba. This is because the calculated significant (p) value of 0.001 is lower than the 0.05 alpha level of significance at a correlationindex r level of 0.771. This shows that the higher the ICT usage, the higher their academic performance, Hence the null hypothesis which state that there is no significant relationship between ICT usage and academic performance among students of FCT College of Education, Zuba, Nigeria is hereby rejected.

Hypothesis two: There is no significant differences between students using ICT tools for academic purpose perform better than those who are not using ICT tools among students of FCT College of Education, Zuba, Nigeria.

Table 4.4: Independent t test Statistics on the differences between students using ICT tools for academic purpose perform better than those who are not using ICT tools

Variables	N	Mean	S.D	t cal	Df	P
Students using ICT tools for academic purpose	108	14.731	5.311	6.089	107	0.007
Students that are not using ICT tools	108	11.813	3.791			

Calculated p >0.05, Calculated t< 1.976, at df 107

Results of the independent t-test analysis above showed that there are significant differences between students using ICT tools for academic purpose perform better than those who are not using ICT tools among students of FCT College of Education, Zuba, Nigeria. Reasons being that the calculated p value of 0.007 is lower than the 0.05 alpha level of significance while the t-calculated value of 6.089 is greater than the t-critical value of 1.976, at df 107. Hence the null hypothesis which state that there is no significant differences between differences between students using ICT tools for academic purpose perform better than those who are not using ICT tools among students of FCT College of Education, Zuba, is hereby rejected.

Hypothesis three: There is no significant differences between male and female in ICT usage among student of FCT College of Education Zuba, Nigeria.

Table 4.5: Independent t test Statistics on the differences between male and female in ICT usage

Variable	Gender	N	Mean	Standard Deviation	t cal	Df	P
ICT usage	Male	61	16.223	6.2959	7.971	107	0.0061
	Female	47	8.491	4.4211			

Calculated p >0.05, Calculated t< 1.976, at df 107

Results of the independent t-test analysis above showed that there are significant differences between male and female in ICT usage among student of FCT, Federal College of Education Zuba. Reasons being that the calculated p value of 0.0061 is lower than the 0.05 alpha level of significance while the t-calculated value of 7.971 is greater than the t-critical value of 1.976, at df 107. Hence the null hypothesis which state that there is no significant differences between male and female in ICT usage among student of FCT, Federal College of Education Zuba is hereby rejected.

Hypothesis four: There is no significant differences between male and female in ICT usage on academic performance among computer students of FCTCollege of Education Zuba, Nigeria.

Table 4.6: Independent t test Statistics on the differences between male and female in ICT usage on academic performance

Variable	Gender	N	Mean	Standard Deviation	t cal	Df	P
ICT usage on academic performance	Male	61	25.2131	5.2953	5.821	107	0.007
	Female	47	19.6815	2.1217			

Calculated p > 0.05, Calculated t< 1.976, at df 107

Results of the independent t-test statistics above showed that there are significant differences between male and female in ICT usage on academic performance among computer students of FCT College of Education Zuba. Reasons being that the calculated p value of 0.007 is less than the 0.05 alpha level of significance while the t-calculated value of 5.821 is greater than the t-critical value of 1.976, at df 107. Hence the null hypothesis which state that there is no significant differences between male and female in ICT usage on academic performance among computer students of FCT College of Education Zuba is hereby rejected.

4.3 Summary of Major Findings

The followings are the major findings

1. Significant relationship existed between ICT usage and academic performance among students of FCT College of Education, Zuba, ($r = 0.771$, $p = 0.011$).This indicating that the higher the ICT usage, the higher the student's academic performance of the students.

2. Significant relationship existedbetween students using ICT tools for academic purpose perform better than those who are not using ICT tools among students of FCT College of Education, Zuba, Nigeria ($t = 6.891$, $p = 0.037$). This is because, students who used ICTtoolsto study/researchperformed better than those students who are not using ICT tools for study.

3. Significant difference existedbetween male and female in ICT usage among student of FCT College of Education Zuba, Nigeria ($t = 7.971$, $p = 0.0061$).

4. Significant differences existedbetween male and female in ICT usage on academic performance among computer students of FCT College of Education, Zuba ($t = 5.821$, $p = 0.007$). This is because; male students used ICTtools for studies more than female students. Therefore, male students performed better than female students in their studies.

4.4 Discussion of Findings

The present research aimed at investigating the relationship between Information and Communication Technology Usage and Academic Performance among students of FCT College of Education Zuba, Nigeria.

Hypothesis One: The findings revealed that significant relationship exist between ICT Usage Academic Performance among students of FCT College of EducationZuba.The findings agree with that of Harrison, (2002), who carried out a study on "The Impact of ICTs onPupils 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 also agreed with that of Kulik's (1994), whose findings on Meta-analysis study revealed that, an average students who used ICT based instruction scored higher than students without computer. The students also learned more or less time and liked their classes more when ICT-based instruction was included.The point of departure fromthis 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 NCE 11 and also using all the subjects offering by the students.

Hypothesis Two: The finding of the study shows that significant differences exist betweenstudents using ICT tools for academic purpose perform better than those who are not using ICT tools among students of FCT College of Education, Zuba. With relevance to the above findings, Anyamene, Nwokolo, Anyachebelu and Anemelu (2012)carried out a relatedresearch 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 compute assisted instruction package performed significantly better than their counterparts taught using the conventional method of instruction in the retention test.

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 some selected school subjects. More so, while the above conducted study was carried out in Anambra state, the present study is carried out in FCT, Abuja Nigeria.

Hypothesis Three: The finding revealed that significant difference existsmale and female in ICT usage among student of FCTCollege of Education Zuba. The study agreed with that of Ilomaki, Hakkarainen, Lakkala, Rahikainen, Lipponen, and Lehtinen, (2002), who conducted a research on "Uses of New Technology across Genders and Generations: Comparing the Development of Students 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 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. A self-reported questionnaire was constructed for assessment. The participants were 910 and 365 students from six (6) lower and upper secondary schools. The results indicated that the average level of 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 area of difference is that the study above used self-reported constructed questionnaire while this study seeks to use students semester result on 2014/2015 academic session and ICTSQ.

Hypothesis Four finding revealed that significant difference exist between male and female in ICT usage on academic performance among computer students of FCT, Federal College of Education Zuba. The finding here is in line with Schumacher and Morahanmartins (2001), whose finding shows that female have less experience with ICT tools and are more likely than males to have negative attitudes towards Computer. This finding is also in line with that 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.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.0 Introduction

This chapter presented the summary, conclusion and recommendations on relationship among ICT usage and academic achievement among students of FCT College of Education, Zuba, Nigeria.

5.1 Summary

This study was structured into five chapters in order to effectively carry out this research. Chapter one presented the background and purpose of the study, the statement of problem, including the hypotheses formulated for the study, scope and limitations. In line with the research objectives, four research questions were stated as well as four null hypotheses. The study is significant as it will provide and enlighten the students on the ICT usage in their academic pursuit in other to improve their performance.

The second chapter enumerated the comprehensive literature reviewed that are related to this study include the Concept of Information and Communication Technology, concept of academic performance, ICT usage and Academic performance, relationship between ICT usage and Academic performance, ICT in Education, integrating ICT into the Education System, objectives of ICT in Education, importance of ICT usage, the Approaches of Integrating ICT into Education system, stages of learning using ICT Tools, classification of various Types of ICT, Application in Education and empirical studies. The third chapter presented the study methodology which include the design, sample size and populations, the instrumentation, data collection and administration as well as pilot study and reliability study. A total of 108 students were sampled for this study and was analyzed with the Pearson product moment correlation (PPMC) statistics.

Chapter four was the presentation, interpretation and discussion of results of the data analysis. The IBM 20 version was used for the data analysis. The bio data variables were analyzed by frequencies and percentages while second section test the four null hypotheses at 0.05 alpha level of significance. It was found out that, the higher the students ICT usage the higher their academic performance, those using ICT tools for studies performed much better in their academics, students in school of science performed better than those in school of social sciences and the findings also showed that significant relationship exist between male and female ICT Usage whereby male performed better than female in academics. Chapter five was the summary of the study, conclusion, recommendations, contribution to knowledge and suggestions for further studies.

5.2 Conclusion

Based on the result of the hypothesis, the following conclusions can be deduced from the major findings. The higher the ICT Usage the higher the Academic Performance of students. Students who used ICT tools to study/research performed better than those students who are not using ICT tools for study. Male students used ICT tools for studies more than female students. There is differences between male and female in ICT usage. There is differences between male and female in ICT usage on academic performance among student of FCT College of Education Zuba, Nigeria.

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5.3 Recommendations

The following recommendations are hereby put forwards as a result of the outcome of this study

1. The school management should make ICT available compulsory to all NCE students so as to enhance their academic performance.
2. Teachers should be encourage to teach and set high standard, aspiration and expectation to students who don't use ICT tools, to adopt it and make them so as to come out with an excellent academic performance/scores which prepare them for future practice.
3. The school management should make ICT tools available in school of science and social sciences for students to be motivated andhave interest of using these tools in respective of gender so as to obtain an excellent academic scores.
4. Seminar on how to use ICT tools effectively and positively should be organize to students both male and female in order to have higher and thesame academic performance.

5.4 Contribution to Knowledge

ICT Usage have contributed in the field of Education in the following ways:

1. Students performed excellently in studies because of higher Usage of ICT tools.
2. Students who used ICTs for Academic purpose performed better than the students who are not using ICTs for studies.
3. Students in science Department used ICT tools for studies more than the students of social science Department therefore, students of science Department performed better than the students of school of social sciences.
4. Male students outperformed their female counterparts in studies.

5.5 Suggestions for Further Studies

In the light of the discourse, having discovered the limitations of this study; the following suggestions are therefore given to future researchers:

- Relationship between ICT usage and academic performance among students should be carried out in the entire colleges of education in Nigeria.
- Influence of socio demographic factors of ICT usage on academic performance among students among students should be carried out in Collages of Education.

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APPENDIX I

Department of Education Psychology

Faculty of Education

Ahmadu Bello University

Date

Dear respondent,

QUESTIONNAIRE OF INFORMATION AND COMMUNICATION TECHNOLOGY USAGE SCALE

I am a masters student of Department of Educational Psychology, ABU, Zaria currently conducting a research on relationship between Information and Communication Technology Usage and Academic Performance among student of FCT, College of Education Zuba Abuja, I am here soliciting for your support to answering.

The information gather from this exercise will be treated with greatest confidentiality and will be used solely for academic purpose.

Thank you for co operation

Yours Faithfully,

Idi Anna

INSTRUCTIONS

This questionnaire is divided into two sections. Section A-Bio data, Section B-Information and Communication Technology Students Questionnaire. In each of the section, list of questions are provided with corresponding boxes. Simply tick

[ ] in the appropriate.

SECTION A

BIO DATA

1. Gender Male [ ] Female [ ]
2. Year of study

   Second year [ ]

   Third year [ ]
3. Department/School:

   School of sciences [ ]

   School of social sciences
4. Course of study: ……..

SECTION B

INSTRUCTION: Tick the appropriate option as very often (4) often (3) Sometimes (2) Rarely (1) against each of the item below.

Information and Communication Technology Usage Scale

S/N	Items	4	3	2	1
1	How often do you use laptop, tablet PC, net book or notebook computer with internet access?				
2	How often do you use mobile phone with internet access?				
3	How often do you use portable music or video players, MP3/MP4 players?				
4	How often do you take part in sending and reading email?				
5	How often do you take part in searching online for practical information?				
6	How often do you take part in playing- multi player online games?				
7	How often do you take part in browsing the internet for fun?				
8	How often do you take part in watching video clips, downloading music, games, software from the internet?				
9	How often do you use other online tools, instant messenger, facebook, and you tube?				
10	How often do you use internet at school?				
11	How often do you use interactive whiteboard?				
12	How often do you post your work on the school website?				
13	How often do you use digital books and textbooks?				
14	How often do you install software on your mobile phones or computer?				

Source: Adopted from Alharbi, E. (2015)

APPENDIX II

Result of the Cronbach Alpha Reliability test for information and communication technology questionnaire scale

Case Processing Summary

		N	%
Cases	Valid	30	100.0
	Excluded[a]	0	.0
	Total	30	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.819	.786	14

Item Statistics

	Mean	Std. Deviation	N
Question 1	3.6100	1.02598	30
Question 2	3.1000	.59824	30
Question 3	3.4500	.75915	30
Question 4	3.4000	.59824	30
Question 5	3.3500	.81273	30
Question 6	3.0500	.88704	30
Question 7	3.1000	1.02084	30
Question 8	3.2500	.71635	30
Question 9	3.2500	.78640	30
Question 10	3.5000	.60698	30
Question 11	3.6000	1.02084	30
Question 12	3.4000	.94032	30
Question 13	3.2000	.76777	30
Question 14	2.2000	.69585	30

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	3.202	2.200	3.610	1.400	1.636	.075	14
Inter-Item Correlations	.226	-.531	.931	1.462	-1.753	.066	14