ACCESS, UTILISATION AND QUALITY OF SCHOOLNET FACILITIES AS PREDICTORS OF SECONDARY SCHOOL STUDENTS' LEARNING OUTCOMES IN ICT IN SOUTHWEST, NIGERIA

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A THESIS IN THE INTERNATIONAL CENTRE FOR EDUCATIONAL EVALUATION

SUBMITTED TO THE INSTITUTE OF EDUCATION, IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE

OF

DOCTOR OF PHILOSOPHY IN EDUCATIONAL EVALUATION OF UNIVERSITY OF IBADAN,
IBADAN, NIGERIA

ABSTRACT

Information and Communication Technology (ICT) serves as a motivational tool that is capable of influencing the interest of students towards school subjects. In realisation of this, the Federal Government of Nigeria integrated the teaching of computer education in the basic education programme and provided ICT facilities to facilitate its teaching and learning in schools. In spite of these government provisions, the ICT facilities provided in schools are still not adequate. SchoolNet Nigeria (SNNG) a non- governmental organisation provided schools with varieties of ICT facilities for teaching and learning. Meanwhile, the influence of ICT facilities on students' learning outcomes is yet to be fully realised. This study therefore, examined the extent to which the access, utilisation and quality of the SNNG facilities could predict the students' learning outcomes (achievement, competence in and attitudes towards) in ICT.

The study adopted a survey research design. Multistage sampling technique was used to select the schools involved in the study. The sample consisted of 1100 students (male = 562, female =538) and 20 principals (male = 12, female=8) from 20 schools in four States (Ekiti, Lagos, Ogun and Ondo). Eight instruments were used for data collection; School Checklist, Principals Questionnaire (α= 0.62); Students Access to ICT Rating Scale (α =0.65); Students' Utilisation of ICT Rating Scale (α = 0.65); Students' Assessment of Quality of ICT Rating Scale (α= 0.60); Students' Achievement in ICT Test (K-R20 = 0.72); Students' Attitudes to the Use of ICT (α = 0.77) and Students' Skill acquisition in ICT Test (α = 0.70). Data were analysed using descriptive statistics and multiple regression.

The students (95%) and principal (100%) had access and utilised SNNG facilities. As a measure of quality, the rate of replacement was 8%, repair was 0.7% and service was 0.5 % on the SNNG facilities. There was a significant composite effect of access, utilisation and quality of SNNG facilities on achievement in ICT ($F_{(8, 1091)} = 13.98$, $p<0.05$) and skill acquisition ($F_{(8, 1091)} = 7.74$, $p<0.05$). There was no significant composite effect of access, utilisation and quality of SNNG facilities on attitudes towards ICT use. The most important predictors of achievement (β_1) and skill acquisition (β_2) were access to computer (β_1=3.29, β_2 =0.75), quality Internet (β_1=1.31, β_2= 0.72) and hours the students spent on Internet to do homework (β_1=3.38, β_2 =0.58) all at p= 0.05.

Students' access, utilisation and quality of SNNG facilities increased achievement and skill acquisition in ICT. Therefore, there is need to maintain the quality of SNNG facilities in the existing schools and extend its provision to other schools.

Keywords: SchoolNet Nigeria, Learning outcomes, ICT facilities.
Word count: 422

ACKNOWLEDGEMENTS

I am very grateful and full of praises to my creator Almighty Allah, the Benevolent, who has made this work out in His dominion at the time best to Him.

I am equally duty-bound to appreciate the academic prowess of my able, intelligent, diligent, amiable, indefatigable, experienced supervisor, mentor and evaluator, Dr. Jeremiah 'Gbenga Adewale, a seasoned scholar, erudite researcher of repute. His consistent and persistent understanding, support, patience, guidance, constructive criticism, suggestions, encouragement and supply of relevant materials contributed in no small measure to the success of this research.

My invaluable and unreserved appreciations go to my dear wife, Mrs. Hidayah Olabisi Amoo and our children- Abdussalam Olawale, Abdulhamid Olaniyi, Azeezah Olaitan and Abdussomod Oladipupo. Their support, patience, tolerance, endurance, persistent cooperation and encouragement all the time throughout the course of this programme had without doubt contributed in no small measure to the successful completion of this work. I am equally grateful to my parents; Mr. and Mrs. S. Okunola Amoo who struggled to make sure that I attain this level of formal education, they never denied me at any point in time, may Allah reward you more than you ever imagined in this life and hereafter. I am indebted to Mr. R. A. Amoo, Mr. Najeemdeen Amoo, Mr. and Mrs. A. O. Oyalowo, Mr. Ambaliyu Adesewa and other members of my extended family, for their contributions to my education.

My gratitude also goes to the Director, Professor Tolu. W. Yoloye for his encouragement and the opportunity to complete and accomplish my dream. I wish to appreciate the contributions, comments and criticism of all ICEE staff members. I want to register my sincere appreciation to Professors Mac A. Araromi (immediate past Director, Institute of Education) and Promise N. Okpala, Drs E. Adenike Emeke, Georgina Obaitan, I. Mercy Isiugho-Abanihe, Folajogun V. Falaye, Biodun Adegbile, Eugena Okwilagwe, M. Modupe Osokoya, Adams, O, U. Onuka, Benson A. Adegoke, Felix Ibode, Monica Odinko, Sherifat Akorede, Joshua Adeleke, Ikimat Olanrewaju Junaid. I am equally grateful to the following retired members of staff, Institute of Education, Professors J. O. Odeyemi, Wole Falayajo, Samuel O. Ayodele, and Jonathan Ibiagha for their academic and professional ethics worthy of emulation.

I appreciate the efforts of my friends, namely; Drs. M. A. Adeoye and the family who accommodated and assisted all the time, I. A. Raji, C. C. Agomoh (UBEC, Abuja), S. O Popoola

(LARIS) and Counsellor S. A. Adenle (Students' Affairs Unit LASU). I thank all my mentors, J. O. Olodude, G. I. Olodude, J. O. Olomofe, Q. Abdullah, Alhaji T. A. Fasasi (Abuja), Alhaji and Alhaja S. Aremu (Lagos), J. Oyalowo, M. Olatoye (Lagos), Uncle S.O. Adekoya (Lagos), Dr. O. A. Adepoju (Gombe), Dr. S.A. Famuyiwa, K. Badru, Dr. J. A. Farayola. Specifically, Mr. Olatona, Mr. O. A. Efunbajo, other members of staff Michael Otedola College of Primary Education, Epe, Lagos, you are all highly appreciated. All the principals, staff, ICT teachers and the students of all the schools used for this study are highly appreciated.

Mr. Adesuji of Immaculate Heart Grammar School, Ado-Ekiti is worthy of commendation for providing accommodation during the field work in Ekiti. Mr.Sodunke, thank you for the wonderful accommodation granted at Ayetoro, Ogun State. Mrs. Bello the coordinator, Elizabeth Adebanjo and other members of staff SchoolNet Nigeria, Headquarters, Abuja; you are appreciated for supplying necessary logistics on this study. Past and present members of staff, Criterion Hope Educational Services- Lagos and Ogun chapters are appreciated. I commend equally, the Secretary, Criterion Hope Educational Services for helping me commit this study to prints. I thank you all and may Allah appreciate you more. Also, to my friends and motivators who I cannot forget but space will not permit to write your names, I thank you all and may Allah bless you all.

Sikiru Adesina Amoo, 2010

DEDICATION

This work is dedicated to the glory of Almighty Allah, the creator of the universe. His infinite mercy, protection and unparalleled blessings in my life are unquantifiable. He is the first without beginning, the last with no end. He taught the use of pen and taught man what he knows not.

CERTIFICATION

I certify that this work was carried out by **Sikiru Adesina, AMOO (119119)** in the International Centre for Educational Evaluation (ICEE), Institute of Education, University of Ibadan, Nigeria

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LIST OF ABBREVIATIONS

BECTA:	British Educational Communication and Technology Agency
CAI:	Computer Assisted Instruction
CAL:	Computer Assisted Learning
CSO:	Civil Society Organisation
DfEE:	Department for Education and Employment Documentation
EFA:	Education for All
ETF:	Education Trust fund
FME:	Federal Ministry of Education
FRN:	Federal Republic of Nigeria
ICT:	Information and Communication Technology
ICTs:	Information and Communication Technologies
IDL:	Indirect Learning
IT:	Information Technology
ITT for ICT:	Initial Teacher Training for Information and Communication Technology
MAN:	Mathematical Association of Nigeria
MDG:	Millennium Development Goal
MR:	Multiple Regression
NAEP:	National Assessment of Educational Performance
NCES:	National Center for Educational Statistics
NAERE:	Member of National Association of Educational Researchers and Evaluators
NITDA:	National Information Technology Development Agency
NCET:	National Council for Educational Technology (British)
NCNC:	National Curriculum Development Centre (Uganda)
NGO:	Non-governmental Organisation
NMS:	National Mathematical Society
OECD:	Organisation for Economic Cooperation and Development
RIRC:	Rural Internet Resource Centres
SITES M2:	The Second Instructional Technology in Education Study 2
SNA:	SchoolNet Africa

SAICTRS:	Students' Access to ICT Rating Scale
SAQICTRS:	Students' Assessment of Quality of ICT Rating Scale
SAICTT:	Students' Achievement in the ICT test;
SAUICT:	Students' Attitudes towards the use of ICT
SC:	School Checklist
SCICTT:	Students Competence in ICT Test
SPSAICTT:	Students' Practical Skills Acquisition in ICT Test
STAN:	Science Teachers Association of Nigeria
STME:	Science, Technology and Mathematics Education
STSI:	School-to-school Initiative
SUICTRS:	Students' Utilisation of ICT Rating Scale
SNNG:	SchoolNet Nigeria
PQ:	Principals' Questionnaire
RIRC:	Rural Internet Resources Centres
RITA:	Readers' Interactive Teaching Assistant
TIMSS:	Trends in International Mathematics and Science Study
UBEC:	Universal Basic Education Commission
UNESCO:	United Nations Educational Scientific and Cultural Organisation
VSATs:	Very Small Aperture Terminals
WorLD:	World Links for Development
WSIS:	World Summit on the Information Society

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

Information and Communication Technology (ICT) influences our lives in profound ways and has reduced the whole world to a global village. It would probably be impossible to imagine a world without ICT having experienced the power of ICT from 1946 (when the first computer was invented by John Von Neuman) to date (Adewale, 2005; and Owolabi, 2008). ICT is an aspect found in computer education curriculum that is capable of giving much needed advantage of new education order. Some scholars believe ICT is changing every aspect of human life-trade, manufacturing, communications, services, culture, entertainment, education (including adult and distance learning), research, defence and global security (Glenn, 2001; Akudolu, 2002, Ekoko, 2002, Abada & Nwanse, 2002, Adewale, Amoo & Akinbode, 2005). Isoun (2003) observes that ICT has also become chief determinant of the progress of nations, communities and individuals. The impact of ICT when compared with that of other basic science has progressively shown positive impression in the course of human development. This probably informs the observation of Isoun (2003) that "no work of science has so comprehensively impacted on the course of human development as ICT". This statement means that ICT when explored rightly will enable Nigeria achieve the goal of becoming a strong, prosperous and self-reliant nation. ICT also has transformational tools which, when used appropriately, could promote the learner-centred environment.

In Nigeria and all over the world, educational experience and training in diverse knowledge and skills prepare one to face challenges in life. Individuals then become empowered to modify their environment to meet their needs and desires which is in line with policy on education. ICT could be one of the transformational tools to promote training in diverse skills. In order to achieve educational goals, improving the quality of education is a critical issue, particularly at a time of our educational expansion and reforms. One of the ways to achieving quality in our education is not to undermine the impact ICT in our school system as stated in the policy (FRN, 2004). ICT enhances the quality of education in several ways: increasing learner motivation and engagement, facilitating the acquisition of basic skills and enhancing teacher training. Quality of ICT in education is reflected in the extent to which an institution provides learners' centre environments that enable students achieve worthwhile

learning goals as well as appropriate academic standards. This is a function of quality of resources as well as access, utilisation and quality of those resources in bringing out worthwhile learning outcomes. Successful operation and guidance of the processes of education, as well as worthy learning outcomes are major responsibilities of the stakeholders in education on the use of the resources provided (Farombi, 1998). This means that much depends on students' access, utilisation and quality of the resources provided as well as the interaction with those resources. In this setting, every stakeholder in education including school principals', ICT teachers and students are important in the use of ICT to facilitate the learning outcomes.

Several explanations had been provided on what constitute ICT and learning outcomes at both national and international fora (Abbey-Mensah, 2001, Abada and Nwanse, 2002, The World Bank, 2002, Akudolu, 2002; and Adewale, 2005). Examples of these range from hardware, software to electrically mediated networks. Specifically, ICT consists of hardware, software, networks, and media for collection, storage, processing, retrieval transmission and presentation of information (voice, data, text and images). On the other hand Information Technology which is a component of ICT refers to the creation, storage and processing of data (Akudolu, 2002). The World Bank (2002) refers to Internet which is an aspect of ICT as a powerful tool capable of improving the efficiency and quality of a wide range of public services including education that are important for poverty alleviation or reduction. This probably informs the Federal Government's inclusion of computer education as a pre-vocational subject in Junior Secondary Schools (FRN, 2004) as well as ICT as part of the computer education curriculum (UBEC, 2008).

The enormous role of ICT has made scholars believe it is a tool for global competitiveness which should sustain the youth to bridge the digital development between Nigeria and developed nations (Akindolu and Nwanse, 2002; and Aremu, 2002). In the same vein, from the studies of other scholars, electronic communication and computer system as part of ICT have equally been testified worldwide as having significant impact on teaching and learning (Aremu, 2002; Ekoko, 2002; Asim, Kalu & Ani 2003; Olagunju, 2003; Bamikole, 2004; Adewale, 2005; and Adeyemo, 2005). ICT centred education equally involves the use of computers online, self-learning packages, chips, satellites radio and optical fibres technologies (Akudolu, 2002). Generally, ICT represents all computer and computer mediated tools, electronic devices, all its accessories that are capable of motivating the teachers and learners to achieve what others do with ICT that we can also do it in Nigeria given the opportunity to use online or Internet facilities. Realising the importance of ICT in

the school system made the Federal Government of Nigeria to emphasise the provision of necessary infrastructure and training for its integration. This government statement when examined critically means that the existing subjects and the processes of teaching and learning them would further be enhanced. In Nigeria's bid to achieve ICT integration, the major aim is to establish the type of education system that can produce citizens who can contribute effectively to life as well as develop life-coping skills in the society.

Despite the importance attached to ICTs in advancing knowledge in our schools, its development in Nigeria is still low (Adewale, Adesoji & Iroegbu, 2004). The is need to increase the development of ICT in schools by government, corporate bodies and non-governmental organisations (NGO) for the citizenry can be upgraded to attain the quality required to go in line with developed nations in the area of ICT integration in schools. In order to promote computer education and ICT learning in our secondary schools, the improved students' access to, utilisation and quality of ICT facilities will go a long way to promote global competitiveness of teaching and learning, sharing of ideas, knowledge, and related matters. With this in mind, various strategies were put in place to meet new way of teaching and learning with the use of ICT. This is done by liberalising the integration of ICT in the school system, by supplying computer and Internet facilities in the selected schools and by using these schools as pilot projects. These strategies seem to be between private and public interventions, that is private and government NGO inclusive. This informs Isoun (2003) to state that government's policy on the ICT for school sector has provided the drive needed to re-position the nation in the global ICT world.

Consequently, various governments in Nigeria, non-profit making organisations, like SchoolNet Nigeria (SNNG), professional associations and schools have taken steps to improve ICT integration. The teaching is seen as a means of enhancing scientific literacy and providing gateway to technological breakthrough. The ICT integration would reduce the problem of teaching and learning. Some of the basic measures of improving teaching and learning in schools or quality of education include: the introduction of ICT in computer education at secondary school levels (FRN, 1998) and integration of ICT in secondary schools (FRN, 2004:5); encouraging the teachers to develop themselves in computer education (Adewale, et al, 2004); emphasising refresher or retraining course in computer education and ICT (Abada & Nwanse, 2002; and Bamikole, 2004); sending the teachers to attend courses on ICT related subjects in tertiary institutions. Apart from these measures, the introduction and inclusion of ICT in the policy and curriculum development process in 6-3-3-4 system (now 9-3-4, UBEC, 2008) of education is another effort of government to improve the standard of

teaching in secondary schools. Professional bodies like the National Mathematical Society (NMS), Mathematical Association of Nigeria (MAN) and the Science Teachers Association of Nigeria (STAN) have taken giant strides in providing free teaching and training in ICT at their national conferences. In 2002, Federal Government under the aegis of Federal Ministry of Education (FME) announced the integration of ICT in all unity schools in Nigeria. This and other measures taken are evident in national conferences, workshops and seminars organised by STAN (Isoun, 2003). Moreover, the multidimensional approach of the FME, Ministry of Telecommunication, Ministry of Science and Technology as well as Education Tax Fund (ETF) to support the launching of SNNG in 2001 is a way of creating learning communities of educators and learners. SNNG as a non-profit organisation of stakeholders in education is committed to the effective use of ICT for enhancing teaching, learning and management processes in Nigerian primary and secondary schools (www.snng.org). SNNG is one of the Federal Government e-education initiatives created by education coordinating agencies of government and the Ministry of Education (Mac-Ikemenjima, 2005). It was created like other school networking outfits in Africa and other parts of the world. Despite the similarities, and being united in their overall vision of using ICTs for educational transformation, each SchoolNet is unique and independent, thus, each schoolNets therefore, pursues distinct activities in their respective territories. Within Africa, most SchoolNets associate with SchoolNet Africa (www.schoolnetafrica.org)

SNNG project is an initiative that promotes the effective use of ICTs by networking schools for common access to the Internet. This network is envisaged as one of the means for (i) building connections among students, teachers and schools; (ii) for sharing information and resources; and (iii) preparing learners for knowledge-based societies (Warwick, 1995). SchoolNet worldwide also encourages the creation of locally relevant and high-quality educational resources through ICT, and champions lifelong learning (UNESCO, 2004). It is counterproductive if these ICT resources are made available and not utilised. If they are integrated and the connectivity causes problem, their effective use would be in compromised. The global role of SchoolNet is to use ICT to solve some problems of classroom instructions (SchoolNet Canada, 2004). If the SchoolNet programmes globally improve the teaching and learning in the classrooms, it means there is the likelihood of an improvement in output variables and that of Nigeria will not be an exception. That of course must be a function of access, utilisation and quality of ICT-based learning, which the students are exposed to. The integration of ICT in schools should be seen to transcend mere teaching and introduction to computer literacy in the schools. It should be understood as a means to share ideas which are

ideals to learning and teaching via e-learning. In all, it appears that SchoolNet globally does the work of implementing or improving the government policy on education in secondary schools via e-learning. This is probably done considering several factors that can sustain the use of SchoolNet's ICT facilities.

There are several factors to consider in an attempt to have functional ICT-based facilities in schools. According to SchoolNet Canada, (2004) such factors include inputs (connectedness, workers and other resources), infrastructure (school-based systems and support; equipment), reach (number of users; access, ICT penetration and diffusion), use (amount of use, interactions and communications), outcomes (ICT savvy students, enhanced learning environments), impacts (learning outcomes and quality of graduates). In this study, the researcher considers the ICT inputs to connectivity of the schools with the Internet. The workers include all stakeholders in educational set up within the school and other users connected with educational services. Others are human and non-human resources. The infrastructure are school-based have to do with space dedicated for the installation of SNNG's ICT facilities. The support and equipment are painting the ventilated rooms or laboratory, providing fans, air conditioners as well as generators that can power more than 21 computers of 40 Gigabyte HDD and one 80 Gigabyte HDD. Reach in this study has to do with the number of uses made personally by the students; teachers and related people, what type of access do students, teachers and others have to the facilities. The outcome here has to do with the status of the schools in terms of changes in their academic work, noticeable changes in the learning environment and the students as a result of interaction with the facilities. The impact has to do with the feasibility of the graduates having opportunity to be exposed to skills in the use of the facilities as well as the quality inherent in the students as a result of access and utilisation.

In spite of the factors listed for the functional ICT based facilities, the existing scenario of the education sectors in Nigeria reveals that governance and education system financing; ICT standards. National innovation culture in terms of attitudes towards formal education could serve as enablers or inhibitors. The integration of ICT is as important as the access, quality and continuity in the utilisation. From another perspective, some ICT indicators emerged and these have been variously described as input, output and common ICT indicators (UNESCO, 2002). Input indicators accordingly consist of ratio between computers and students, Internet speed, educational software and number of application used. This study considers the SNNG facilities as input but with the concentration of 21 computers with one server, UPS, VSAT, stabiliser and safety equipment such as fire extinguisher. Utilisation

indicators include the subject using multi-media, percentage of classes or schools using web board or computer laboratories, the percentage of teachers joining ICT association and discussion for academics and students' usage of Internet. The amount of usage the students, ICT teachers and principals' make use of the facilities in the laboratory are considered in the study. Output indicators deal with the teachers and students having e-mail addresses, homepage and ICT certificates, students and teachers having completed prescribed hours of ICT course. The relevance of this indicator to this study helps to find out the learning outcome in ICT. The common indicators are used to determine ICT infrastructure in terms of availability of space for computer hardware; ratio of computer to students; computer per classroom; computer per teacher; type of computer standing alone; multi-media network; availability of connectivity and bandwidth (UNESCO, 2003). The methods of collecting indicators depend on what is/are to be measured. This study considers some of the listed indicators to manipulate the independent (access, utilisation and quality) and dependent (achievement, attitudes and practical skill acquisition in ICT) variables. ICT is part of science and technology education that has been emerging discipline in many countries across the globe including Nigeria (Adewale, et al, 2004, Amoo & Rahman, 2004). In such a context, considering the influence of antecedent disciplines to achievement, attitudes and skill acquisitions or competence, it would be interesting to know that what access, utilisation and quality of ICT in SNNG intervention schools and what attributes the students and stakeholders in education ascribe to learning outcomes (achievement in ICT, attitudes towards the use of ICT and skill acquisition in ICT) in computer mediated discipline are very important.

Despite the importance attached to ICT use, it has some peculiar challenges that could disturb the effective implementation of ICT policy. Several educators (Comu, 2002 and Olorundare, 2006) have identified challenges that might impede the implementation of ICT policy in Nigeria. These are challenges such as what is currently going on in the classrooms, some of the teachers presently are not positively disposed to the use of ICT (Amoo & Rahman, 2004, Adewale, 2005); some teachers' low level of computer literacy (Adebanjo, 1997, Adewale, 2005, Abimbade, 2006); and trainers of teachers and educators also have low level of computer literacy (Adebanjo, 2005). Other problems are; inadequate funding of the school system, this includes development of infrastructure (Ogunleye, 1999, Adewale, 2005, Adebanjo, 2005, Adebayo, 2008); management attitudes and inadequate supply of computer and Internet facilities (Hsu and Huang, 1999; and Adewale, 2005). With these peculiar challenges, one must not forget that poor supply of power and slow development of alternate supply of power as well as non or slow development of local software are likely to be

challenges. Notably, in solving some problems of education, several attempts were made in the areas of research with the intention to elicit ways out of those challenges. With respect to ICT and computer education in junior secondary schools in Nigeria, some researchers have at one time or the other reviewed and evaluated the curriculum of computer education at this level in order to find lasting solution to computer education problems in schools (Bamikole, 2004; and Adewale, et al, 2004). Bamikole (2004) reports that facilities are still small compared to the population explosions in schools requires. Strategies relating to the use of computer to facilitate learning and several others methods like CAI to improve teaching have been the concern of researchers at a time in our secondary schools. The findings of Bamikole (2004) reveal that computer teaching and learning in the JSS was still low, few computers available as at the time of her research were having low capacity. The submissions of (Adewale, 2005 and Abimbade, 2005) on computer and ICT were not different from the propositions of Bamikole. By implication, the use of these facilities in the pilot secondary schools should be seen as efforts to improve and enhance teaching and learning of the other subjects such as Mathematics, Basic science, Agricultural science.

Secondary school education in Nigeria in recent time has been the subject of discussion regarding a downward trend in academic performance and achievement of students. The researchers concerns are especially in the areas of mathematics, sciences and ICT (Ogunleye, 1999, Adedayo, 2002; Amoo & Rahman, 2004, Adewale et al, 2004, Adeleke & Amoo, 2007), quality assurance in ICT education (Erinosho, 2004, Abimbade, 2005) and strategies for improved achievement in STMICT at secondary education level (Adepoju, 2002, Adewale, et al, 2004; Banjo, 2004; Adepoju & Raji, 2004; NAEP, 2006; UBEC, 2008). This probably is as a result of dearth of or obsolete materials, facilities and modern school resources (ICT inclusive) or the need to improve on the existing ones. This could be attributed to the general state of the economy, or unwillingness of the appropriate policy implementation agencies that show nonchalant attitudes towards education. It has also been attributed to poor infrastructure, inadequate facilities, inadequate teaching and learning materials and the disparate locations of some schools (Farombi, 1998, Adedayo, 2002; Amoo, Eko & Olomofe, 2004). With the emergence of ICT in the classroom, the researcher opines that if ICT facilities integrated are of good quality and the students have access and utilise the SNNG facilities, there is hope that the attitudes of students would change; there might be improved motivation towards learning other subjects.

In Nigeria, secondary school education encourages the use of textbooks for studies, which in most cases are not available and where available, some students do not buy them;

there is mostly no library resource, even where they exist, they are not well-equipped (Popoola 2001). Unfortunately, the available ones tend to contain outdated materials or no adequate and accurate records (Okpala & Popoola, 2006). Acquisition of books for the libraries is inadequate. If the need arises for budget cuts to be made, funds for the library are the most likely to be cut (NAEP, 2006).

The measure of success in learning is largely dependent on the ability to memorise and reproduce which is, learning by rote. Chalk, use and dictation have been the tools for informing students and with the exception of laboratory work, if any. Students do not participate in the learning process when it comes to sourcing educational materials. Students are dependent on teachers for everything such that without the teachers most students are not able to do independent work. The integration and use of ICT is capable of assisting the students to do independent work and at the same time will create opportunity to have access to the utilisation of audio-visual or virtual library to do the school works.

Some teachers use the same instructional materials for years without updating them (Amoo et al 2004) this tends to affect the output of students who study under them. Computers are unknown in most schools (Adewale, et al 2004, Bamikole, 2004) besides other ICT facilities, and even if they exist the cost of maintaining them will not permit teachers and students to explore them. Some schools lack the basic facilities such as accessibility and regular supply of power. The government's efforts at improving intervention programmes in the areas of facilities and infrastructure in schools led to the extension of electricity and telephone facilities to every part of the country. The extension of rural electrification will enable Nigerian citizens, including schools, in these areas to take maximum advantage of the power supply to tap the advantage of SNNG project facilities. The question is what about the policy on ICT and what about its integration? The integration of ICT in secondary schools has equally attracted public attention among parents, teachers, scholars and policymakers (Isoun, 2003). The attention arises and becomes major concerns as to effective use of ICT in schools. This statement is a pointer to make education in Nigeria an instrument “par excellence” for effecting national development (FRN, 2004). Based on the recognition of the role of ICT in advancing knowledge and skill in the modern world, Federal Government through ETF is not relenting in funding ICT related projects in schools. Thus, the national strategies for improvement in this area was the inclusion of computer education as a required course for the teacher education programme (NCCE, 2002), production of graduates in computer science in other tertiary institutions, computer centres sprung up to teach basic computer literacy, desk top publishing, word processing to computer installation, maintenance and Internet services

(Adewale, et al, 2004).

Another strategy used by government to promote ICT integration and use, led to the provision of enabling policy which incorporated the activities of SNNG in our secondary schools. SNNG in its bid to achieve its objectives has invested in some projects such as: SchoolNet DigiNet programme- ETF- SchoolNet, MTN SchoolsConnect and Print Based projects-Multi-choice resource centres project. In order to carry out these projects as planned, there are guiding principles in form of the objectives the SNNG has for ICT solutions. The SNNG's core activities are in the form of her objectives and these are meant to:

i. implement, support and coordinate ICT development projects in education for national and state level projects;
ii. provide and support Internet and technology solutions for schools, particularly at lower-cost and scale able solutions;
iii. provide support mechanisms for schools in respect of technical infrastructure.
iv. develop local, state-wide and national ICT in education capacity;
v. implement training for educators to use technology in enhancing teaching and learning;
vi. address the shortage of technical ICT skills;
vii. support and facilitate the development of education content, particularly local content, for use by learners and educators;
viii. promote collaboration among educators and learners;
ix. assess the functionality and impact of ICT-based learning opportunities and resources in the classroom to encourage systemic improvement in educational system;
x. create awareness of the use of ICTs in education (through press, conferences, seminars, electronic media and the Internet), leading to grassroots demand and adoption and levels of the education system;
xi. introduce the integration of project-based learning as well as ICTs in school curriculum;
xii. develop partnerships in support of ICTs in education; and
xiii. provide strategic guidance and support policy development in the area of ICTs for education in order to create an enabling environment (www.snng.org).

The listed objectives provide the bases of SNNG activities. However, the one that relates to this study among the core aspects is the SNNG DigiNet Centre: in this setting, the piloted schools serve as centres. This DigiNet centre project aims to ensure that Nigerian students are provided the opportunity to cross the "Digital Divide", and use ICTs to enhance their learning

experience irrespective of their locations. The project entails reaching all schools in Nigeria and equipping them with computer and communications technology. It was developed to address the severe digital infrastructure deficit in our secondary schools. It essentially provides digital access (usually 21 computers, server, curriculum based content and VSAT based Internet) to Nigerian schools (www.snng.org). This digital access transcends the provision of equipment, but is an integrated programme, which includes an elaborate four to six months teacher development programme in which teachers learn how to use technology to enhance the teaching and learning of specific subjects. With SNNG's programme of intervention in the schools where they are currently been implemented, there is need to investigate the performance of students in terms of achievement in their cognitive, affective and psychomotor domains. Bearing in mind those students' opportunity of access, utilisation and quality of SNNG facilities, one can use the independent variable to predict learning outcome in ICT aspect of computer education in junior secondary school (JSS).

Solvberg (2003) finds, in her longitudinal study, that the students' intrinsic motivation was high and remained relatively sTable over time, and there was no evidence of novelty effect of attitude as found in previous studies. Further, she concludes that the improvement of quality and functionality of computer tools (e.g., interfaces and usefulness) during the last decade may influence the interest and value of computers among students in a school setting. Thus, as students become more familiar with computers, the potential for educational use becomes more profound for students. In consonance with Solvberg's findings, Cooper and Brna (2002) report that pleasure and variety kept students engaged and motivated. Further, since students worked happily and would less easily lose motivation, the teacher had more time to help individuals. Cooper and Brna (2002) conclude that if ICT is carefully planned and pedagogically implemented, it can support relationships and motivation that in turn support long-lasting engagement and learning. These scholars are of the opinions that the availability of computer and its accessories in schools will serve as motivation to learners and are capable of bringing out the potentials in the students.

McKinnon, Nolan and Sinclair (2000) opine that students in their experimental group became enthusiastic computer users and performed significantly better compared to the ones in the control group. However, their attitudes towards computers became significantly less positive over time because computers became such a routine part of the studying (like pens, for example) that they lose their halo effect. The authors suggest that ICT can be compelling, but the quality of curriculum programmes in which the technology is implemented makes the real difference to students' attitudes, motivation and performance. In another study, Popoola,

(2002) establishes that computer training and experience, system quality, and management/library support, influenced users' anxiety and attitudes towards computer -based library system. What the researcher can infer from the earlier researchers is that their focuses were limited to those areas like using computer to teach or enhance computer literacy, using computer mediated programmes to impart knowledge. Presently, the research findings are not conclusive on the learning outcomes in ICT at secondary level in Nigeria and that why this study is significant.

Students' learning outcomes are rapidly becoming the principals' gauge of educational effectiveness round the globe and Nigeria must move with global trend in this regard. Very few studies that have empirically examined the impact of students' learning outcome as noted by (Ruhland & Brewer, 2001:142) are on students' learning expectations in the area of cognition and attitudes. Ruhland and Brewer (2001) argue that learning outcomes should not only demonstrate what students know but should also capture the changes that occur in their cognitive and affective development as a result of their school experiences. On the other hand, some educational theorists postulate that the function of students' learning outcome statements is primarily to guide students' learning, which increases their ability to achieve each of the expected outcomes (Banta, 1996). In Nigeria, studies on learning outcomes were concentrated on various subject and courses. Notably, the works of researchers (Ajelabi, 1998; Bamikole, 1998; Etukudo, 1998 & Ibode, 2004) are as important as the background to this study. Ajelabi (1998) reports relative effectiveness of computer assisted and text assisted programmed instruction on students' learning outcome in social studies. Etukudo (1995) reports the effect of Computer Assisted Instruction (CAI) on the achievement of secondary school students' achievement in graph. Bamikole (1998) equally corroborates positive learning outcome of students in mathematics when exposed to CAI. In other words, according to these researchers, students use learning outcomes statements as a means of focusing on the critical components of subjects and to assist them in mastering skills and contents of instruction. From the point of view of these researchers it can be inferred that students' access, utilisation and quality of SNNG facilities would assist the schools and teachers to focus on the ICT which is critical in the attainment of the aspect of computer education in JSS. As would be evident from this study, learning outcomes to consider are the achievement in ICT (cognitive); attitudes towards ICT use (affective) and skill acquisition in ICT (psychomotor).

Achievement in ICT forms one of the dependent variable in this study and it is defined as measurable behaviour in a standardised series of tests (Simpson & Weiner. 1989). It also

indicates the degree of success attained in some general or specified area (Okpala, Onocha & Oyedeji, 1993). Achievement test is usually constructed and standardised to measure proficiency in school subjects. In most cases, "accomplishment" is sometimes used to describe achievement. There is evidence in literature about the use of achievement test. Wilson (2008) lists the impact of educational faculty on students' achievement based on his reflections regarding educational facilities, planning, leadership, architecture and management on the work of Tanner and Lackney (2006). She reports that teachers' psychological behaviour to instruction affects students' achievement; that school designs are capable of allowing for a variety of learning groups and spaces to accommodate different sizes of group learners; that small class sizes allow for greater students' achievement than large classes. In the same manner, Tunzun, Yilmaz-soylu, Karakus, Inal & Kizilkaya (2008) investigate the effect of computer games on students' achievement and motivation in geography learning. They find out that students made significant learning gain by participating in the game-based learning environment; students demonstrate statistically significant higher intrinsic motivations and lower extrinsic motivation learning in the game-based environment. Ibode (2004) recordes a significant achievement as a result of the method used. The summary of this is that if achievement had been possible in other subject areas, there is need to investigate the possibility in this study.

Attitude towards ICT is another dependent variable in this study. Tunzun, et al (2008) find out the positive effect of computer game-based learning on learning and motivation and positive attitudes of students and teachers. The relevance of this review centres on the fact that computer games can be viewed as an ICT tool in formal learning environment to support students in effective learning. Adesoji (2008) investigates attitude towards science through problem-solving instructional strategy. The study reveals that students in the experimental groups develop more positive attitude towards chemistry after treatment. Earlier studies relating to science reports that students positive attitudes to science correlates highly with their science achievement, Soyibo (1985) and Dafiana (1995) note that using integrated science environment activities improve high school students' attitudes and awareness about environment. Other studies reveal more positive attitude of students after exposing them to self-learning strategy (Aiyelaagbe, 1998, Ibode, 2004, Bamikole, 2004, Amori, 2005). On the contribution to self-learning devices, Udousoro (2000) reports positive attitudes towards learning after using computer and text-assisted programmed instruction on students. If all science related subject had created positive effect on students' attitude there is need to find out if the predictor variables considered in this study will explain students' attitudes to ICT.

Skill acquisition in the use of ICT is capable of making students to practically demonstrate whatever they have learnt in the class. This has to do with manipulating or displaying some skills in the use of computer and other ICT facilities. Smith (2004) relates that students who have been exposed to certain skills as a result of instruction had demonstrated increased self-efficacy. In the same study, Smith (2004) shows that students indicate and claim a high degree of computer technology expertise and increased self-efficacy (confidence) rather than actual performance (competence). Smith (2004) equally reports significant difference existing between the post-course self efficacy and performance. In a similar study, Roth & Karsten (1998) find that students who demonstrated ability to use computer in future significantly improve as a result of their training experience. Modelling teachers perceived the usefulness of ICT in Singapore, Teo, Lee, Chal & Chay (2008). They show that perceived competence and course delivery have direct effect on the pre-service teachers. In a nutshell, the ability of students' performance in the ICT skills acquired will probably be as a result of access the students had to the facilities, the countless time of utilisation and at the same time the quality in the facilities as to produce learning outcomes.

Students' access to quality ICT in schools is one of the independent variables in this study. On this, UNESCO (2003) lists some access indicators which after critical assessment for understanding what constitute access to ICT facilities in our JSS. These include computer, Internet connectivity and the use of multi-media online subject access. Consequently, the following statements arise: on physical access to ICT, the ICT must be available and physically accessible. The appropriate ICT according to local conditions and how do people need and want to put ICT to use must be in place. The affordability of ICT and its use must be pursued. The ICT access must be affordable for people to use. Human capacity and training must be easy in ICT education because of its benefits. People must understand how to use ICT and its potentials. People should have locally relevant content, applications, and services. There should be locally relevant content, especially in terms of language. The integration into daily routines must be ensured. The ICT must further broaden people's lives. The socio-cultural factors must be considered when people use ICT. People should not be limited in their use of ICT based on gender, location, or other socio-cultural factors. There should be trust in ICT usage. People must have confidence in and understand the implications of the ICT they use, for instance in terms of privacy, security, or cyber-crime. The local economic environment should be considered in the ICT usage. There should be a local economy that can and will sustain the ICT use. Within macro-economic environment, there should be national economic policy conducive to widespread ICT access, for example, in terms of transparency,

deregulation, investment, and labour issues. There should be legal and regulatory framework, laws and regulations affect ICT utilisation and what changes are needed to create an environment that fosters its further use. There political will and public support for ICT access. There should be necessary political will in government to enable integration of ICT throughout society. If all the statements above are well articulated, ICT education in schools should be made important.

Utilisation is an independent variable considered in this study. The records on the utilisation of ICT in schools reveal that readiness of appropriate authorities (federal and state ministries' of education) to change legal conditions to allow implementation of self-initiated academic programme with an intensive focus on ICT especially with that of SNNG project has implications in the educational system. Accordingly, Nigerian government provides avenue for this as stated in her policy (FRN, 2004:54). On this, Peter & Hermann (2000) state that provision of financial and human resources for the process; provision of space for special educational needs and openness to change among the whole staff are indicators for utilisation of ICT. In other words, self-initiative and engagement of a competent team; a school programme containing goals, instructions and ability or willingness to sustain extraordinary curriculum and schedules are main indicators of success in such ICT school approach (UNESCO, 2002). Based on this, the operational statement here indicates that all stakeholders including teachers and principals' are important in giving direction to students learning outcomes in ICT. They are expected to show willingness to the implementation of this policy. Wilder and Malone (2005) argue that for teachers of today's international and technological world, the challenges of 21st century citizenship means the teachers themselves must be ready to benefit in the shared global experiences now made possible by technology. This makes (Peter & Hermann 2000, Solomon, Allen & Resta, 2002) to maintain that ICT knowledge for the new teachers in the countries like United States of America may mean an increased understanding and awareness of the shared global experiences. In addition to being able to use ICTs effectively in their classrooms they should equally be ready to change students' attitudes and develop skills towards it. For trained teachers but not in ICT in developing countries like Nigeria, emphasis may be placed on the use of ICT skills in the classroom and how to motivate students' effective use of ICT. Solomon, Allen and Resta (2002) as well as Wilder and Malone (2005) have extensively recorded relevant indicators of ICT in schools across the world; some of these indicators include the supply of ICT facilities (as listed earlier). In this study and based on the documentary evidence (from snng.org), SNNG had a precondition of investing in schools first contact donor companies, after contacting either federal or state

ministries of education on the provision of infrastructure, that is, the space dedicated as ICT room. Schools that met the conditions in the geopolitical zones/states are attached (Appendix VIII) and integrated into the SchoolNet.

Quality of ICT facilities is yet another independent variable relevant to this study. In all education set up in Nigeria, quality in every facet of the system is very important and indispensable. In Nigeria of today, JSS ducation was set up to face the challenges of pre-vocational subjects and to provide minimum basic education (FRN, 2004; & UBEC, 2008). Computer education in which ICT forms its bedrock occupies a place in the JSS curriculum. In as much as our policy emphasises quality of instructions, one cannot rule out the quality of infrastructure and facilities when it comes to teaching and learning of computer and ICT in our schools. Studies abound on the quality of school facilities and learning outcomes. Obanya (2002) opines that there is need for a shift of emphasis in education discourse from how much and how many to how well, from quantity to improved quality. This is because the ultimate goal of education is improvement, not just increment. The effect of education on individual and the society takes time to manifest. Any neglect of the quality dimensions of education including that of ICT is likely to lead to an undue emphasis on long-term gains. So is the case of ICT in secondary schools, its integration and functionality should be qualitative. The issue on ground now is that ICT is more than a teaching tool. Its potential for improving the quality and standards of pupils' education is significant. Equally, its potential is considerable for supporting teachers, both in their everyday classroom role, by reducing the time occupied by the administration associated with it and in their continuing training and development. Having examined the issues on ICT and learning outcome, the gaps existing in literature suggest the need for investigating access, utilisation and quality of SNNG facilities and learning outcome in ICT.

In all, it appears that there exists few in literature on the use of SNNG facilities (as intervention) in teaching and learning in secondary schools. Researchers have not investigated chronologically the access, utilisation and quality of SNNG facilities as to predicting learning outcomes in ICT aspect of computer education in JSS. This study is therefore, necessary since it will provide relevant information on the contributions of some factors such as the access, utilisation and quality of SNNG facilities in predicting students' learning outcomes in ICT in secondary schools.

1.2 Statement of the problem

Literature has shown that different researchers have focused on the classroom strategies with the aim of improving teaching and learning in secondary schools. Overtime, schools' learning outcomes have not improved appreciably as suggested by external examination results. With this, many approaches have been used in raising students' achievement levels; one of them is computer assisted instruction in teaching school subjects. Computer education consists of different aspects in its curriculum out of which ICT section is more of applications to daily activities. ICT serves as a motivational tool that is capable of influencing the interest of students towards school subjects. In realisation of this, the Federal Government of Nigeria integrated the teaching of Computer Education in the basic education programme and provided ICT facilities to facilitate its teaching and learning in schools. In spite of these government provisions, the ICT facilities provided in schools are still not adequate. SNNG a non- governmental organisation provided schools with varieties of ICT facilities for teaching and learning. However, the influence of SNNG's ICT facilities on students' learning outcomes is yet to be fully explored in Nigeria. Thus, there is need to examine the impact of access, utilisation and quality of SchoolNet facilities on learning outcomes. This is against the background of the efficiency of SNNG facilities in enhancing learning outcomes. There is need to affirm the efficacy of SNNG facilities or otherwise of access, utilisation and quality of SNNG facilities vis-à-vis learning outcomes. The essence of this is to find ways of improving on the effectiveness of SNNG project for better learning outcomes. This study therefore, examined the extent to which the access, utilisation and quality of the SNNG facilities would predict the students' learning outcomes in ICT in school. These learning outcomes in the study used the SNNG intervention schools facilities to assess students' learning outcomes in JSS in terms of cognitive (achievement), affective (attitudes) and psychomotor (practical skill) - in southwest, Nigeria.

1.3 Research Questions

In order to achieve the purpose of this study, the following research questions are to guide the study:

1. To what extent do the project schools have access to SNNG facilities?
2. What is the level of utilisation of the SNNG facilities?
3. What is the quality of the SNNG facilities supplied to the schools in term of the following indicators? (i) Students, (ii) Principals' and (iii) School checklist
4. What is the students' level of achievement in ICT test?
5. What are the attitudes of students to the use of SNNG facilities?
6. What is the level of practical skills acquired by students using SNNG facilities?
7. What are the composite and relative contributions of access, utilisation and quality of SNNG facilities to students' achievement in the use of ICT facilities?
8. What are the composite and relative contributions of access, utilisation and quality of SNNG facilities to students' attitudes to ICT?
9. What are the composite and relative contributions of access, utilisation and quality of SNNG facilities to students' competence in the use of ICT facilities?

1.4 Scope of the Study

The study was limited to JSS3 students of the 20 SNNG project schools in four states (Ekiti, Lagos, Ogun and Ondo) in southwest, Nigeria. The study is interested in the extent of the use of the SNNG facilities on the students' learning outcomes in ICT among secondary school students. The study is delimited to, access, utilisation and quality of SNNG facilities (21 workstations, 1 server, printer, UPS, VSAT and Internet connectivity, a server based curriculum education content software). The scope includes the technical training involving four staff from each school, a generator for alternative power supply. The scope equally includes infrastructure in schools in terms of ICT installation, nature of school and laboratory, availability of school based inputs (such as infrastructure to enable the use of ICTs such as electricity, school buildings, technologies for efficient, affordable, quality access to the Internet for schools), and sustainability of project.

1.5 Significance of the Study

This study is designed to explore the access, utilisation and quality of SNNG facilities as predictors of students' learning outcomes in ICT in southwest, Nigeria secondary schools. Such a study is important because its expected results should provide basis for improving on learning outcomes in ICT. This study assesses the SNNG project status and its functionality in secondary schools in Nigeria with particular reference to ICT integration and utilisation. The anticipated outcome of this study should be of immense value to the Nigerian education sector. Provide basis for planning a befitting in-service education training for teachers based on areas of identified instructional and assessment needs across local governments and states in Nigeria, provide basis for supply of adequate resources in the areas of need to attain ICT goals and objectives. Further, the expected research output should provide modalities for strengthening the activities of SNNG to forge ahead in education sector as well as provide impetus for more corporate donor companies to invest in education sector. The study should provide impetus for further researches on the SNNG project implementations. The study has policy implication increasing SNNG facilities and liberalising facilities to all schools. It has administrative implications for the school principals'. Students would benefit from the report of this study. It should be useful in understanding why different outcomes emerge when study of this nature is conducted. The result of this study will serve as bases for improved ICT project management. Ultimately, the expected results emanating from this study should be useful in planning for improved instructions in schools in the area of ICT, help identify appropriate outcomes for formative evaluations. As a predictive study, the anticipated results should provide empirical baseline data for future summative (or "impact") evaluations as well as overall management of ICT education.

1.6 Definition of Terms

The following terms are defined to further illuminate this study:

Networking: This include all cables and physical devices, the PCs and servers and their linking operating system software e.g. Windows and everything in between the PC and Internet.

School Readiness: Providing a dedicated space and infrastructure for installing ICTs, and a plan and management system for using the ICTs.

Teacher Capacity Development: This includes dedicated projects for the development of teacher capacity in the use of ICTs, specific integration into teaching systems and pedagogical models.

1.7 Operational Definition of Terms

The following terms are operationally defined in the context in which they are used in this study

Access: This refers to the ease of locating, and retrieving needed information from the ICT resources by the users. It is to be measured in terms of ease of locating required information by number of students to each of the ICT facilities. This is operationally seen as: very easy, easy, fairly easy, and not easy.

Access loading for analysis: Access to computer and access to Internet facilities - access.

Achievement: This refers to scores earned by students in the ICT tests administered on them in ICT across SNNG intervention schools in SW Nigeria. This is done and based on the fact that they should have completed all the ICT part of the computer education curriculum

Attitudes towards the use of ICT: This refers to the pre-depositions of the students to the use of ICT facilities. It is called attitudinal scale.

ICT*:* It is computer based electronics capable of capturing, processing, storing, retrieving and disseminating information to users. In this study, ICT is refers to as part of computer education curriculum in JSS; it is treated like a component of computer education.

Learning outcomes: The learning outcome used here covers the three domains of Taxonomy's educational objectives. These refer to: (i) Students' Achievement in ICT test; (ii) Students' Attitudes towards the use of ICT and (iii) Students' acquisition of practical skills in ICT or Students' acquisition of skill- it is also called practical competence in ICT. The students' levels of scores in these tests constitute learning outcomes in this study.

Practical skill: This refers to the competence of students or ability to perform the task given within the time frame, as measured in the identification, manipulative and communicative skills. In this study, students are to be given some instructions to demonstrate, such as how to power the computer, UPS, type their names, locate document, retrieve document saved, print, and add text to objects drawn or the use of website or other search

engines.

Quality: This is measured in terms of repair, replacement, service and use, connectivity with Internet. Internet and computer were measured in terms of how fast, slow or not functioning at all. The quality indicators used in this study are in terms of students' and principals' rating the speed of computer and the time it takes the Internet to connect. Also, a checklist was used to ascertain the rate of repair, replacement, service and the use of the facilities which the researcher used to measure the level of the quality of SNNG facilities.

Quality loading for analysis: Quality of computer in terms of computer speed and quality of Internet in terms of Internet speed.

SNNG: The acronym that describes the body in-charge of SchoolNet Nigeria. It is a non-governmental body that uses or provides ICT facilities to schools as interventions in education sector.

Students' Achievement in the ICT: The scores of the students are used as their performance measuring the cognitive aspect of the subjects across the states.

Students' Attitudes to the use of ICT facilities: The scores obtained here represent what the researcher used to measure the affective domain of the learning outcomes

Students' Practical skills in ICT: The scores obtained here represent what the researcher used to measure the psychomotor domain of the learning outcomes, it is equally called competence test

Utilisation: This refers to the amount of work done or used (per week, day, hour, etc) in which students enter into ICT room to interact with the computer and Internet.

Utilisation Loading for Analysis: Number of times students enter to computer a with teacher; number of times students search for information on Internet facilities in a week with a teacher ; number of hours students spend on computer to do home work in a week; and number of hours students spend on Internet to do homework.

CHAPTTER TWO

LITERATURE REVIEW

2.0 Introduction

The review of literature in this chapter focuses on the access, utilisation and quality of SchoolNet facilities - ICT in school and some related issues surrounding the teaching and learning of ICT education in Nigerian secondary schools. The literature is reviewed and organised along the following sub-headings.

1. Theories of Learning and Information and Communications Technology (ICT)
2. National Policy on Education as it relates to ICT education.
3. Studies on ICT status and its integration in secondary schools
4. Students' achievement in computer and other ICT
5. Students' attitudes and the use of computer and other ICT
6. Students' skill acquisition in ICT, computer curriculum and the use of ICT
7. Studies on learning outcomes
8. Access to ICT and learning outcome
9. Utilisation of ICT and learning outcome
10. Quality of ICT and students' learning outcome.
11. Studies on SchoolNet activities in Africa and outside Africa
12. Empirical Review
13. Summary of Literature Review

2.1Theories of learning and Information and Communications Technology

The need to bring to focus the theories of learning as well as their relevance to ICT in JSS is to create awareness of some claims made about the potentials of ICT for learning, some findings in educational psychology as well as their prerequisites for effective selection and use of ICT applications in teaching and learning in secondary school. In Nigeria for example not much has been done in the area of ICT as compared to advance countries of the world. Adewale et al, (2004) note that ICT and its impact in our schools is at low ebb. However, in Great Britain for some time now considerable claims have been made about the potential

contribution of ICT to students' learning by policy makers, researchers and some teachers. In Nigeria we should be interested in the contribution ICT would impact on our students. In 1994, for instance, the body advising the British government on the use of technology in education, the National Council for Educational Technology (NCET) [now the British Educational Communications and Technology Agency (BECTA)], published a compendium of research findings entitled 'IT works!'. This report made as many as 27 points with supportive references from research, which are listed below. These points need to be seen in the context of a government trying to re-affirm and consolidate a belief in the educational potential of new technologies, this list offers a useful starting point for a discussion of the potential of ICT to enhance students' learning. The roles of ICT and its influence in the classroom instructions are listed.

1. Student who use computer at home are more enthusiastic and confident when using one in school
2. Video games can be educational if they are well managed
3. ICT can provide a safe and non-threatening environment for learning
4. ICT has the flexibility to meet the individual needs and abilities of each student
5. Students who have not enjoyed learning can be encouraged by the use of ICT
6. Computers give students the chance to achieve where they have previously failed
7. Computers can reduce the risk of failure at school
8. ICT allows students to reflect on what they have written and to change it easily
9. Using a computer to produce a successful piece of writing can motivate students to acquire basic literacy skills
10. ICT gives students immediate access to richer source materials
11. ICT can present information in new ways which help students to understand, assimilate and use it more readily
12. ICT removes the chore of processing data manually and frees students to concentrate on its interpretation and use
13. Difficult ideas are made more understandable when information technology makes them visible
14. Interactive technology motivates and stimulates learning
15. Computing programmes which use digitised speech can help students to read and spell
16. ICT gives students the power to try out different ideas and to take risks
17. Computer simulations encourage analytical and divergent thinking
18. ICT is particularly successful in holding the attention of pupils with emotional and behavioural difficulties
19. ICT can often compensate for the communication and learning difficulties of students with physical and sensory impairments
20. Pupils with profound and multiple learning difficulties can be encouraged to purposeful activity and self-awareness by ICT
21. Using ICT makes teachers take a fresh look at how they teach and the ways in which students learning
22. Computers help students to learn when used in well-designed, meaningful tasks and activities
23. Students make more effective use of computers if teachers know how and when to intervene

24. ICT offers potential for effective group working
25. Giving teachers easy access to computers encourages and improves the use of ICT in the curriculum
26. Head teachers who use computers raise the profile of ICT in their schools
27. Management Information Systems can help save money and time in schools (**NCET, 1994)**

A careful study of the 27 points has policy implications for Nigeria in her bid to meet up with global partnership for development. The emphasis on the new technologies especially in ICT should be easy access, such that when integrated into school will be utilised for the purpose of teaching and learning. These technologies should of the quality that could be easily accessible and utilised that are capable of bringing needed potential in students. The potential of ICT is to liberate users from routine tasks and empower them. Another way is to focus on the creative and cognitive rather than procedural aspects of writing or to make accessible vast amounts of information is to some extent reflected in the National Curriculum Orders for Information Technology. This method emphasises the capabilities of communicating information, handling information, controlling and measuring as well as modelling (FRN, 2004, UBEC, 2008). These possibilities are, however, not unproblematic as they can be seen potentially to deprive students of real, firsthand experiences at the cost of simulations and models. Also the quality of the final product can easily become more important than the processes involved in creating it or as the quantity of information can easily be misconstrued for quality of experience (Bonnett, 1997). A tendency to perceive the value of new technologies in terms of a delivery model has widely prevailed. This can be seen to perpetuate the transmission model of education (the student as an empty vessel) and stand in the way of pedagogical innovation (doing new things in new ways with ICT).

There have been attempts to explore the potential contribution of computers to the social qualities of our lives (Crook, 1994:2) and using computer as means of instruction in the classroom (Amoo & Rahman 2004). This realisation of new technologies is seen as agents in interaction and collaboration rather than more narrowly as work-related tools is. Linked to it are the implications of ICT utilisation not only for how we communicate with each other but also for how we use language in teaching and learning.

In summary, there are clearly strong claims to be made for access, utilisation and quality of ICT but to view ICT as the solution to the educational challenges we face by virtue of its sheer existence, is misguided. We need to know about how we learn to be able to maximise the effectiveness of ICT use in formal educational contexts we, as teachers, need the requisite technical skills. The example of this can be seen to be the main thrust of the 1998 DfEE Initial Teacher Training for ICT (ITT for ICT). The success of ICT use depends on our

familiarity with good practice firmly rooted in an understanding of how students learn. Also important is our reflection on optimal environments of ICT use as bases for pedagogic innovation. The reflection is beyond the assimilation of new technologies into prevailing traditions of classroom practice. In other words, in view of the fundamental changes to our concept of knowledge and the learning process, the role of the teacher and human relations in effective use of ICT facilities should complement classroom interaction. We need to go beyond doing the things we have always done with teaching and learning, albeit with the help of new technologies.

The aim of the 1998 DfEE (ITT for ICT) was *to equip every qualified teacher with the knowledge, skills and understanding to make sound decisions about when,* ***when not, and how to use ICT effectively in teaching particular subjects*** *(bold in original) (DfEE 1998:17)*

In my view requires a basic familiarity with learning theories and the findings from (educational) psychology as otherwise there is a real danger that

"the implementation of the computer activity may too easily encourage a distancing of teacher involvement; or more generally, a dislocation from the normally rich context of class-based activity and discussion" (Crook 1994:18)

While acknowledging the fundamental impact on traditional pedagogical modes, it is important to emphasize how the effectiveness of new technologies in the learning process. This depends on the 'centrality' of the role of the teacher in rendering students' experiences and work. With the computer coherent, teacher should play their roles by embedding them in a context of interpersonal support (Crook, 1994:101). The role of the teacher, therefore, remains pivotal, such as in identifying appropriate learning outcomes, choosing appropriate software and activities and structuring and sequencing the learning process. Nevertheless, fundamental changes to the role of the teacher are taking place, in John Higgins' terms, from 'magister' (instructor) to 'pedagogue' (facilitator of students learning) as related by (Higgins, 1988). In view of the absence of widely shared criteria for evaluating ICT applications, familiarity with the findings from (educational) psychology is a useful starting point for gaining a better understanding of how ICT applications can contribute to the learning process as well as the role of the teacher vis-à-vis the computer - subject domain - learner triangle.

In examining theories of learning and their implications for ICT use, MacGilchrist, Myers and Reed, in their book 'The Intelligent School', distinguish a 'traditional' model of learning, which views learning as 'the reception of knowledge, the learner as passive and the appropriate learning style as formal' (the behaviourist tradition) and a 'progressive' model, which sees learning as 'discovery' the learner as active and the learning style as informal" (the

cognitive, humanist and social interactions traditions) (MacGilchrist et al. 1997:20). Learning is seen to occur by making sense of knowledge one is exposed to and with which one interacts by way of mental processes and/or interaction with other people. The role of new technologies in bringing about learning is increasingly attracting the attention of commentators.

A central premise of behaviourism is the notion of learning as conditioning, the idea that it is possible to explain human behaviour in terms of responses to stimuli and that, dependent on the nature of the stimulus, varying kinds of human responses can be provoked. This principle was subsequently extended by the idea that human behaviour can be accounted for through what is observable, that environmental rather than genetic factors result in learning, that there exists a range of behaviours that are possible and that reinforcement is imperative:

(behaviourist) theory thus came to explain learning in terms of operant conditioning: an individual responds to a stimulus by behaving in a particular way. Whatever happens subsequently will affect the likelihood of that behaviour recurring. If the behaviour is reinforced (i.e. rewarded or punished) then the likelihood of that behaviour occurring on a subsequent occasion will be increased or decreased (Williams & Burden, 1997: 9).

Behaviourist ideas are prevalent in many spheres of education, notably teacher education, and fall in the category of traditional models described above. In ICT terms, applications in the behaviourist tradition tend to follow an instructional pattern. Learning is broken down into a sequential series of small steps each covering a piece of the subject domain or a particular skill. The computer programme models the role of the tutor offering some input or paradigm which the learner can 'drill and practise' followed by the provision of feedback. Warschauer identifies the following rationale behind these programmes which he considers to have value:

- *Repeated exposure to the same material is beneficial or even essential to learning*
- *A computer is ideal for carrying out repeated drills, since the machine does not get bored with presenting the same material and since it can provide non-judgemental feedback*
- *A computer can present such material on an individualized basis, allowing students to proceed at their own pace and freeing up class time for other activities (Warschauer 1996: 10).*

In this context, (Crook, 1994: 12) notes that teachers might find this mode particularly appealing because they consider such experiences to be important and furnishing the necessary opportunities is not the easiest or most rewarding part of their responsibility. One of the particular problems with 'drill and practice' software is that it can potentially create 'a passive mentality which seeks only the 'right' answers, thus stifling student's motivation to seek out underlying reasons or to produce answers that are in any way divergent' (Bonnett, 1997:157-8). More advanced hybrids of the computer- as-tutor software tradition, Norbert

PACHLER (Institute of Education, University of London such as artificial intelligence, intelligent tutoring or integrated learning systems, preoccupied with (1) individualisation (of) problems and questions tailored to the (changing) needs of particular learners, and (2) the delivery of constructive feedback" (Crook 1994:12), have proved very difficult to develop. One of the important arguments Crook advances in his critical evaluation of the tutor model of educational computing is that:

*'tutoring' talk is something that is organised at levels super-ordinate to that of the current moment. In other words, effective tutoring dialogues are embedded in more extensive contexts of shared experience. Such dialogues are normally made possible by the history of this experience.(Crook 1994:*15)

The value, therefore, of interactions with human tutors unlike computer lie in the fact that, they are able to draw from the knowledge the learner gained through previous interactions in similar and different contexts. Given the complexity of the processes involved, it is very difficult to programme it through mathematical algorithms. Cognitive theories of learning see the learner no longer as a passive recipient but as a mentally active participant in the learning process. Two main schools of thought can be distinguished, information processing and constructivism. The former tries to explain the workings of the brain in terms of rules and models of information intake, storage and processing and how this helps to explain human behaviour. Research on intelligence or intelligent behaviour, which can be seen as the appropriate use of cognitive skills and strategies within specific contexts" (Williams & Burden 1997:20), have been significantly informed by the information processing model of cognitive psychology. According to Howard Gardner (n.d) who has made a significant contribution to our understanding of human intelligence, learners are potentially able to develop at least seven types of intelligence:

- linguistics: the intelligence of words
- logical-mathematical: the intelligence of numbers and reasoning
- spatial: the intelligence of pictures and images
- musical: the intelligence of tone, rhythm, and timbre
- bodily-kinesthetic: the intelligence of the whole body and the hands
- interpersonal: the intelligence of social understanding
- intrapersonal: the intelligence of self-knowledge (MacGilchrist et al. 1997: 23-4)

From this it follows that, as teachers, we need to present the subject (domain) and requisite skills in ways that meet the varied learning needs and types of intelligence of our students, ICT can make a significant contribution to this process.

The work of constructivists such as Jean Piaget and his followers has been concerned with how human beings construct the world around them through personal meaning rather

than simply through the accumulation of knowledge and facts or the development of skills.

Constructivists postulate that there is no reality independent of the human being. Reality is always constructed by the human being and exists, only subjectively in his or her brain. (Wolff 1997: 18)

Piaget advanced the notion that human beings pass through a number of stages from the use of basic senses to more sophisticated ones, abstract reasoning in particular.

> *"Piaget saw cognitive development as essentially a process of maturation, within which genetics and experience interact. The developing mind is viewed as constantly seeking equilibration, that is. a balance between what is known and what is currently being experienced. This is accomplished by the complementary processes of assimilation and accommodation. Put simply, assimilation is the process by which incoming information is changed or modified in our minds so that we can fit it in with what we already know. Accommodation, on the other hand, is the process by which we modify what we already know to take into account new information. Working in conjunction, these two processes contribute to what Piaget terms the central process of cognitive adaptation (Williams & Burden 1997: 22)*

The summary in ICT terms suggests that the theories of cognitive psychologists can be seen to inform software following the 'revelatory' paradigm of discovery-based and problem-solving oriented learning and simulation (Collins et al, 1997:16). The most notable proponent of using the potential of new technologies to help learners construct new understandings through their exploratory activity is Seymour Papert with his notion of a 'microworld' (Crook 1994:16): Papert's proposal is driven by a compelling image. If you wish to learn to speak French, he argues, you go to France. This surely makes good sense to us. But if France is where you go to command French, where do you 'go' to command, say mathematics? What must be discovered in that case is a sort of 'Mathsland' (Crook, 1994:16) State of the art multimedia and hypermedia simulation software, combining and integrating the written and the spoken word as well as various kinds of images, has a huge potential for presenting to learners near-to-life microworlds modeling and (re)creating diverse aspects of subjects. There remain, of course, problems which should guard us against over-reliance on ICT-based approaches. True representations of reality are often, if not always impossible; there exists the danger of (over)simplification as well as of working in isolation and at one stage removed from reality itself. There is also the question whether ICT-based activities add or subtract authenticity to classroom-based learning activities.

Theories of cognitive psychology also allow us to understand the impact of applications and tools which help users process information, engage them in abstract thinking, allow them to make the knowledge construction processes transparent and help them build classificatory systems. Generic software, such as word processors, databases, spreadsheets fall into this

category. There is some consensus amongst commentators that these applications are liberating and empower the user to engage in cognitive and creative thinking.

Other important lessons to be learnt from (cognitive) psychologists relate to learning styles, the characteristic cognitive, affective and physiological behaviours that serve as relatively sTable indicators of how learners perceive, interact with and respond to the learning environment. Learning style is a consistent way of functioning, which reflects underlying causes of behaviour. (Keefe, 1979 quoted in Ellis 1994:499) It is a widely held view that it is beneficial for teachers to be aware of students' preferences vis-à-vis their learning environment and the nature of interactions in it. There has been considerable interest lately, particularly in the field of modern foreign languages teaching, in making students themselves aware of their preferences and dispositions in order to become more adapTable to the requirements of specific learning tasks and activities or the learning process more generally. Key terminology in this field is 'learner strategies' and 'learner training'.

Ellis (1994: 500). notes a number of distinctions that have been made by various researchers over the years in relation to learning styles such as focuses (concentrate on one aspect of a problem at a time and proceed in a step-by-step manner) versus scanners (tackle several aspects of a problem at the same time and allow ideas to crystallise slowly), serialists (operate with single proposition hypotheses) versus holists (operate with multiple-proposition hypothesis), impulsive versus reflective thinkers, divergent versus convergent thinkers and field dependence ('perception strongly dominated by the overall organisation of the surrounding field') versus field independence ('parts of the field are experienced as discrete from organised ground').

Other studies have identified differing perceptual learning modalities:

- visual learning (for example, reading and studying charts)
- auditory learning (for example, listening to lectures and audio tapes)
- kinaesthetic learning (involving physical responses)
- tactile learning (hand-on learning, as in building models) (based on Reid 1987 in Ellis 1994: 506)

To equally drag home necessity of theory relating to ICT, the researcher read and identified the four general learning styles. General learning styles according to Willing 1987 (Ellis 1994: 506) are:

1. concrete learning style: Direct means of processing information; people-oriented; spontaneous; imaginative; emotional; dislikes routinised learning; prefers kinaesthetic modality.

2. analytical learning style: Focuses on specific problems and proceeds by means of

hypothetical deductive reasoning; object-orientated; independent; dislikes failure; prefers logical, didactic presentation.

3. communicative learning style: Fairly independent; highly adapTable and flexible, responsive to facts that do not fit; prefers social learning and a communicative approach; enjoys taking decisions.

4. authority-oriented learning style: Reliant on other people; needs teacher's directions and explanations; likes a structured learning environment; intolerant of facts that do not fit; prefers a sequential progression; dislikes discovery learning.

In his discussion of this and other studies, Ellis points out that our concept of learning styles is still ill-defined, that the strength and nature of motivation seems to impact on learning styles and that environmental factors appear to be at least as important as innate qualities (Ellis 1994:506-7).

Irrespective of these shortcomings as well as the fact that there is still uncertainty which learning style works best, this aspect of (cognitive) psychology is of relevance for teaching in general and the use of ICT in particular. There appears to be the tendency amongst beginning teachers to teach how they themselves would like to be taught (Pachler & Field 1997: 37-40). In order not to provide too narrow a range of teaching styles it is important for teachers to be aware not only of their own preferences but also of the diversity of preferences amongst pupils. Given the variety of preferences amongst pupils about the learning environment and their interactions with it, teaching approaches and methods need to be varied. New technologies offer one of many possibilities to provide varied learning opportunities. A further school of thought of (educational) psychology is social interactions which add the importance of the location of human learning within a socio-cultural environment to the idea of learners constructing their own knowledge and understanding. The best known proponent of social interactions is the Russian Lev Vygotsky whose work, whilst conceived in the 1930s, did not become available in the West in translation until the 1960s and 70s. Put simply, the premise of his work revolves around the importance of interaction with others as part of the learning process: Vygotsky took issue with the Piagetian view that from the time of their birth student learn independently by exploring their environment, and with the behaviourist view that adults are entirely responsible for shaping student's learning by the judicious use of rewards and punishment (Williams & Burden 1997:39). Vygotsky afforded great importance to the role of language in the interaction of learners with one another:

> *"it is by means of language that culture is transmitted, thinking develops and learning occurs" (Williams & Burden 1997:40). According to social interactionism,*

learning takes place through engagement with contextualised and situationalised socio-cultural environments and through „contact with a culture of material and social resources that everywhere supports cognitive activity" *(Crook 1994:32).*

A crucial part is played by other significant people in learners' lives, be they parents, teachers or peers, who enhance the learning of others by 'selecting and shaping the learning experiences presented to them' and who help them 'to move into and through the next layer of knowledge or understanding' which Vygotsky called the zone of proximal development (Williams & Burden 1997:40). It means ICT can also be seen to have mediatory potential in the Vygotsky sense. This view is, however, not unproblematic. In the light of the insights afforded to the researcher by social interactionism the researcher considers it to be vitally important for teachers to be aware of how the use of ICT (in the classroom) impacts on teacher-students, student- teacher and student-student interactions as well as on (inter)personal relationships. Also, there are the issues of the impact of ICT on the status of the teacher and the role of new technologies as mediators of learning. Given the importance of interpersonal exchanges in such a view of learning, questions need to be asked as to whether ICT does, indeed, have this mediatory potential or whether the use of ICT will undermine the social quality of education and deprive learners of vital 'scaffold social encounters' (Cook, 1994: 61-80). Charles Crook, in his 1994 book Computers and the collaborative experience of learning, repeatedly points out the need to employ computer-mediation very carefully and deliberately and to ask searching questions as to its potential to provide interactions that are actually significant in bringing about learning. The communicative potential of computer-mediated communication via the Internet, therefore, warrants more detailed investigation. The discussion of theories of learning in this section, then, suggests that in view of the limited availability of intelligent software, learning is as, if not more, likely to take place via the interactions of pupils with peers and the teacher whilst using ICT applications as it is via the interactions with ICT itself.

Other useful starting points for gaining a better understanding of how ICT applications can contribute to the learning process can be found in research into other related disciplines such as the study of literature or film. In an interesting article in the British Journal of Educational Technology, Plowman argues, for instance, that interactive multimedia challenge traditional definitions of narrative structure and that their relative lack, for instance, of redundancy and fixed sequences has serious implications vis-à-vis comprehension and cognition in educational contexts. She posits that the potentially beneficial attributes of interactive multimedia, such as their multimodality, the integral part of group discussions or

periods of individual reflection as well as the control of the user in navigational terms, are double-edged inasmuch as interaction with the computer can potentially disrupt the narrative structure which, she claims, is central to our cognition. (Plowman, 1996: 92-7)

As with any other teaching tool, ICT applications have to be judiciously vetted by teachers for their effectiveness in facilitating learning. One particular challenge of ICT applications relates to the fact that they obey specific conventions and rules which differ significantly from those of more traditional tools. They make use of a wide range of semiotic systems in that they can, as in the case of hypermedia, combine the written word, the spoken word as well as images. Their user-interfaces predicate faculties which have been termed 'critical media literacy' (Collins et al. 1997: 62) in order to facilitate successful intake, processing and storage of the information contained therein. There is insufficient space in the context of this chapter to analyse these characteristics in detail, teachers along with all other users will, nevertheless, need to pay great attention to developing (in their students) the requisite skills and this appears in chapter four of this study. Due to the hypermedia nature of new technologies, their move away from sequential to random modes of information presentation is a very important feature for teachers to be aware of. No longer is the recall of facts and figures central but, the ability to locate, select and re-use appropriate material. An additional problem in this context is the comparative lack of skills in teachers to make judgements on the basis of 'professional' experience: (the) very nature of multimedia, vast, non-linear and readable only through the computer screen, means that it is difficult to assess the scope and quality of a title or source without spending considerable time on it. There is no equivalent to picking up and flipping through a book which will give an experienced teacher a clear view of its coverage and relevance (McFarlane, 1996:4). It is important to bear in mind that software developers make a number of assumptions in the process of the conception, production and evaluation stages of a new application. These include assumptions about the process of learning, the teaching methodology and the knowledge/skills base of the intended users including their cognitive abilities. To some extent their possibilities are constrained by the technical capabilities of their chosen delivery system. In summary, these theories as often done for other subjects give insight into what should be the basis for ICT and how to do it in the context of new learning processes.

2. 2 National Policy on Education as it relates to ICT education

The Federal Republic of Nigeria has no specific policy for ICT in education (Osei, 2007). If this statement is true, the absence of such a policy is a challenge having realized the impact of ICT in the global economy. Ogunleye (1999) relates 1981 to 1985 as the period of technological awareness in Nigeria after which ICT evolved. This period witnessed technological acquisitions. One of the important features as opposed to the statement of (Osei, 2007) as regards policy on education is setting out clear objectives at all levels which are related to the overall national objectives of building a free, democratic, egalitarian, strong, just and self reliant Nigerian society; full of opportunity for all citizens (FRN, 2004) . For the secondary education, the important objectives in relation to science and technology which later includes ICT as part of computer education are: (a) to diversify its curriculum to cater for differences in talents, opportunities and future roles possessed by or open to students after their secondary education school. (b) to provide manpower in the applied science and technology; (c) to equip students to live effectively in our modern age of science and technology; (d) to raise a generation of people who can think for themselves, respect the dignity of labour and appreciate those values specified under our broad aims and live as good citizens (e) to provide technical knowledge and vocational skills necessary for agricultural, industrial, commercial and economic development. In order to achieve these objectives, structural reforms at secondary education was proposed and this did not exclude ICT policy.

The National Policy on Education (FRN, 2004) makes government intention known by stating the need for its integration in schools at all levels. However, the Ministry of Education created its ICT department in February 2007, notwithstanding several government agencies and other stakeholders in the private sector having initiated ICT-driven projects and programmes to impact all levels of the educational sector. The challenge is lack of electric power and telecommunications infrastructure in a substantial part of the country. Mobile telecommunication currently covers 60% of the national territory but mobile telephone companies generally power their base stations using electric power generators since the Power Holding Company of Nigeria (PHCN) is unable to supply them with power. This phenomenon is prevalent nationwide and constitutes the bottleneck to effective countrywide deployment of ICT in education (Okhiria, 2007).

It was projected that Nigeria will be a net supplier of electric power by the end of 2007 when its massive cross-country electric power grid construction and interconnection projects

were expected to be completed. It is hoped that mobile operators will introduce technologies that permit Internet access on their networks across the country to facilitate the implementation of e-learning programmes. Osei (2007) states that Nigeria's objective for primary education does not elicit the knowledge of ICT. Emphasis is placed on:

- Widening access to basic education
- Eliminating present inequalities in the enrolment between the urban and rural populations
- Ensuring greater retention in schools
- Ensuring long-term permanent literacy for those student who have completed the programme.

While ICT knowledge is not evoked in the vision set for primary school pupils, it is clear that government's new policies and programmes in the telecommunications and ICT policy sectors do not address the problem. The reflection of this statement is found in Universal Basic Education document (UBEC, 2008). Nigeria started implementing its ICT policy in April 2001 after the Federal Executive Council approved it by establishing the National Information Technology Development Agency (NITDA), the implementing body. The policy empowers NITDA to enter into strategic alliances and joint ventures and to collaborate with the private sector to realise the specifics of the country's vision of, "making Nigeria the ICT capable country in Africa and a key player in the information society by the year 2005 through using IT as an engine for sustainable development and global competitiveness." In this study the researcher lists the vision though it is yet to be fulfilled. Outlined below are some of the objectives of Nigeria's ICT policy:

- to ensure that ICT resources are readily available to promote efficient national development
- to guarantee that the country benefits maximally, and contributes meaningfully, by providing the global solutions to the challenges of the Information Age
- to empower Nigerians to participate in software and ICT development
- to encourage local production and manufacture of ICT components in a competitive manner
- to establish and develop ICT infrastructure and maximise its use nationwide
- to empower the youth with ICT skills and prepare them for global competitiveness
- to integrate ICT into the mainstream of education and training
- to create ICT awareness and ensure universal access in promoting ICT diffusion in all sectors of national life
- To create an enabling environment and facilitate private sector (national and multinational) investment in the ICT sector
- To encourage government and private sector joint venture collaboration
- To develop human capital with emphasis on creating and supporting a knowledge-based society
- To build a mass pool of ICT literate manpower using the NYSC, NDE, and other platforms as a train-the-trainer scheme for capacity-building

However, in the present age of ICT where the whole world seems to be reduced to a global hamlet in terms of communication, no country desires to be mapped out of the relevant

hamlet. ICT is therefore indispensable for any country that must belong to this hamlet. No wonder, Nigerian government in the introductory statement of her policy emphasises the introduction of ICT into the school system (FRN, 2004:5). It also stipulates that relevant infrastructure would be put in place to expand the use of ICT in schools. As at now, government efforts in this regard remain inadequate. Specifically one of the challenges of our time is probably to improve learning environment of the child and students with the provision of basic infrastructure and in fact, the integration of ICT into education in Nigeria. The role and benefits of ICT in our school system as well as its use in advancing knowledge and skill in the modern world had been a major activity of STAN, MAN, NAERE, NMS and other professional bodies in recent years. This probably makes Okeke (2003) to note that ICT dominates several aspect of human endeavour.

In similar vein, Isoun, (2003) in the keynote address at one of STAN conferences notes that no work of science has so comprehensively impacted on the course of human development as ICT. Undoubtedly, ICT has been the greatest change agent in this century and promises to play this role even more dramatically in the coming decades. ICT is breaking old barriers and building new interconnections in the emerging global hamlet or village. It has also become the chief determinant of the progress of nations; communities and individuals. For Nigeria, the rise of ICT is an opportunity to overcome and once again become the master of one's own national destiny. ICT promises to compress the time it would otherwise take for Nigeria to advance rapidly in the march of development and occupy a position of honour and pride in the community of nations. In order to uphold challenges of ICT in the present world, Federal Executive Council approved National Information Technology Policy in March 2001, the National Information Technology Development Agency (NITDA) was established by the Federal Government to implement the national ICT policy as well as promote the healthy growth and development of the ICT industry in Nigeria.

The vision statement of the policy is to "make one key player in the information society by the year 2005, using ICT as the engine for sustainable development and global competitiveness" while mission statement is to 'USE ICT' for education, creation of wealth, poverty alleviation; job creation and global competitiveness. A major strategy of achieving both the vision and mission of the ICT policy is human capacity building, which involves both education and training of not only the adult but the young and youth. This means that at our pre-vocational education level such skill as that of computer appreciation should extend beyond demonstrating computer to teach alone but a step in the direction of achieving global competitions across digital divides (Adewale, 2005). Training and re–training programmes are

equally very vital for acquiring better skills to enhance productivity especially in this era of "life-long" leaning (Adeyemo,2005). It is a well-known fact that there is scarcity of human capital at all levels. This makes Mac-Ikemenjima, (2005) to state that policy, managerial and technical skills are some of the main obstacles to the sustainable growth and development of developing nations like Nigeria. Since, the ICT industry is a very dynamic one, Adeyemo, (2005) suggests that the attendant need for continuous and aggressive training and retraining programmes to catch up with the frontiers of knowledge are the creativity and innovation to ensure national pride and global relevance.

The central element of capacity building strategy is therefore necessary in order to strengthen the national capabilities to respond to the training and other capacity building needs. This can be achieved through improved public policy formulation strategies; promoting train the trainers' courses; development and dissemination of manuals and managerial skills, conduct of strategic national capacity building development conferences and workshops which STAN upheld since 2003 and making use of academic research results.

The global information society has initiated a shift of emphasis from the natural resources – based economic development model to that of knowledge – based resources development in creating national wealth. There are several benefits of ICT for students at any educational level. Several among them are the: increased employment and educational opportunities for young people; opportunity for life-long learning; learning while working; open and distance education; skill for employment; promotion of unity in diversity; transformation of 'brain drain' to 'brain gain' (Isoun, 2003; Leicester, 2003; Baggot la Velle; Mc Farlene and Brown, 2003). Recent efforts made by the government towards the ICT development in Nigeria according to Isoun (2003) include: launching of the National Telecommunications and Policy, September, 2000; development of the comprehensive science and technology policy 2001; development and launching of the National Policy on Biotechnology 2001; development and launching of Information Technology Policy 2001; establishment of the National Information for Development Agency NITDA 2001; launching of the Nigerian Satellite Systems programme by the National Space Research and Development Agency NASRDA 2001; development and launching of mobile Internet units, which are bases equipped with computer systems and other accessories with a VSAT installed on the buses for Internet access; Rural Internet Resources Centres (RIRC) were established with the collaboration of international organisations in the six geo – political zones of the country to provide for training of the inhabitants and to provide access to link up with the inhabitants and to provide access to link up with the rest of the world on the Internet.

A clear perusal of the establishment and launching of various ICT solutions by government are indications towards achieving target 18 of MDGs. Tapping these ideals, the need for school training for capacity building under the slogan of catch them young would afford them the improved learning in the ICT as well as achieving the target 18 of the MDGs which says 'in cooperation with the private sector, make available the benefits of new technologies especially ICT, the relevance of this statement is found in the work of SNNG intervention in schools.

2.2 Studies on ICT status and its integration in secondary schools

Historically, Federal Government of Nigeria first applied computer to processing of 1963 census through some expatriates and so no other organisation was involved in the use of computer except some universities until later year (Abimbade, 1996). The National Policy on Computer Education was inaugurated in 1988 to deliberate on and plan a policy to guide and formulate the curriculum for Computer Education. On this note, the Federal Government highlighted to the committee reasons why computer education was imperative. Among the reasons given according to Jegede (1990) in Abimbade (1996) were:

1. for Nigeria to be able to cope with the twenty first century which was obviously expected to be of high technology in which the computer will be central piece, the most sophisticated and enabling tool.
2. for Nigeria to catch up with the rest of the world
3. for the enhancement of operational efficiency and management, in an almost infinite scope of activities which the computer provides
4. for Nigerians to be able to secure computer related jobs control to the proliferation of micro-computer and integration within the education system in Nigeria. On this, Abimbade (1997) outlines the general objectives on which the committee on computer literacy was expected to work with as follows:

* to bring about a computer literate society in Nigeria by the mid 1990s
* to enable present generation of school student at different levels of education appreciate the potentials of the computer in various aspects of life and later, occupation.

The offshoot of these objectives reflects in the subsequent reviews of the National Policy on Education to incorporate computer education (FRN, 1998), ICT (FRN, 2004) and Computer Studies (UBEC, 2008). The procedure, specifications to operate with were spelt

out at all levels. On the other hand, there are various relevant studies that were undertaken in Nigeria on the status of ICT and its related appliances. Notably, Udousoro (2000) investigates the relative effects of computer and text-assisted programmed instruction on students learning outcomes in mathematics, using the students of Federal Government colleges in Nigeria, found out that female performed better than their male counterpart in mathematics instruction. In another study carried out by Ibode (2004) who investigated the effect of computer-assisted instruction and video tape instruction on Senior Secondary schools, the study examined the main and interaction effect of gender and verbal ability on students' achievement in English language. With a sample of 345 students (181 boys & 164 girls) from six co-educational public secondary schools in Ibadan city it was discovered that there was significant main effect of computer, video and control on the students' achievement. He discovered that students exposed to computer-assisted instruction performed better than video tape instruction.

These studies and others carried out earlier by (Abimbade, 1996, Ajelabi, 1998) are all pointers to the fact that all computer mediated programme instructions, tape instruction are capable of providing learners who fall behind their studies the way out. Ajoke-Harbor-Peters (2001) reports the feeling of pre-service and in-service mathematics teachers in Enugu State on the availability of computer for all by the year 2010. Twenty five percent (25%) of the subjects believed that computer would de-humanise the classroom and replace their roles. Sixty percent (60%) of the teachers are confused and frightened to make use of computer, and would want it introduced when they are retired and out of the system, while fifteen percent (15%) believed that computer is a mark of development and would want it introduced now in the education system. The implications of the study lie in the fact that a lot is needed to be done in the acquisition of relevant knowledge, skill in computer appreciation so as to be up to the task when using ICT to teach. It is therefore, sufficient to say that computers have become indispensable in the contemporary world as a powerful means of communication and education. Interest in learning languages has increased due to the availability of the Internet, which provides easy access to every possible kind of information, and serves as an effective tool to facilitate learning. Whatever reasons teachers have for teaching language via the web, the first important point is to clarify the goals of using the Internet, e.g. to teach writing, to revise vocabulary or grammar, to prepare projects, to solve WebQuests or to communicate via email, etc. It is vital to remember that "little is usually gained by just adding random online activities into a classroom" (http://iteslj.org/Articles/Warschauer-Internet.html.).

Warschauer (1997) recommends that teachers provide support, i.e. personal help to learners during activities, getting students to work in pairs or groups, or creating detailed handouts. The integration of online activities into the course curriculum "rather than adding these on top of the rest of the classroom activities in a disconnected fashion" is another important point http://www.espworld.info/Articles_3/Global_Classroom.htm.). Teachers' contributions remain important for coordinating group planning, focusing learner attention on linguistic aspects of computer-mediated texts, helping students gain linguistic awareness of genres and discourses, assisting learners in developing individual learning strategies, and creating an appropriate atmosphere for language learning.

In order to fully exploit these opportunities, according to Warschauer (1997), the teacher must learn to become a "guide on the side" rather than a "sage on the stage". It is no surprise that impact should be near the top of the development work, with or without technology? How do we claim credible evidence of impact? And in ICT domain: Are there some special ways that impact must be both defined and measured? Technology advocates describe a range of potential impacts that ICT can have when applied. According to (Koma, 2005) impact include: student outcomes such as increased knowledge of school subjects, improved attitudes about learning, and the acquisition of new skills needed for a developing economy. Beyond learning outcomes, ICT helps close the gender gap, and help students with special needs; teacher and classroom outcomes such as development of teachers' technology skills and knowledge of new pedagogical approaches, as well as improved mastery of content and attitudes towards teaching.

With the promise of these outcomes, government policy makers and NGOs in developing countries including Nigeria have computers in some schools and connected them to the Internet; provided students with multimedia tutorials and simulations trained teachers, giving them access to new resources, provided schools with management and productivity tools, and some established community technology and multimedia centres in villages (Koma, 2005). These resources represent significant investments, particularly in the light of limited resources and competing needs in developing countries. What have we learnt from these experiences? To what extent has the potential of ICT been realized? And how do we use what we know to support Millennium Development Goals? (MDGs). The research results on the impact of ICT in students, teachers' schools and communities had been undertaken (Pedro, Enrique, Ernesto & Lucio, 2004). While majority of studies in these areas have been done to date in OECD countries, the results coming from developing countries, lend support to similar conclusions (Koma, 2005).

A number of the researchers focused upon the impact or outcomes of the ICT-based innovations they studied. Some concentrated on micro-level processes in the classroom while others, on the communities outside the classroom. The papers reviewed as a whole provide a perspective revealing the wide range of outcomes, many of which are complex and difficult to measure, from exemplary use of ICT in classrooms. It has been observed that Nigerian Youths lack modern skills in ICT to compete in the global economy (Asim, Kalu & Ani, 2003). Thus the youths have been called upon to use ICT as a platform for skills' acquisition as the world begins to experience a revolution where emphasis would be laid on knowledge economy rather than on an industrial finite resource economy. Hence, investment in ICT is a tool for global competitiveness and our youths who are in secondary schools represent the future that will sustain ICT in this country to bridge the digital divide between Nigeria and developed nations.

Researches show that Internet skills followed the programming skills (Asim, Kalu & Ani, 2003). The skills demand is for many job opportunities are in ICT societies. Also possible use of ICT in classroom teaching and its application in science, technology and mathematics education (STME) may pose a problem if those ICT materials are not within the reach of average Nigerians (Kalu & Ekweme, 2003). However, studies relating to ICT status had been presented in STAN conferences. Notable among these are the studies of Anaeckwe, (2003) who surveyed the ICT enhancing skills of pupils needed for sustenance of STME, found out that basic study and integration of ICT in the classroom is very essential. In the same vein Grushen (2001) identifies the following areas of need in ICT which calls for a goal in computer literacy as: teachers and students must be proficient, critical uses of current educational technology and the recognition of their limitations; teachers and students need a broad education in order to determine the application and innovations in technology; teachers need competency in design of instructional system such as programming, web; teachers and students need to review critically the relevance of software packages for their teaching practice.

There are other studies undertaken that are relevant to this review. This document presents a selection of research on the use of ICT in learning and teaching English. Rather than being an exhaustive literature review, the collection of abstracts and references should be seen as a starting point for those interested in the topic. References for 46 documents are presented here, with abstracts for 15 of the most significant studies. Topics covered include: Reading; Speaking and listening; Writing; Literacy and English teachers'

attitudes to using ICT. The literature is drawn mainly from the UK and covers both primary and secondary age phases. There is an extensive body of academic literature dealing with the use of ICT in the English curriculum and literacy education, and evidence of good practice and positive outcomes in a number of areas. However the pedagogy associated with using ICT to support English learning and teaching is still evolving. For example, the use of word processors is still not fully embedded or used effectively in many classrooms in the UK. Within the literature certain technologies and age phases are better represented than others. There is more research into the use of ICT in English in primary schools than in secondary schools. There is a need for a clearer identification of how the positive benefits can be incorporated into classroom practice, at what stage, and using which particular hardware and software. Certain aspects require further research, in particular the role of ICT in promoting speaking and listening, the effectiveness of ICT on spelling ability; how the Internet environment contributes to the development of higher reading skills and the use of ICT in drama.

In the areas of reading there are other researches carried out in UK, US and countries that are relevant to this study notable among them are in Birmingham, (2001) who investigates the ways in which secondary (Year 9 and 10) students and their teachers use a storyboard tool which provides the user with the capability to create, capture, store, retrieve and interact with a range of images and texts. Research findings report on two distinct ways this product made a valuable contribution to students' learning by encouraging them to explore beneath the surface of the text of Macbeth, in order to gain a deeper understanding of plot, mood, and atmosphere and character motivation.

Hall, (2000) evaluates 17 American studies using Computer Assisted Instruction (CAI) in reading for students with learning difficulties. The studies were categorised by type of computer instruction (drill and practice, strategy and simulation) and type of reading intervention. The findings show that students with learning difficulties, who use CAI in reading, increase performance in reading decoding and reading comprehension. Well designed CAI software that is regularly applied in classrooms, has the potential to reinforce teacher instruction, offers students an increase in practice time and can lead to success in reading. However, access alone to hardware and software does not automatically result in reading success for students with learning difficulties.

Lynch (2000) engaged in an evaluation of Computer Assisted Learning (CAL), in particular reading support software called RITA (Reader’s Interactive Teaching Assistant) used with eight students (mean age 11.7) needing intensive support in one comprehensive

secondary school over ten weeks. Findings suggest it can be effective for most students with reading failure in secondary school. The effect of three weekly twenty-minute sessions was measured pre- and post- test. It was most effective for non-dyslexic student, with significant progress in those areas targeted and less progress in areas not targeted in Individual Education Plans. Mean scores did increase for each test, especially for reading and comprehension, and it reversed the general downward slide in standard scores. Highly variable results in spelling may have been due to a school-wide spelling initiative that caused extra difficulty. The least impressive results were for two ESL students where the computer-generated speech may have been too poor to assist with their comprehension difficulties. There were significantly higher levels of enthusiasm and commitment than with traditional approaches. Nicolson, (2000) describes a small study with students aged 6 and 8 identified as being most at risk of reading failure. The RITA (Reader's Interactive Teaching Assistant) system was used with HyperCard 2.3 on Apple Macintosh computers. RITA is a flexible system, which allows the teacher to tailor individual activities for the students, automatically storing and analysing the results. The study found that RITA was as successful as using a previously administered traditional intervention approach, with very satisfactory educational effectiveness and cost effectiveness.

However, RITA was significantly more cost effective in improving the reading skills of junior school students. Additionally, the students using RITA showed higher levels of motivation than with the traditional approach. However, as successful as computer assisted learning (CAL) appears to be, it is likely that around 10 per cent of the cohort will need to be provided with continuing support. Scrase, (1997) investigates the use of scanners linked to computers with speech synthesisers, with a group of sighted year 2 students who had been identified by their teacher as needing additional help with their reading. All the students quickly learned to use the system and the average reading score increased from 6.11 to 7.2. Spelling scores increased from 6.6 to 6.9 and comprehension scores increased from 9.23 to 9.62 during the trial. Findings concluded that the system was more effective at improving reading than spelling and students with specific reading difficulties made little or no progress with the system.

Scrase, (1998) evaluates the impact of a multi-sensory system for teaching reading and spelling skills to pupils with learning difficulties. Students using the Starcross Indirect Learning (IDL) system listened to sentences dictated by the computer, then typed the sentences as the programme read out the letters. Correct typing was displayed, while asterisks replaced incorrect typing. Research findings demonstrated that students

improved both their reading and spelling ages by six months or more for each month of the programme. This represented 3.7 times their previous rate of progress for reading and 4.4 times their previous rate for spelling. Further analysis showed that the system was also effective for students with problems with their visual processing (Meares-Iren syndrome). The study was part of the 'Reading by Computer' project.

Van Daal, & Reitsma, (2000) describe two small-scale pilot studies, into the effects of an instructional multimedia system on spelling motivation and reading skill acquisition. The first study examined whether reception-aged student can independently acquire initial reading and spelling skills through computer-assisted practice. The findings show that students, who participated in the computer-based reading and spelling practice, improved their word recognition skill and decoding skills. In up to 16 hours of computer practice they learned as much as in 3 months of traditional reading instruction. The second study examined the impact of computer-based spelling practice on the levels of motivation of student with reading failure. The students showed more positive behaviour during practice with the computer and less during classroom instruction. Computer-assisted spelling practice also helped them to improve their spelling.

On the relevance of speaking and listening Reid (2002) between October 2001 and March 2002 BECTA ran a Digital Video (DV) pilot project involving 50 schools from across the UK. The aim of the project was to gather evidence of the impact of DV technology on pupils' engagement and behaviours, and to identify models of effective practice. BECTA commissioned the British Film Institute to undertake an evaluation of the Digital Video pilot project. Their report looks at patterns of use and good practice in Digital Video, and considers how the technology has increased pupils' motivation, broadened access to the curriculum and has fostered both creativity and moving image literacy. The report contains key findings, analysis, case studies and recommendations.

Segers, & Verhoeven (2002) undertake a research study into the development of a child-friendly computer software programme to enhance the early literacy skills of reception-aged student. The ergonomic aspects of designing software for young students are described, along with two studies of reception-aged student using the story and vocabulary parts of the programme. Multimedia activities such as storybook reading, communicative writing and language games had an impact on students' oral and written language development, with significant gains in vocabulary development of ethnic minority students. On the area of writing, there is a study by (Breese, 1996) that investigates the effects of unlimited access to word processors on students writing over a

period of 20 months. Each of the 22 Year 7 students was given a laptop to use for all their writing in English lessons. Samples of their narrative writing were compared with samples from a parallel class who only used handwriting methods. Students using word processors showed significant improvement over those using pen and paper. Deadman, (1997) in an action research project exploring ways in which reflective writing supports pupils' learning. Students were given two writing activities: one group had the support of the teacher and the other involved students supported by both the teacher and a hypermedia reflective writing framework. The writing was then analysed sentence by sentence and the results compared. The findings suggest that there were improvements in students' ability to reason when they were further supported by a hypermedia reflective writing framework. In this summary we are concerned only with the area of literacy. While the project demonstrated that ICT can be part of raising attainment dramatically, the researchers stress that these gains cannot be attributed to the use of ICT alone and must be taken in the wider context of learning and teaching. However students writing development was accelerated and enhanced by access to word processing and there was an average improvement in literacy of 5.1 months per month. Presentation software enabled teachers to show ideas dynamically – for example, when showing suffixes joining with root words. Pupils were motivated to read more and in doing so extended their vocabulary using ICT texts such as word processors with speech facilities.

Karchmer, (2001) in his report explores ICT-literate primary and secondary teachers' perceptions of how the Internet has or has not changed the way they taught reading and writing in their classrooms. Findings indicated that the teachers viewed the Internet's influence on reading and writing as an extension of traditional literacy skills but had difficulties finding Internet materials written for a range of reading levels. Teachers were teaching skills of evaluating Internet materials in more depth and at a much earlier stage. In the way, (Mumtaz & Hammond, 2002) consider why the use of the word processor to develop literacy has not become embedded in primary classroom practice and how it is used beyond the literacy hour. Key findings were that teachers need more time for reflection on their learning objectives and that there is confusion as to whether ICT is to be used to enhance ICT skills or to enhance the curriculum. Teachers saw word processing activities as largely individualised with little intervention or support, with the exception of students with special needs. The summary of the literature on the status of ICT cannot be exhausted, as there are various lessons to learn if the integration of ICT in school project of SNNG can be sustained.

2.4 Students' achievement in computer and other ICT

In relation to achievement test in ICT, there is need to ponder on different effects of computer use by students could have depending on the context in which the use takes place. In the case of school, computer use by students could facilitate learning and therefore, having a positive effect on achievement. The educational activities that involve the use of computer technology capture the interest of students, which facilitates their understanding of the content and provides a different way of expressing knowledge (Ediger, 1994). Empirical research on this subject shows evidence that confirms a relationship between use of computer at school and achievement (Weaver, 2000; Amoo & Rahman, 2004). However, studies have not always demonstrated a positive correlation between the use of computer at school and achievement. Antonijevic (2007) finds in his study of data obtained from TIMSS 2003 (Trends in International Mathematics and Science Study), which includes 47 participant countries worldwide, that the use of computers in education contributes significantly to higher student performance in science but not in mathematics. There was even negative correlation found between these two variables (Ravitz, Mergendoller & Rush, 2002). Trends and prospects of ICT in teaching and learning of Mathematics at one time or the other has been recorded (Amoo & Rahman, 2004; Ezeamenyi & Alio, 2004; Amoo & Efunbajo, 2004). They all concluded that the functionality of ICT in the teaching and learning of Mathematics is one of the major concerns of scholars looking at the way teachers are prepared for the current challenges of ICT in the country.

More works on Science Mathematics and ICT (Fennema, 2000; Halpen, Wai & Saw, 2005; Adewale, et al, 2004; Adewale, 2005; Adepoju & Amoo, 2005; Adeleke & Amoo, 2007) have pointed out specific school influences- timetabling of the subjects, assessment procedure, teachers expectations, peer pressure, school resources including ICT and environment contribute to gender inequality in STM learning. The most comprehensive of reviews of research in the area of gender differences have shown differences between Mathematics and achievement needs between male and female students, et al, 2004, Adeleke, 2007). On this many observers (Comu, 2002; Adebayo, 2008) indicate that the impact of ICT will be mostly on educational methods, others (Osunade & Yara, 2005; Olorundare, 2006) emphasize the issue of technological contents. The reviews on students' achievement in computer equally show a moderate score among students

(Bamikole, 2004). All these though related yet the students' achievement on the ICT as part of computer studies still requires attention of experienced ICT teacher.

2.5 Students' attitudes and the use computer and other ICT

Attitudes towards ICT use deals with the students' beliefs, interests, perceptions, aspirations, practicing habits, persistence and self concepts. Attitudes play a major role in the comprehension of ICT. This can be discussed as the state of readiness, a tendency to act or react in a certain way. This is what Emeke (2004) refers to as learned disposition or tendency on the part of individual to respond positively or negatively to a situation person or thing. Bolaji (1996) in Amoo et al (2004) opines that attitudes influence how well students adjust to people or situation and how they behave. Several studies are reviewed to reflect the students' attitudes to the use of ICT. For example, a study conducted by some researchers in Israel was to find out how students use Internet with regard to their accessibility to computers and Internet source, time spent on their Internet-based activities, kind of activities and factors affecting Internet usage by the students (Rafi, 1998; Osunade & Yara, 2005). Three groups of users were identified in the study. The first was the non user groups comprising of 10% students. One tenth of them were computer –literate and do not use computer at all even for gaining knowledge or for leisure. Over 70% of the groups were girls. The second group was the common users comprising about two third of the student population. Students in this group focused mainly on the use of basic tools like word processing and gaming – spending 2-6 weekly hours using Internet. The third group was skilled students or users (25%), which dealt with sophisticated tasks, such as graphic processing, spread sheet and Internet usage. Within this group were highly skilled students (7%) that were able to cope with data manipulation and programming tasks. On the computer accessibility, the Israel study shows that about 87% of the students had computers at home half of which were connected to the Internet. Majority of the students indicated that they preferred to use computers at home or in other settings rather than at school. The figures reported from this Israeli study by the students as weekly time spent on computer work at school was 40 minutes a week. It was reported that the average overall time spent with computer was above seven hours per week but most of it out of school.

In another review based on age and attitudes of secondary school students to the use of computer, Colley & Comber (2003) examine possible changes in the computer experience

and attitudes of 11-12-year-old and 15-16-year-old students following a period in which ICT has become much more widely used in the school curriculum. In comparison with findings from a similar study undertaken in the early 1990s, there was evidence of a reduced gender gap, particularly in the use of computers for applications such as word-processing, graphics, programming and mathematics. In addition, more recently introduced applications such as e-mail, accessing the Internet and using CD-ROMs showed no overall gender difference in frequency of use. However, some gender differences remained, particularly in attitudes. Boys still liked computers more, were more self-confident in their use than girls. They also used computers more frequently out of school, particularly for playing games. There was evidence that, as found previously, older girls held the least positive attitudes, and it is suggested that their approach to computers may be influenced by the cultural pressures of gender stereotyping. More general age differences in use and attitudes were also found and these may result from the different computing applications used by Year 7 and Year 11 pupils at school. In summary, although we found evidence of some change since the early 1990s, increased exposure to computers has not closed the gender gap. If there were positive attitudes of students to computer mediated subjects in other countries of the world, this study expects see the influence of students' access, utilisation and quality of SNNG facilities on their attitudes to ICT in southwest, Nigeria.

2.6 Students' skill acquisition in ICT, computer curriculum and the use of ICT

It has been argued that education represents a major agent for the control of social change (Osokoya, 2008). Going by this statement, it means that educational system has no doubt contributed immensely to the development of new methods and materials, on our standards and style of living. The effect of education as a whole therefore, is to increase the speed at which technological and material changes are diffused through the society. With the emergence of IT and later ICT in our society, there is need to refocus the process of teaching and learning for the achievement of the much needed development in these areas. In order to achieve these, computer education and functional ICT in the classroom should be seen as instruments of social change.

In order to entrench effective and social change in our classrooms, ICT in the classroom needs to be integrated and effective networking of computers is important. It must be noted that networking of computers gave birth to Information Technology and this is embedded in ICT (UNESCO, 2003). UNESCO considers ICT as "Scientific, technological and engineering disciplines and management techniques used in information handling and processing. The application of computers and the interaction of teachers and students should effect social change in the classroom in such a way to create atmosphere mastering skills the use of ICT. According to Smith (2004), a mosaic of technologies, products and techniques have combined to provide new electronic dimensions to information management. It means that the emergence of ICT should enhance teaching and learning and not otherwise. This statement is further supported by the submissions of Ogunleye (1999) that this mosaic known as Information Technology should help improve teaching and learning as well as developing requisite skills necessary to function in the learning environment. OECD (1987) treats Information Technology as "a term – used to cover technologies used in the collection, processing and transmission of information. It includes micro-electronics and info-electronic based technologies incorporated in many products and production processes and increasingly affecting the service sector. It covers inter alias computers, electronic office equipment, telecommunication, industrial robot and computer controlled machine, electronic components and software products."(Peter & Hermann, 2000). The presence of computer and the use ICT in the classroom cannot function in isolation. The presence of those facilities without trained personnel who are highly committed to effect changes in teaching and learning process by developing much needed competence inherent in students are important.

ICT teachers should not concentrate on developing the cognitive domain alone so that students can achieve the required skills stated in computer curriculum. The teachers' efforts in this regard should be geared towards developing the affective and psychomotor domains. One of the ways to do justice to that is by exposing the students to quality of ICT instruction. In this regard, skill acquisition should be greatly emphasised. This is a function of monitoring and control in the use of the ICT facilities. To ensure quality control in our science based innovations in the schools, the wealth of experienced professionals who initiated workshops on various subject panels at STAN conferences had included development of retraining of science teachers only to be ICT compliant but should also learn to integrate instructions with ICT in the classroom (Ogunleye, 1999).

Several books had equally been developed on computer education to help develop

competence among the students (Owolabi, 2008). This development in ICT should not be seen as an effort in futility, rather it should further strengthen the capacity building and means for further skill acquisitions among stakeholders. The need to achieve the essence of ICT in classroom instruction depends on personnel and implementation of ICT policy. Presently, where there are inadequate personnel and implementation plan on any policy set by the government, the same might affect the achievement of ICT nowadays. To solve the problem of implementation of government policy, it is essential to retrain teachers in the classroom for effective instruction (Osokoya, 2008). The opinion of the researcher is not different on the need to retrain the existing teachers in the classroom instruction to achieve ICT in school system. To achieve this feat, SNNG started with secondary schools in the project schools in every State that satisfy the infrastructural conditions. The schools were given curriculum based CD on some school subjects together with the ICT facilities (SchoolNet, 2003). The major concern is the issue of access, utilisation and quality of SNNG facilities and learning outcome in ICT. The computer curriculum contains topics on skill acquisition; the use of SNNG facilities to affect the teaching and learning of those skills are in schools, this is duty teachers have to do. It means that effective utilisation, easy access and quality of ICT facilities in schools are expected to elicit skills in the students.

2.7 Studies on Learning outcomes and ICT

Several studies have examined the relationship between attainment of academic success and cognitive and non-cognitive variables respectively. For instance (Farombi, 1999; Okwilagwe, 2001; Akinbote & Iroegbu, 2001) found a significant positive relationship between cognitive variables and students academic achievement. The results from previous studies on relationship between non-cognitive factors seem to be in conflict (Okwilagwe, 2001), low relationship between cognitive and academic achievement (Okwilagwe, 2001; Akinbote & Iroegbu, 2001). Of all documents reviewed none centred studies on ICT but on other subjects, except where Ajagun (2003) mentions National Computer Education Curriculum as draft, meaning the development of the use was still in early stage.

Therefore, using the Australian cases, *Ainley and associates* analyses the ICT-based learning and teaching processes along three dimensions: a taxonomy of the type of ICT resource used; the complexity of the knowledge sought for the student outcomes and the

complexity of the cognitive processing required by the student activities. Their approach is particularly powerful for those concerned with designing or analysing assessments for student learning with ICT tools. It also provides analytical categories that help to clarify the demands or expectations associated with the higher levels of knowledge toward which many ICT-based instructional innovations are oriented.

Mioduser, Nachmias, Tubin, & Forkosh-Baruch (2002), in analysing ten Israeli cases, was challenged by how to characterise differences in innovativeness across their cases. They produced a conceptualisation and rubric called the 'innovations analysis schema', that can be used to operational levels of innovativeness based upon the degree to which ICT and associated pedagogies have transformed the school and the number of domains (time and space utilisation, student roles, teacher roles, curriculum content and assessment) impacted.

Examining the contributions of professional community to exemplary use of ICT, Dexter Seashore & Anderson (2002) in six case study cites that commitment to teachers' individual learning about technology as a support to instruction was very strong and was complemented by technology leadership, support staff and professional development programming dedicated towards this end. The paper describes some conclusions about how the presence of the need to learn and the supportive conditions to do so was reciprocal, or mutually supportive, of the development of professional community around technology use. The professional community deepened and refined the shared vision related to the purposes of instructional technology, and the technology support. The supposition is that effective use of technology and professional community are mutually supportive in that increases in one create conditions for increase in the other.

Implementation and sustainability factors are of great concern both at national and international levels. Two researches teams, those of Canada and the USA, went beyond descriptions of innovative practices and the outcomes of those practices to ask what school-level conditions influenced how effectively educational ICT was implemented. Among the conditions examined were formal staff development practices, on-going support for teachers' ICT use, school-wide decision-making practices and policies related to ICT, individual teachers' pedagogical beliefs and instructional practices, as well as professional community. Each of these contextual factors affects how ICT is used. Results were interpreted within the frameworks of ongoing research on educational technology and technology support, school change and reform, constructivist pedagogy, professional community (McLaughlin & Talbert, 2001), and organisational learning (Senge &

Associates, 2001).

Owston and colleagues (1997) describe several schools in Canada and focus upon prediction of successful integration. Data from four of 12 qualitative case studies of Canadian schools made it possible to address the question of what teachers perceive as the factors that contribute most to their successful implementation of ICT in the classroom. Teacher interview data were coded for factors, individual characteristics and ways of learning. Findings suggest that formal training has little direct impact on teaching practice, whereas informal training (on the job with colleagues) was more influential. Little relationship was found between successful use of ICT and teaching experience or experience using ICT. Among the contextual attributes that they found associated with sustainable implementation were commitment to a learning community and personal investments by teachers and staff in ICT-supported innovation.

In the final case study paper, *Dexter, Seashore and Anderson* analysed the first six of their 11 cases. They discovered that the metaphor of the learning organisation made a lot of sense in their schools because of their apparent educational vision, their emphasis upon a learning culture among the staff and teachers, and their emphasis upon student projects solved in learning communities. Most of their analysis focuses upon 'professional community', which is defined in terms of collective purpose and shared activity in their instructional mission, practice, and teachers engaged in reflective dialogue, all of which tends to be linked to their view of themselves as professionals working together in a community. They concluded that there is a 'powerful reciprocal interaction' between professional community and effective use of technology. The Second Instructional Technology in Education Study: Module 2 (SITES M2) is a series of qualitative studies that identify and describe innovative pedagogical practices in 28 participating countries that use technology (Kozma & Anderson, 2002). The project resulted in 174 case study reports of innovative practice that are currently being analysed.

Law, Lee & Chow (2002) on innovative characteristics that leads to new order in learning outcome. The key research question for this study was to ask whether or not innovative teaching practices would lead to the development of learning outcomes essential for preparing the younger generation for the challenges of life in the knowledge society of the 21st century, and if so, how are the pedagogical features related to the different learning outcomes. Preliminary analyses of the case study data collected from the SITES M2 Study in Hong Kong reveal that where the development of more significant learning gains were observed, the cases possess characteristics additional to

the criteria defined in the Study for selection of innovation. More importantly, it was found that the impact of the pedagogical practices was not determined simply by the aggregation of characteristics of the practices *per se*, nor on the technologies used, but on whether 'empowerment' permeates the curriculum goal and process. Further, this thesis claims that these affective and socio-cognitive learning outcomes are more important as preparation for lifelong learning in the 21st century than 'knowledge management competencies'.

Turun (2008) reviews the effects of ICT on school from teachers' and students' perspectives. The focus was on three main subject matters: on ICT use and competence, teacher and school community, and learning environment and teaching practices. The phenomena were investigated using a mixed methods approach. Data from three case studies and quantitative data from three statistical studies were combined. The results indicate that the technical resources for using ICT both at school and at homes are very good. In general, students are capable and motivated users of new technology; these skills and attitudes are mainly based on home resources and leisure time use. Students have the skills to use new kinds of applications and new forms of technology, and their ICT skills are wide, although not necessarily adequate; the working habits might be ineffective and even wrong. Some students have a special kind of ICT-related adaptive expertise which develops in a beneficial interaction between school guidance and challenges, and individual interest and activity.

Teachers' skills are more heterogeneous. The large majority of teachers have sufficient skills for everyday and routine working practices, but many of them still have difficulties in finding a meaningful pedagogical use for technology. The intensive case study indicated that for the majority of teachers the intensive ICT projects offer a possibility for learning new skills and competences intertwined in the work, often also supported by external experts and a collaborative teacher community; a possibility that "ordinary" teachers usually do not have. Further, teachers' good ICT competence helps them to adopt new pedagogical practices and integrate ICT in a meaningful way. The genders differ in their use of and skills in ICT: males show better skills especially in purely technical issues also in schools and classrooms, whereas female students and younger female teachers use ICT in their ordinary practices quite naturally.

With time, the technology has become less technical and its communication and creation affordance have become stronger, easier to use, more popular and motivating, all of which has increased female interest in the technology. There is a generation gap in ICT

use and competence between teachers and students. This is apparent especially in the ICT-related pedagogical practices in the majority of schools. The new digital affordances not only replace some previous practices; the new functionalities change many of our existing conceptions, values, attitudes and practices. The very different conceptions those generations have about technology leads, in the worst case, to a digital gap in education; the technology used in school is boring and ineffective compared to the ICT use outside school, and it does not provide the competence needed for using advanced technology in learning. The results indicate that in schools which have special ICT projects ("ICT pilot schools") for improving pedagogy, these have led to true changes in teaching practices. Many teachers adopted student-centred and collaborative, inquiry-oriented teaching practices as well as practices that supported students' authentic activities, independent work, knowledge building, and students' responsibility.

This is, indeed, strongly dependent on the ICT-related pedagogical competence of the teacher. However, the daily practices of some teachers still reflected a rather traditional teacher-centred approach. As a matter of fact, very few teachers ever represented solely, e.g. the knowledge building approach; teachers used various approaches or mixed them, based on the situation, teaching and learning goals, and on their pedagogical and technical competence. In general, changes towards pedagogical improvements even in well organised developmental projects are slow. As a result, there are two kinds of ICT stories: successful "ICT pilot schools" with pedagogical innovations related to ICT and with school community level agreement about the visions and aims, and "ordinary schools", which have no particular interest in or external support for using ICT for improvement, and in which ICT is used in a more routine way, and as a tool for individual teachers, not for the school community.

Since the SchoolNet project is an initiative that would later expand to all schools, it is suggested that any community where they are operating now should be in the forefront to help promote the sustainability of ICT use. Its application to teaching and learning should be seen to ameliorate the stress encountered in the teaching and learning of other school subjects. The ICT teachers and the school head should monitor the effective use of ICT in order to bring about learning outcome in ICT.

2.8 Access to ICT and students' learning outcome

Access and utilisation of information are at the hearts of development (Egbokhare,2002 and 2004). This is possible if the resources are of good quality. In the words of Kofi, Annan, "a technological revolution is transforming the society in a profound way. If harnessed and directed properly, ICTs have potential to improve all aspects of our social, economic and cultural life. ICT can serve as the engine of development in the 21st century (Adebayo, 2005). In proper perspective, the statement talks about harnessing and directing ICT to make instrument of development. Local content relates to the struggle for autonomy, adaptation of technology, competition of space and the struggle for comparative advantage in the global market for cultural goods.p.18

In the area of content creation, barriers to participation and diversity in the Information Society they acknowledge the existing imbalances in media content and the dominance of Colonial languages, which have hindered the cultural expression and socio-economic development of majority of African people. A major opportunity presented by ICTs is a diversification of existing ownership patterns in terms of barriers to market entry. Measures should be put in place to ensure access by new players / entrepreneurs to services and opportunities regardless of gender, geographic location, age, economic status, literacy, religion or disability. Any market restructuring must ensure that adjustment policies do not lead to further external dependency. Given that Africa is under-represented in the global knowledge economy, there is a need to develop and encourage local information resource centres and to build capacity to produce and collect accurate and relevant local content in official and national languages and lingua franca taking cognizance of oral and traditional forms of communications.

The African enabling environment requires a convergence of media legislation that takes into account the convergence of modern and traditional technologies. It is essential that ICT is pro-actively used to address the gaps between government and civil society, the information rich and poor, and that cross-platform compatibility facilitates information flow that bridges divides and creates equality. Tariffs must be affordable and facilitate access to all. This could require subsidies for those who are marginalised and vulnerable.

In the face of rapidly changing technological advancement, and the exorbitant cost of proprietary hardware and software solutions, which discriminate against CSOs that are

attempting to participate in ICTs for development, the need for open source solutions has emerged. There is a global trend toward open source solutions, which have become viable, cost effective and sustainable options for CSO participation in ICTs for development (Adeyemo, 2005).

Some research efforts have been reported on the application of ICT in schools. It has rightly been said that, what is wrong with Education cannot be fixed with technology' (Obanya, 2002). All the same, Obanya continues, that life today is dominated by information technology, and, since a major aspect of the new vision for secondary education is seeking close articulation with the emergent world, the reform of secondary education should take information technology in its stride. Thus, information technology, in its various manifestations (as a discipline, as a tool for teaching, learning and management, and a way of life) has to come forcefully into secondary education in Africa. On this, (Obanya, 2002) opines that three aspects have to go together for information technology to impact meaningfully on the lives of institutions, overall education system, teachers and learners. The problem is how to bring information technology into secondary education in situations in which the basic infrastructure (electricity, telecommunication facilities, the technical expertise for routine maintenance, etc.) are not readily available. Or how best can this be done in a society that is still on the wrong side of the international digital divide? What this means is that the issue of information technology for the enrichment of secondary education will have to be taken together with overall national information technology plans and policies. To actualise this propositions of Federal Policy on ICT, Obanya states that one sure way or area of great potentials for ICT would be in the non-formal 'option' for the provision of secondary education. It is an area that would require very serious attention. It is also a good candidate for regional cooperation, with a good appeal potential for international solidarity.

What New Information Technology entails? The new information technologies are the new mix of communication technologies used in the transfer of messages, knowledge and instruction (Amoo & Rahman, 2004). Some examples not different from the ones earlier mentioned including telefax, which have widened the possibilities and range of communication not only among societies but also even in the educational sectors (Dubbledam, 1994). With the universal recognition of need for New Technology in Education, it is pertinent for technology as a factor. In the last century, there was an explosion of scientific development. Advances in scientific discoveries, communication

technologies and educational practices invariably facilitate procedures in effecting the transfer of messages knowledge and instructions. Adedayo (1997) however, claims that in the 40 years, contemporary discoveries, inventions and developments in electronics have given birth to a new generation of electronics audio-visual aids. Of course these statements were not different from the findings similar reports of (Ibode, 2004, Bamikole, 2004 and earlier discoveries of (Abimbade, 1996, Ogunleye, 1999, Ajelabi, 1998). However, Nwaboku (1997) identifies the media available for instruction in the classroom. These range from the chalk board bulletin board laser disk transparencies, slides epidiascope, to instructional telephone network, computer systems, satellite systems and Internet which are the ideas of the projects mounted by SNNG inform of ICT facilities in some of our secondary schools in Nigeria.

2.9 Utilisation of ICT and students' learning outcome

The integration of ICT in education in Nigeria and possible implementation of SchoolNet programme pose serious challenges. A critical look at the challenges facing ICTs are training in ICT skills, the pedagogical value of ICTs, changing and learning practices, meeting the needs of diverse stakeholders and possibly, research (Collins & Jung, 2003, Holcoft, 2004). The principals' factors that prevent schools from using computer as tools for teaching and learning are insufficient funds; insufficient numbers of computers into different learning areas, and absence of properly developed curricula for teaching computer skills (Howell & Lundall, 2000; Salau, 2003). A painstaking evaluation of the ICT utilisation in Nigerian schools revealed that there is a slow pace of the development in computer and ICT based equipments. The prominent factors among these are low level of computer literacy among teachers (Akudolu, 2002; Salau, 2003,), dearth of technical support staff.

The issue of the availability, space and use of ICT, changing the use of existing classroom space is a challenge to SchoolNet programme. Traditionally, all existing structure of classrooms in Nigerian secondary schools follow the traditional arrangement of students facing the chalkboard, there is no provision for such new innovations. The classroom style of curriculum delivery with little, if any, thought being given to investigation-based, group learning let alone fibre-optic cabling. While some funding is available for renovation and rebuilding, the reality for most schools is that existing space must, be adapted to accommodate new learning technologies. The arrival of even one

computer in the classroom can have a profound effect on the way students learn and the way the classroom operates. Teachers integrating computer use into the curriculum must modify their classroom, to reflect the changes in the student learning behaviour that inevitably emerge. Creating space in the classroom for ICT infrastructure like computer and peripherals such (as printer network connection) to re-evaluating how classroom activities and learning experiences work best.

Early responses to ICT often involve creating a technology centre or dedicated building to house computer and peripherals, with students being taken to where the facilities are when working with computer is needed. In order to sustain ICT in school programme, computer laboratory was a condition as the infrastructure a school needed to provide before the installation and the use of SNNG facilities. This arrangement will attract more funds not only from government but also from the community, NGOs and philanthropists. Alongside laboratories, however, a variety of solutions have to be developed, enabling in-class access to computer facilities, appropriate technologies, content relevance, and sustainability, human resources capacity, school readiness and it was some of those arrangements that were of interest and were incorporated in this research. Based on this background, students' access, utilisation and quality of SNNG facilities SNNG facilities as predictors of learning outcomes

2.10 Quality of ICT and students' learning outcome

The issue of quality is multi-dimensional concept, which takes into account at least quality of the facilities (computer, and its accessories, Internet facilities, building, power supply, speed of the Internet and others) provided in the schools. However, developing quality in education and effectiveness in instructional process had been the major concern of the educationists (Oyedeji, 1998, Obanya, 2002 and 2005, Amori, 2005, Erinosho, 2007). It is a statement of facts that everyman is in favour of quality (Obanya, 2002). In other words, to demand for quality is to have life abundantly and to have it more abundantly is how some people expressed idea of quality of life. People in all works of life and all countries have life are to have a constantly improving quality of life. This could be achieved through quality of instruction. The question is how to get there. Since nobody is against the quality, it means that everyone is in favour of assuring quality in education or any new thing education may bring to the citizens. How do we know whether or not that we are achieving quality? Do we set target? If yes how? What is then

the quality? Is quality the same to everybody? How much quality is feasible within the constraints of time and money? How do we know the degree we are assuring quality? What kinds of system deliver quality? The summary and answer to these questions are the words of Obanya (2005) who reiterates that quality of any education has to do with the educational outputs that lead to quality of life. The implication of these will have to become an important area of concern to the educational sector and with special attention to basic education. Obanya (2002) opines that there is need for a shift of emphasis in Education discourse from how much and how many to how well. This is because the ultimate goal of Education is improvement, not simply increment. The effect of Education on an individual and the society, takes some to become manifest. Any neglect of the quality dimensions of education is therefore, likely to lead to an undue emphasis on long-term gains. So is the case of ICT in secondary schools. Its integration and functionality should tool the line quality and nothing but quality. What is then the meaning of quality? Webster's Dictionary defines it as the characteristic or attribute; degree of excellence; high standard. Quality is required in all facets of human endeavour be it education including the teaching and learning of ICT in schools. The issue of quality is a global concern attested to in the conclusions of most of the world and regional deliberations.

The Jomitien Declaration on Education for All (article 4) had stressed that "the focus of basic education must be on actual learning acquisition and outcome, rather than exclusively upon enrolment, continued participation in organised programme and completion of certification requirements" what is most characteristic of quality in education is that it is the words of the World Declaration. Thus quality in ICT pervades every action that goes into making process of ICT in schools possible, every element of the activities undertaken in the process of educating and wide array of beneficial results of educational activities on both individual learners and wider society. The essential elements of quality in Education which can be applied to ICT in schools is illustrated in Table 2.1

Table 2.1 **Input and process for ICT**

Inputs	Process	Process for ICT
Society	Participatory processes, full societal acceptance and ownership of programme	Full acceptance by the school, community and society at large
Policy	Democratic formulation and articulation of policy, adaptability of local conditions	Implementing policy by adapting to local conditions
Management framework	Decentralisation/devolution of power and initiatives to the grass root levels empowerment and autonomy for operators down the line	Finding ways to support the continuity of the programme, enhanced learning environment using School-based Management committee
Curriculum	Responsive to individual and societal needs and aspirations, comprehensive coverage, adapTable to changing needs, times and conditions	Implementing curriculum according to societal need, aspirations, comprehensive coverage, adapTable to changing needs, times and conditions feedback required.
Teaching force	Quantitatively adequate. Adequately educated and professionally prepared, well motivated	Adequate, professional and maintaining quality
Infrastructure	Quantitatively aesthetically, and spatially adequate, learner and teacher friendly, integrated pedagogical space; classrooms, workrooms, toilets and First aid facilities	Improving on beatification of infrastructure and facilities installed, using School-based Management committee
Materials	Quantitatively adequate, user friendly, a judicious mix of print/text, audio, video, electronic teaching/learning facilitators closely related to the curriculum	Users friendly and relating to the curriculum
Funding	Quantitatively adequate, targeted to the things that will really make a difference, made readily available at school and other levels of education.	Finding means to sustain along with budget by mounting pressure on government using School-based Management committee, old students, NGOs and donors.

(Adapted from Obanya, 2002)

It is only a combination of quality inputs and process that can produce quality outcomes. However, the quality inputs include (connectedness, workers and other resources); infrastructure (school-based systems & support; equipment); reach (number of users; access; ICT penetration & diffusion); use (amount of use; interactions; process & communications); outcomes (ICT students; enhanced learning environments); impacts (learning outcomes; and quality of graduates) are essential ingredients to functional ICT-based facilities in schools. This is equally a function of policy implementation and enabling environment.

Creating ICT-enriched learner-centred environments requires a holistic approach that calls for changes at three levels teacher, schooling environment and learning activities (Lee Kar Tin, 2006). Fundamentally, however, it is teachers who, with support from parents, administrators and policy makers, can optimise the benefits of ICT-enriched environments to make learner-centred learning a reality. This section/review therefore pays due attention to the salient issues confronted by teachers in the creation of ICT-enriched learner-centred environments, by using Hong Kong as an example to highlight the myths, gaps and challenges. Reviewed in the study are three myths that many educators in Hong Kong subscribe to, including ICT having limited values, ICT being a panacea to learning problems and technical knowledge of ICT being paramount. Highlighted are the gaps that can be observed in the field, of which include gaps in perception; the theory and practice of teaching every student; team building; and the desire to use ICT. The challenges discussed include teachers encouraging students to become active participants; teachers assisting students to understand their weaknesses and strengths; changing classroom dynamics; leadership in existence; and teachers having an individual sense of how they are able to successfully influence student learning.

The research on ICT and education has highlighted exemplary courses, as well as the challenges of developing online learning. Many pedagogical researchers espouse the importance of more community-oriented theories of teaching and learning (Harasim, 1989; Sorensen and Takle, 2002), while the methodologists focus on ways to structure online learning activities (Simpson, 1999 & Salmon 2000,). While these studies have helped to advance the development of technology and learning, most examine a single dimension in relation to online classroom learning, for example, pedagogy, teaching methods, or the technical use of communication tools. Fewer focus on the multi-dimensionality of online communities and the challenges for development and organisational change that accompany this growing life long learning environment.

Subsequent to the studies completion, the world of ICT continued to develop, influencing our daily organisational culture and work routines, as well as the delivery of professional development and lifelong learning programmes.

The study site included 60 educators from seven countries, and an initial teacher-leadership staff of 12 persons from three countries, and two universities (Snyder and Acker-Hocevar, 2004; Snyder and Wagenius 2002). The professional development programme provided training in global school and leadership development to principals' and school staff. The early stages of programme development focused on several dimensions including, programme content, learning community organisation, and instructional design. Following this, pedagogical theory and models for group structure and facilitation were added. The second and third years were spent developing the online communication and social community. Each phase of the development emerged in response to the needs of the participants, programme leaders, and project goals. The building blocks of these years of virtual living provided a platform to examine and explore the multi-dimensionality of online connections and communication; a powerful tool to open learning beyond the classroom. Decades of research according to (Jackson, Alexander von Eye, Biocca, Gretchen Barbatsis, Yong Zhao, and Fitzgerald, 2006) has focused on the issue of whether using computers facilitates learning, typically measured as school performance. After reviewing dozens of studies of school learning with computer-based technology, including five meta-analytic reviews, Roschelle and colleagues (2000) came to the less-than-satisfying conclusion that the findings are inconclusive (Roschelle, Pea, Hoadley, Gordon, & Means, 2000). For example, one meta-analytic review of over 500 studies (kindergarten through twelfth-grade students) found positive effects of computer tutoring applications on achievement test scores.

However, other uses of the computer, such as simulations and enrichment applications, had no effects (Kulik, 1994). Still other findings suggest that the benefits of computer-based instruction are clearer for mathematics and science than they are for other subjects. For example, a study by the Educational Testing Service found that using computers to engage higher-order thinking skills was related to better school performance in mathematics by fourth and eighth graders (Wenglinsky, 1998). Roschelle et al. (2000) offered three explanations for the equivocal findings with respect to computer-based instruction and school performance. First, variability in hardware and software among schools participating in the research may explain the equivocal findings. Second, the failure of schools to accompany technology use with concurrent reforms in the other areas,

such as curriculum and teacher professional development, may explain the failure to find beneficial effects of technology use on academic performance. Third, the lack of rigorous, structured longitudinal studies may explain the failure to find positive effects of computer-based instruction, as well as information technology use in general, on academic performance. Rochelle and colleagues suggest that positive effects are most likely to emerge when technology is used to support the four fundamentals of learning: active engagement, participation in groups, frequent interaction and feedback, and connections to real-world contexts. Subrahmanyam and colleagues reviewed the research on computer use and cognitive skills, focusing on a broad array of cognitive competencies but particularly on visual intelligence skills, such as spatial skills and iconic and image representation skills (Subrahmanyam, Kraut, Greenfield, & Gross, 2000; Subrahmanyam, Greenfield, Kraut, & Gross, 2001). These authors conclude that computer use does contribute to cognitive skills, specifically to visual skills. For example, playing certain types of computer games, namely action games that involve rapid move- Linda Jackson, Alexander von Eye, and Hiram Fitzgerald, Department of Psychology, Michigan State University; Frank Biocca, and Gretchen Barbatsis, Department of Telecommunications, Information Studies, and Media, Michigan State University; Yong Zhao, Department of Counseling, Educational Psychology, and Special Education, Michigan State University. This research was supported by National Science Foundation– Information Technology Research Grant NSF-ITR085348, "HomeNetToo: Motivational, Affective and Cognitive Antecedents and Consequences of Home Internet Use in Low-Income Families: Understanding the Digital Divide and the Internet Paradox," awarded to Linda Jackson. As a parent, one must be aware of many benefits of Internet to the student.

Access to the Internet can improve your child's reading skills by providing interesting materials to read, send e- mails to their friends, and learn about other cultures, access libraries and reference materials for school or homework. Other findings point to a relationship between technology use and academic performance, although causal relationships have been difficult to establish (Blanton, Moorman, Hayes, & Warner, 1997; Cole, 1996; Rocheleau, 1995). Several studies show that the presence of educational resources in the home, including computers, is a strong predictor of academic success in mathematics and science (National Centre for Educational Statistics, 2000). Having a home computer has been associated with higher test scores in reading, even after controlling for family income and other factors related to reading test scores (Atwell, 2000).

Still other findings indicate that participating in a networked community of learners improves educational outcomes for at-risk student (Cole, 1996; Project TELL, 1990–1997). Some researchers have even suggested that recent nationwide increases in nonverbal intelligence test scores may be attribuTable to "exposure to the proliferation of imagery in electronic technology" (Subrahmanyam, et al., 2000, p. 128). Overall, whether using computer-based technology contributes to student's academic performance remains uncertain (Shields & Behrman, 2000). Available evidence suggests that having a home computer is linked to somewhat better academic performance, although most studies fail to control for factors that co-vary with having a home computer e.g., parental income and education).

The effects of computer-based school and after-school activities are unclear, although favourable effects have been observed under some circumstances (e.g., when a supportive learning environment exists; Project TELL, 1990–1997). Even more uncertain is whether using the Internet at home has positive or negative effects on academic performance, such as school grades and standardised tests of achievement (National Science Foundation Report [NSF] Report, 2001). Also of interest in the HomeNetToo project was the frequency and nature of low-income student's home Internet use.1 Numerous surveys have attempted to measure the frequency of student's Internet use—the length of time student spend online. Estimates vary widely, depending on how Internet use is measured (e.g., self-report, automatically recorded), the ages of student sampled, when data were collected (i.e., year of the study), and how Internet use is defined (length of time online, frequency of use). At one extreme are estimates that student spend approximately one hour a day online (Turow & Nir, 2000). At the other extreme are estimates that student spend only 3 hours a week using the Internet (Kraut, Scherlis, Mukhopadhyay, Manning, & Kiesler, 1996; Stanger & Gridina, 1999; Woodward & Gridina, 2000).

These findings contrast with popular opinion that America's student are spending a great deal of time online (e.g., Kids Count Snapshot, 2002; Kraut et al., 1996; NSF Report, 2001; Pew Internet & American Life Project, 2000a, 2002; Stanger & Gridina, 1999; UCLA Internet Report, 2000, 2001, 2003; Woodward & Gridina, 2000). Other research examined the nature of student's Internet use-what they actually do when they go online. Once again, findings vary, depending on the same factors that influence estimates of the frequency of Internet use as previously discussed (e.g., ages of student sampled). Some studies find that student's primary use of the Internet is for schoolwork, specifically searching the Web for information needed for school projects (Kraut et al., 1996; NSF

Report, 2001; Pew Internet & American Life Project, 2002; Turow, 1999; Turow & Nir, 2000; Valkenburg & Soeters, 2001). The second most common use of the Internet is to communicate with peers using e-mail, instant messaging, and chat rooms (Kraut et al., 1996; Turow, 1999). However, the extent of student's Internet use for communication is unclear, in part, because few studies have recorded actual use (versus self-reported use) and, in part, because studies are so few.

Gross (2004), using the diary report of upper-middle-class adolescents, found that the extent to which the Internet was used for communication was dependent on the number of acquaintances, family, and friends online. Communication was the number one use of the Internet in Gross's study, a finding that has appeared consistently in more recent studies using upper-middle-class adolescents (Pew Internet & American Life Project, 2002). It is unclear if this finding was true in 2000 for poor adolescents and whether it was or is still true of younger student. Conceivably, younger student may use the Internet more for information gathering than they do for communication.

Literature also explored relationships among age, Internet use, and academic performance. Two questions were of particular interest. First, does age influence the nature of Internet use such that younger participants use the Internet more for information whereas older participants (that is adolescents) use it more for communication? Second, are the effects of Internet use on academic performance, if any, similar across the age range considered in this research (that is age 10 to 18 years)? Alternatively, does any evidence exist of a developmentally "sensitive" period during which Internet use has the greatest impact on academic performance? The essence of the review is to show that home and school have a lot to do in an attempt to understand the use of SNNG facilities in the project schools

2.11 Studies on SchoolNet activities in and outside Africa

SchoolNet Africa (SNA) places great emphasis on research aimed at informing and improving school networking practice in Africa. As a network of practitioners and change agents in the arena of ICTs and education in Africa, SchoolNet Africa's role is also to contribute towards continuous learning and knowledge production in this new, exciting and innovation – rich subject. The ICTs for education in Africa research programme comprises a range of research topics categorised in four major themes: Access to and use

of appropriate ICT solutions; appropriate policy frameworks; educational and pedagogical application of ICTs and management and sustainability of School Nets (SchoolNet Africa, 2003). In an attempt to actualise the set themes, the objectives of researching ICT for education in Africa programme are to: Gather evidence and learn from experience with integration of ICTs in African schools for the purposes of learning and teaching; Research methods and frameworks that effectively demonstrate the value – added learning and developmental effect of ICT use in formal school education in an African context; Promote the developmental dimension of ICT policy processes by generating knowledge on affordability, accessibility and sustainability of the use of ICTs in education – deprived communities; Broader knowledge and understanding of issues related to building an African information society and bridging the digital divide in education in Africa; Enrich our understanding of the generated dimensions of ICT integration in schools in Africa; Impact on policy and decision – making processes from a developmental and educational perspective.

Having highlighted the themes and related objectives of research reports on ICTs in Africa programme, there are research reports on ICTs for education that were undertaking various African countries, some of which are in line with guided indicators. Reports and findings show that SchoolNet had undertaken various projects to assist in the following areas of ICT – based distance education (COL international, 2000) and ICT for education; (SchoolNet, Africa, 2003), on these, policy environment which is favourable to the development of the telecommunications and Internet infrastructure, and how elements in education policy can help the use of ICT in education are discussed. Clearly the use of ICTs in education actually depends on at least the following factors and these according to (COL international, 2000) are: geographical size and situation; policy on telecommunications, the Internet; policy on market size; per capita income(s) perceived; perceived educational or developmental needs. The latter two factors are in fact, very much related but unfortunately the level of income often hinders the government's freedom to act on perception of need. Many developing countries are facing these fundamental problems with education delivery in which ICTs could assist, however they face a severe challenge garnishing the necessary skills and resources to address the opportunity. There may also be difficulty in putting into place a policy environment with which they are entirely comforTable. Meanwhile, high-income countries can afford to address a wide range of felt needs; not all their initiatives can be labelled as successes but such countries can afford experiment until they get it right. For example, (COL

international, 2000) reports that Canada sees a need to address the educational and skills acquisition requirements of its whole labour force in the information age, as well as the special needs of its rural communities, native communities and language minorities. With high national income, forward-looking policies, market liberalisation and heavy government investment; it can afford to address the needs and develop new opportunities for its citizens (Shade and Dechief, 2005). Most of the other countries see the strategic importance, in lesser or greater degrees, but have comparably less financial resources to act unless they are assisted in doing so (Mac-Ikemenjima, 2005).

The dilemma of developing countries including Nigeria is acute especially in STMICT (Adewale et al, 2004, Wagner, 2005). Further, many are justifiably worried that opening to new technology increases their dependency on outside resources. Nevertheless, those developing countries will have even fewer options and fall further behind unless they open their markets sufficiently to improve their Internet access, and adopt policies that encourage the entry of private sector investors, and service providers as well as the indigenous use and development of electronic resources. In a case study of ICT initiatives in Canada, the following sectors had been touched; Kindergarten to Grade 12 (K – 12) elementary and secondary school networks; tertiary education programme; professional training and skills; lifelong learning; health education; rural communities and language minorities and native. ICT usage ranges all the way from financially assisted telephone dial accessed Internet connectivity for schools and rural communities to satellite based programmes and advanced fibre–linked skills centres' equipped with video – conferencing for university courses and software job re-training packages. In a similar report, ICT usage in some African countries projects portrayed South African SchoolNet project covering community information services, African virtual university (regional), multipurpose community Telecentres; the technologies used are PCs, Internet and website, telephone, fax, email, scanners, photocopiers etc. In Ghana, SchoolNet international; uses PCs and Internet, broadcasting (radio and video) CD-ROMs, databases, satellite.

In Mozambique, World Banks for Development SchoolNet international project also adopts PCs and Internet, broadcasting (radio and video) CD – ROMs, databases, and satellite. The United Nations (UN) has adapted the Millennium Developmental Goals (MDGs) as the key development targets for the first part of the 21st century. All nations are 'on board'; among the most prominent of these goals are those that relate to achieving basic education, building on the Education For All (EFA) initiative begun in Jomtien (Thailand) in 1990, and reaffirmed at a second EFA meeting in Dakar in 2000 (UN, 2005).

The MDGs have gone further in proposing goals that integrate not only education, but also extreme poverty and hunger, as well as health, gender equity and many other worthy social and economic outcomes (Wagner, 2005). Within the final goal, there is a final item (Target 18) as follows "In cooperation with the private sector, make available the benefits of new technologies, especially information and communities" (UNESCO, 2005). This item is a reference to a growing and increasingly important area that has seen huge growth over time, namely ICTs for education. The attraction of ICTs for development in general and ICTs for education in particular, is clear from the growth of both public and private sector investments. And the growth of MDG – relevant ICT investments has been increasingly recognized as well (The World Bank, 2003). As noted by the former UN Secretary – General Kofi Annan, there is little doubt that ICTs may "unlock" many doors in education, and do much more than that as well. The irony, however, is that ICTs may also lead, literally, to 'locked' doors, as school directors try to ensure the security of equipment from time to time. While there is clearly much promise to the use of ICTs for education, and for the MDGS more generally, there is at the same time, a well-known ignorance of the consequences or impact of ICTs on education goals and targets (Wagner, 2005).

The issue is not usually, whether ICTs are 'good' and 'bad' or even whether doors are more 'open' than 'locked'. The real world is rarely so clearly divided. More often than not, in a situation where one thinks there may be an opportunity for development investment, but unsure of which of the large menu of options will have the greatest pay off for the desired results when related to the investments made. This simply put, is cost – benefit analysis. But what are the costs and what are the benefits? Creating a relevant and actionable knowledge base in the field of ICT for education is an essential first step in trying to help policy makers make effective decisions. Yet, in the areas of ICTs for education–unlike, say, improved literacy primers there are high entry costs (as ICT use in education may require significant investments in new infrastructure); significant recurrent cost (maintenance and training), and opportunities for knowledge distortions due to the high profile (and political) aspects of large ICT interventions. Koma (2005) maintains that research evidence shows that simply putting computer into schools is not enough to student learning; that specific applications of ICT can positively impact student knowledge, skills and attitudes; ICT use can benefit both girls and boys, as well as students with special needs, that ICT can contribute to changes in teaching practices, school innovation, and community services.

Research findings (Katahoire, Baguma & Etta, 2000) show that unlike the other school networking projects included in their evaluation study, Acacia has not directly supported SchoolNet Uganda, although it has been engaged in the exchange of experiences with Acacia. The Acacia Initiative is, however, supporting a pilot CurriculumNet project in Uganda being implemented by the National Curriculum Development Centre (NCDC). This project deploys a mechanism for delivery of the Uganda primary and secondary school curriculum via computer-based tools and communication networks. The pilot project is a research and experience-gaining exercise to test the economic, technical and operational feasibility of ICTs as teaching and learning support mechanisms in the core subject areas of the educational system.

The CurriculumNet initiative aims to determine the value added by ICTs to the educational process in Uganda. It is expected that ICT facilities will enhance intra- and inter-school learning, and that students from different schools will collaborate in the learning process by using ICTs to interact with each other. It was hoped that the CurriculumNet project would benefit from the existing experiences of SchoolNet Uganda in this area, and that these experiences would serve as a useful input not only for the CurriculumNet Project, but also for other school networking projects in Africa and elsewhere, hence the inclusion of SchoolNet Uganda in this pan-African evaluation studies is necessary.

SchoolNet Uganda is an outgrowth of what was originally the World Links for Development (WorLD) programme in Uganda – Uganda was the first pilot country. The effort began in 1996 with the School-to-School Initiative (STSI), a programme focused primarily on helping students develop basic computer skills and communicate via the Internet. Under the pilot, three senior secondary schools in Kampala with about 930 students in all, received the necessary hardware and software for training and establishing connections. These schools were Gayaza High School, Namilyango College and Mengo Senior Secondary School, all situated within a 10–15 km radius of Kampala. They were chosen in accordance with the following criteria:

- existence of telecommunications infrastructure;
- existence of a burglar-proofed room;
- opportunity for long-term self-sustainability;
- interest of the local community; and
- capacity to innovate.

In 1998, the programme expanded to include ten schools and trained 55 teachers and administrators. Attempts were made to engage in collaborative distance learning activities

with American schools, but none of these were fully realised. At the time of the evaluation study in December 2000, the WorLD programme was being implemented in 20 schools, all with varying levels of connectivity and equipment. Ten other schools were also being considered for inclusion.

SchoolNet Uganda is piloting very small aperture terminals (VSATs) in ten rural areas. It also organises training programmes and workshops for the professional development of teachers in the use of computers. The training is organised in phases, where at least two teachers and the head teacher from each of the participating schools are encouraged to participate. According to the National Coordinator, approximately 120 teachers and administrators had gone through the first two phases of this training at the time of this study.

2.12 Empirical Review

In 2003, the ICT Curriculum Integration Performance Measurement Instrument was developed from an extensive review of the contemporary international and Australian research pertaining to the definition and measurement of ICT curriculum integration in classrooms (Proctor, Watson, & Finger, 2003). The 45-item instrument that resulted was based on theories and methodologies identified by the literature review. The paper describes psychometric results from a large-scale evaluation of the instrument subsequently conducted, as recommended by Proctor, Watson and Finger (2003). The resultant 20-item, two-factor instrument, now called Learning with ICTs: Measuring ICT Use in the Curriculum is both statistically and theoretically robust. This paper should be read in association with the original paper published in Computers in the Schools (Proctor, Watson & Finger, 2003) that describes in details the theoretical framework underpinning the development of the instrument. The measurement of student learning outcomes as a result of the use of ICTs in the curriculum has become the focus of recent investigations with a view to improving teaching and learning. For example, a 2005 AARE Conference symposium provided insights into a range of current approaches for measuring ICT use in Australian schools (Fitzallen & Brown, 2006; Lloyd, 2006; Trinidad, Newhouse & Clarkson, 2006; Finger, Jamieson-Proctor, & Watson, 2006). These approaches stem from requirements for the measurement of student outcomes as a result of ICT integration, in line with recent priorities that emphasises outcomes (Andrich, 2002) and accountability

(Gordon, 2002). However, researching and measuring the impact of ICT integration in schools has been found to be problematic (Cuttance, 2001). In Queensland, an instrument for measuring student use of ICT in the curriculum was developed, trialled and evaluated (Jamieson-Proctor, Watson, Finger, Grimbeek, & Burnett, 2007). This instrument has shown to be useful in measuring ICT use by students in Queensland State schools (Jamieson-Proctor & Finger, 2006; Jamieson-Proctor, Burnett, Finger & Watson, 2006).

In computer use and students academic achievement, Gil-Flores (2007) finds out the relationship between computer use and academic performance, measuring the students' proficiency in Mathematics and linguistic communication skills, the results show a much higher use of computer at home than at school. Using multiple regression analysis, a significant relationship between computer use at home and academic achievement was found, even taking into consideration the effect of socio-economic and cultural background. On the other hand no significant relationship is known between the use of the computer at school and academic achievement. Other researchers Maliki & Uche (2007) investigate students' background variables and utilisation of library resources among secondary schools in Cross River State, Nigeria. The study determines the relationship between the dependent and independent variables. The students' background variables significantly related thereby predicting their utilisation of the ICT resources. Expectedly, it is important to note that home as well as the school is bound to influence effective utilisation of the library resources consequently reflecting on their performances as well as achievement. This is because the type of home and school a student lives and attends tend to influence his/her awareness of the potentiality in the use of ICT. However, the use of computer and their external values in the present time made the researcher to infer that if the ICT aspect of computer curriculum is well articulated and taught, access to and quality of such facilities as well as its utilisation could predict learning outcomes.

Bajulaiye (2001) investigates provision and utilisation of materials relative to students' achievement. The results show there was significant difference between the performance of students in schools that had resource materials and utilised than the students that resource materials but did not utilise them. The students with learning materials but did not utilise them did not perform better than the students in the schools that did not have the resource materials to utilise. The implication of this to the researcher is that making the SchoolNet facilities available without utilising them may affect the learning outcomes in ICT. This may serve as challenge to computer education in schools.

Waxman, Lin and Michko (2003) estimate the effect of teaching and learning with

technology on students' cognitive, affective and behavioural outcome of learning. 282 effect sizes were calculated using statistical data from 42 studies that combines 7000 students. Their results show that 0.410 ($p<0.00$) with 95 percent confidence interval of 0.175 to 0.644. that teaching and learning with technology has small positive, significant ($p<0.001$) effect on students' outcome when compared to traditional instruction. The mean weighted effect size for 29 studies containing cognitive outcomes was 0.448; and the mean study weighted effect size for the 10 comparison that focused on students' affective outcome was 0.464. On the other hand, the mean study weighted effect size for the 3 studies that contained behavioural outcome was -0.091, indicating that technology have a small negative effect on students' behavioural outcomes. The general study of Waxman, et al (2003) weighted effect were due to constant across the categories of study characteristics, quality of study indicators, technology characteristics and instructional teaching characteristics.

Wighting (2006) used a mixed-method design to determine whether and how use of computers in the classroom affects sense of learning in a community among high school students (N = 181). The results indicate that using computers in the classroom positively affects students' sense of learning in a community. Analyses revealed that students' believed that connectedness with their peers is the most important variable in developing a sense of community. Results suggest the following policy implications for urban education: (a) use of computers in teaching may add to the sense of classroom community and (b) sense of community is important and may be linked to academic success. This study also suggests that irrespective of location, the SchoolNet facilities can have similar influence on students learning outcome.

In the study of Adisa (2004) who correlates some indicators of school quality with learning outcomes of JSS students in Lagos State and established relationships existing between school quality and learning outcomes. The study was not different from the earlier finding of (Farombi, 1998, Famade, 2000, Oloyede, 2004 & Newa, 2007) However, for the purpose of this study, the focus is on the schools context. As Passey (1999) argues, "understanding school contexts is important, not only because they enable those undertaking evaluations to understand differences and to make reasonable comparisons, but also because they offer schools opportunities to do the same"(p.325)

According to Passey (1999), the success and failure of schools implementing ICT projects could depend on a range of significant elements and factors such as:

- the approaches and stance of the principals' or senior management;

- the role and responsibilities of the ICT coordinator;
- the involvement and practices of the library resources management;
- the presence and contribution of an ICT policy;
- the extent of integration of curriculum and administration;
- support gained through staff development;
- consideration of teaching styles;
- concerns about ICT skills of pupils/students;
- provision of ICT technical support;
- allocation of funding;
- deployment of physical resources;
- focus for school community link;
- development of a sharing ethos;
- forms of monitoring and record-keeping; and
- uses made of evaluation and assessment.

Many of the contextual factors raised in this study are in agreement with those that Passey has identified as important for determining the success and failure of schools implementing SNNG's ICT projects.

Bovée, Voogt and Meelissen (2007) investigate computer attitudes of 240 students from eight primary and secondary schools in South Africa. The student population of six of the eight schools that participated in the study can be characterised as middle or upper class. Two schools were from South African townships. All eight schools used computers for educational purposes, although the availability and use of the computers differed. The research question of the study was whether differences in computer attitude could be found between boys and girls, and to what extent these differences could be explained by student, school, and environment characteristics. In contrast to most studies on gender differences and computer attitudes, no gender differences in computer attitudes were found. However, this study showed differences in computer attitudes between students from the upper/middle class schools and students from the township schools. The latter showed a less positive attitude towards computers, but more interest in computer-related careers compared with the students in the upper/middle class school

2.13 Appraisal of Literature Review

In this study the researcher has reviewed theories of learning and Information and Communications Technology; the results of these theorists were juxtaposed to make differences and the way to ameliorate the gap in the literature. The issues of National Policy on Education as it relates to ICT education were critically examined. The phases of historical account of STMICT were espoused. These were linked to having ICT policy and

the operation and its sustainability in Nigerian set up. Also, studies on ICT status and its integration in secondary schools were reviewed. The historical account of its starting point affords the researcher to link science and technology objectives with the broad national goals. Students' achievement in computer and other ICT were emphasised. Considerations were recorded on the success of learning outcomes in other relevant subject areas. There were records put at believing that success achieved in the earlier studies but not ICT might equally transform to achieve success if SNNG's ICT in education is effectively handled. The students' attitudes, the use of computer and other ICT were reviewed with the intention to observe the difference in attitudes on one side and to see the need for ameliorating the differences and the areas of congruence.

Attitudes towards school subject were reviewed to see the areas of congruence or otherwise. Students' competence or skill acquisitions in handling instructions in ICT room, reaping the benefits of ICT in computer curriculum and the use of ICT were mentioned. The advantages or otherwise of ICT if it is rightly or wrongly used or taught were recorded. Included in this thesis are studies on learning outcomes. The presentation and some strategies to make the teaching and learning of ICT were examined, access to ICT and learning outcome, utilisation of ICT and learning outcome. The essence of access to ICT and its utilisation were recorded to explain the quality of SNNG facilities. Other issues are the quality of ICT and students' learning outcome that were explained; studies on SchoolNet activities in and outside Africa from historical and recent perspective, and some empirical reviews that centred on earlier works of researchers that are of relevance to this study were presented.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter outlines the steps in carrying out the research work. These include type of research and design, the variables, the population, sample and sampling procedure, instrumentation, data collection procedure and method of data analysis.

3.2 Research Design

This is a survey research which adopts non-experimental design. The appropriateness of this study type lies in the fact that the SNNG facilities have been mounted earlier. It is considered appropriate because it facilitates the collection of factual information that best describes the existing phenomena according to Kerlinger and Lee, (2000). Also, this design would permit the description of the relationship between the independent (predictor) and the dependent (criterion) variables thereby answering the research questions and development of generalisations.

3.3 Variables in the study

Independent Variables

i. Access,
ii. Utilisation; and
iii. Quality.

Dependent Variables

i. Students' Achievement in the ICT,
ii. Students' Attitudes to the use of ICT facilities; and
iii. Students' Practical Skills in ICT

3.4 Population

The target population for this study includes all secondary schools covered by SNNG projects facilities in southwest, Nigeria. The JSS three students from 20 schools

with SNNG facilities were included in the study. The total number of JSS 3 students as at the time of study was 7032. The class was chosen because they had studied all aspect of ICT in computer education and were preparing for the final state or/and federal examinations.

3.5 Sampling Technique and Sample

Multistage sampling was employed to select the samples for this study.

Sampling at geopolitical zones: Purposive sampling was used to select one zone out of six geopolitical zones. This is because the researcher is familiar with the zone.

Sampling at State level: Purposive Sampling procedures as stated earlier was employed to cover four states in South West Nigeria (see Table 3.5.1). The researcher based the selection of schools on the availability of SNNG facilities. The secondary schools with SNNG facilities in the selected states excluded two Federal Government schools having the facilities in Lagos State. This is because they did not have Junior Secondary Students as at the time of the study.

Sampling at school level: A random sampling technique was used to select 1100 students from 7032 students. This constitutes 55 students per school. The reason for the choice of 55 was based on the fact that equal number of facilities was integrated in the schools. In all, irrespective of gender, location and characteristic background all the potential respondents have equal chance of been selected. See Table 3.5.1

Table 3. 5. 1: Summary of the distribution of the subjects in the SNNG Project across the states

Zones	State	SNNG Project participant at State level	Total SNNG Project participants per state
SW	Ekiti	Principals' 8, Students 440	448
	Lagos	Principals' 3, Students 165	168
	Ogun	Principals' 4, Students 220	224
	Ondo	Principals' 5, Students 275 Others 4	280
	Total		1122

Oyo and Osun States were not included because as at the time of the study the project had not started.

3.6 Instrumentation

The eight instruments used to collect data for this study were developed by the researcher after consulting literature on SchoolNet Africa and other parts of the world.

The following instruments were designed to collect data for the thesis and these are:

3.6.1.1. School Checklist (SC);

3.6.1.2. Principals' Questionnaire (PQ) on the measurement of access, utilisation and quality;

3.6.2.1. Students' Access to ICT Rating Scale (SAICTRS);

3.6.2.2. Students' Utilisation of ICT Rating Scale (SUICTRS);

3.6.2.3. Students' Assessment of Quality of ICT Rating Scale (SAQICTRS);

3.6.2.4. Students' Achievement in the ICT Test (SAICTT);

3.6.2.5. Students' Attitudes towards the use of ICT (SAUICT); and

3.6.2.6. Students' Practical Skill Test (SPSICT)

3.6.1.1. School Checklist (SC)

This instrument was designed for the school principals'. It was designed to collect data on the infrastructure before the SNNG Project facilities were integrated in such schools. It is divided into five sections.

Section A consists of background demographics of the school including the year of establishment and the year of installation of the SNNG facilities. Other items are School address; year of establishment, local government where the school is situated; type of school, whether federal or state; name of State where the school is established; the school location whether rural, semi-urban, urban and others. It also includes respondents' status in terms of headship of the school; their gender, whether male or female; the respondents' highest qualification; total number of staff; teaching and non- teaching, number of students in the school (male, female) constitute part of background characteristic. It sought to find out whether the school had e-mail and website.

Section B was designed to measure the status of infrastructure in terms of space, laboratory, its dimension and how the ICT laboratory is managed, how principals' allowed students to use the laboratory for teaching and learning.

Section C was designed to record the infrastructure and the facilities available. This entails the list of infrastructure and the facilities expected in the schools as specified by SNNG

management. The section was designed to give specific numbers available for utilisation.

Section D was designed to measure quality in terms of replacement, repair, service; and **Section E** was designed to further capture the quality and functionality of the ICT facilities.

The essence of the checklist was to confirm the status of available facilities since the inception of the project in the school as well as determine the students' opportunity of access, utilisation and quality of those facilities.

3.6.1.2. Principals' Questionnaire (PQ)

The measurement of access: This aspect of instrument was designed to ascertain how the principals' allowed students access to SNNG facilities. In the questionnaire too, the aspect of principals' having interaction with phone was included. How often the principals' allow students access to the SNNG facilities were asked and was measured in terms of: None = 1, Once = 2, Twice = 3, Thrice =4, Everyday = 5

The measurement of utilisation: This section explains the principals' time used to enter website to send e-mail, made use of computer and Internet to do school work or the hours they grant students to do homework. How often the principals' utilise the SNNG facilities were measured in terms of: None = 1, Once = 2, Twice = 3, Thrice =4, Everyday = 5. Quantifying the hours the principals' spend to use ICT facilities, this was measured in terms of: None = 1, One = 2, Two = 3, Three =4, More than three hours = 5

The measurement of quality: The measure of quality is patterned just like that of students. The principals' were directed to rate the computer and Internet facilities in terms of time in minutes it takes computer to boot and Internet to connect a website. This was measured using the options: 1-5 = Minute as fast; 6-10 = minutes as fair; 11-15 = minutes as slow; 16-20 = minutes as not functioning properly. The principals' equally answer the open ended questions

3.6.2 Students Questionnaire

Six instruments were developed to capture the independent and dependent variables. Three instruments were developed for independent variables in this study.

3.6.2.1. Students' Access to ICT Rating Scale (SAICTRS)

This section was designed to elicit information on how students had access to the computer and Internet. These contain two items which were rated using the options: Not Easy=1, Poor=2, Fairly Easy=3, Easy=4 and Very Easy=5. The experts in the field of ICT education ascertain the construct validity of the instrument. The reliability was established using Cronbach alpha and the result produced (N=50, α = 0.62) to measure the internal consistency.

3.6.2.2. Students' Utilisation of ICT Rating Scale (SUICTRS)

This instrument was divided into two: (i) the students were asked to indicate time spent on the ICT facilities with their teachers when learning with computer ICT; and (ii) they were told to indicate time spent on ICT facilities (Computer and Internet) without their teachers for homework.

The options that students filled; none = 1, once = 2, twice = 3, thrice = 4, everyday = 5. The reliability of the section was established using Cronbach Alpha and this produced (N =50, α = 0.65).

3.6.2.3 Students' Assessment of Quality of ICT Rating Scale (SAQICTRS)

This was designed to determine out students opinion on the usage of the SNNG facilities in terms of quality. This was measured such that options 1-5 = minutes as fast; 6-10 = minutes as fair; 11-15 = minutes as slow; 16-20 = minutes as not functioning well. The validity of this section was done using Cronbach Alpha and this produced (N=50, α =0.60).

Others that were developed for three dependent variables took care of the three domains of Taxonomy's educational classifications.

3.6.2.4. Students' Achievement in the ICT Test; (SAICTT)

The instruments consist of achievement in the ICT test: The achievement test was developed to determine the extent of the students' mastery of certain aspects of ICT and the essence to education in the classroom. It consists of 25 objective questions with options A, B, C and D, the correct answer attracted two marks each. The Table of specification is presented as shown below.

Table 3.6.2.4.1 Table of specification showing the distribution of the items

Items	Knowledge	Comprehension	Thinking	Total	%
Computer and accessories	2, 20, 21, 22	18, 23,	3, 24	8	32
Internet and applications	1, 4, 5, 19	7, 9, 11, 12, 14, 15, 25	6, 8,10,13, 16, 17	17	68
Total	8	9	8	25	
%	32	36	32		100

The total mark obtainable is 50. The achievement test underwent appropriate validation processes. The experts on the field of computer and computer education, the researcher's colleagues and supervisor attested to the appropriateness of the final items included in the test. Using 50 students in schools similar to but not SNNG schools, the difficulty levels ranging from 0.14 to 0.69 were determined. The reliability of the test was determined using K-R 20 and was 0.72, the researcher considered this good enough to be used for larger audience.

3.6.2.5. Students' Attitudes towards the use of ICT (SAUICT)

The second section is to test the affective domain of the students. It consists of three sections. **Section A** dwells on bio-data, items on attitudes and items listing the topology of quality and quantity of the SNNG ICT facilities. It assessed students' attitudes towards the use of SNNG facilities, quality and rate of use.

Section B of the instrument was adapted from Bandalus and Benson, (1990) who used the instrument as computer attitude scale. It consisted of 23 items, 13 out of all items were modified and two were added to suit the present study. The instrument consists of 25- item questionnaire. The respondents were asked to fill the instrument as appropriate. The response format is; very true, true, almost true and not true. The experts on the field of education

including the researcher's supervisor attested to the content validity of the instrument. The instrument thereafter was produced for the purpose of testing its reliability before the final use and reliability of the instrument after administering it to 50 students in a school with similar facilities to but not SNNG's produced (N= 50, α =0.77), using Cronbach Alpha.

3.6.2.6. Students Practical Skills in ICT Test (SPSICT)

The third part testing psychomotor domain consists of students' competence test. This instrument consists of 12-item questionnaire. The text blueprint of the construction of the items is shown in the following Table.

Table 3.6.2.6.1 Specification Blueprint Showing the Distribution of the Items

Topics	Knowledge	Comprehension	Thinking	Total	%
Computer	2	5	2	9	75
Internet	1		2	3	25
Total	3	5	4	12	
%	25	42	33		100

The respondents demonstrated skills in some aspects of accessing data from the Internet and at the same time mastering the use of some ICT related activities on computer. Each item attracts appropriate marks (as indicated in the instrument) and the total marks obtainable being 40. In addition, the students were observed and rated with appropriate marks during the time they worked or performed task on the skills acquired, especially while working with ICT facilities. In order to use the instruments described for this study, the psychometric properties of instrument was obtained using Scott phi inter-rater reliability coefficient of 0.70.

3.8 Data Collection Procedure

Preliminary visits were made to the SNNG office at Abuja and also to the websites. These helped to obtain preliminary information about the activities and projects of SNNG in the area of ICT integration and use in secondary schools that form part of the proposal written for the final thesis. Pilot visits had been made to schools to confirm the existence of the facilities. The reason was to obtain necessary baseline data on what SNNG projects in schools

are for. The researcher carried out data collection with the help of four research assistants in each school who are the ICT teachers in the SNNG project schools. They were trained, after which the researcher and his assistants administered all the instruments to the students. The research assistants worked directly with the researcher who collected the data based on the instruments guiding the study. The researcher personally used the checklist to confirm the existence of the SNNG facilities in selected schools. The participants were given enough time to answer the questionnaire and the test designed for the purpose. The collection of data lasted seven weeks.

3.9 Scoring of the Instruments

In all the instruments, with their respective response formats, the items were coded based on the descriptions, options and levels of each section described above. All items worded negatively were coded accordingly (attitudinal). All responses collected were collated for the purpose of analysis as explained in the next section.

Scoring of the school principals' instrument

The backgrounds of schools were used as nominal data using frequency counts on the physical facilities on ground. The infrastructure in terms of equipment like fans, AC, generator was counted and these were put together as part of the report. Section A that measures the students' access to the facilities according to the principals' were coded as none - 1, once - 2, twice - 3, thrice - 4, everyday - 5. How often the principals' make use of facilities were coded as none = 1, once = 2, twice = 3, thrice = 4, everyday = 5.

Section B consisted of the number of hours the principals' allow the students to use the ICT facilities: none = 1, once = 2, twice = 3, thrice = 4, everyday = 5. Section C of the principals' questionnaire was graded using frequency counts. The entire column representing time of usage was coded as: Yearly = 1, Term = 2, Monthly = 3, Weekly = 4, Once a week = 5, Daily = 6.

All open ended questions raised under this section were answered by the principals'. All other sections of the instruments were based on physical counting and they were recorded accordingly.

Scoring of the students' instrument

Students' Access to ICT Rating Scale: This section was designed to elicit information on how students had access to the computer and Internet. It contains two items which were rated using the options: Not Easy=1, Poor=2, Fairly Easy=3, Easy=4 and Very Easy=5.

Students' Utilisation of ICT Rating Scale: This section was divided into two: (i) the students were asked to indicate time spent on the ICT facilities with their teachers when learning with computer ICT; and (ii) they were told to indicate time spent with ICT facilities (Computer and Internet) without their teachers for homework. These were scored using the options: 1-5 minutes as fast = 4; 6-10 minutes as fair = 3; 11-15 minutes as slow = 2; 16-20 = minutes as not functioning well= 1.

Students Assessment of Quality of ICT Rating Scale: This section describes the quality as rated by the students. The students were asked to indicate the quality of the SNNG facilities

Student Achievement Test in ICT (SAICTT) carries 50 marks in all. All the scripts were marked and two marks was awarded for every item.

Students' Attitudes towards ICT use carries 100 marks (SAICTT). There was no wrong or right answer. Very true – 4, True – 3, Almost true – 2, Not true – 1 were used as options and were scored as such. All negatively worded items were reversed.

Students' Practical Skills Test: There were 12 main activities students were asked to display. The marks were distributed and the scoring of the items was as follows:

Table 3.9.1.Measure of Practical Skills among the Students in the Computer Laboratory

SN	Skills observed to measure skills	S
1	Power on UPS and computer	4
2	Open a Microsoft page 2, type your name 1, school 1, class 1, and the number you are given today	6
3	Save your document on the desktop with your name	2
4	Open the saved document on the desktop	2
5	Type your family member names at least three, 1 marks for any two	2
6	Click file then save your document as Web page on the desktop	2
7	Click insert folder, then insert date and time e.g.15/03/2009 10:00:25	2
8	Click insert folder again, then insert a pyramid or sphere	2
9	Type your name and class on the object	2
10	Use keyboard to print your document	2
11	Open an e-mail address, write on how you would like to be in future communicate with your teacher during long vacations in your document you earlier opened	9
12	Attach your document and mail to amooadesina@yahoo.co.uk	5
	Total	40

3.10 Data Analysis Procedures

The data collected were analysed using the underlisted procedures and arranged into different Tables as appropriate. This facilitated answering the respective research questions. Descriptive statistics and Multiple Regression analysis techniques were employed in the analysis of the data.

Table 3.10.1 Dummy for Answering Research Questions

SN	Research Questions	Instruments	Respondents	Method of analysis
1	To what extent do the project schools have access to SNNG facilities?	Principals'/ students	Principals'/students	Descriptive statistics
2	What is the level of Utilisation of the SNNG facilities?	Principals'/ students	Principals'/ students	Descriptive statistics
3	What is the quality of the SNNG facilities supplied to the schools in term of the following indicators? (i) Students, (ii) Principals' and (iii) School checklist	Principals'/ students	Principals'/students	Descriptive statistics
4	What are the students' performances in ICT achievement test?	Achievement test	Students	Descriptive statistics – weighted means
5	What are attitudes of students to the use of SNNG facilities?	Attitudinal scale	Students	Descriptive statistics – weighted means
6	What is the level of practical skills acquired by students using SNNG facilities?	Competency test	Students	Descriptive statistics – weighted means
7	What are the composite and relative contributions of access to, utilisation and quality of SNNG facilities to students' achievement in the use of ICT facilities?	Students' Achievement test in ICT	Students	Descriptive statistics and Multiple Regressions
8	What are the composite and relative contributions of access to, utilisation and quality of SNNG facilities to students' attitudes to ICT?	Students' attitudinal scale in ICT	Students	Descriptive statistics and Multiple Regressions
9	What are the composite and relative contributions of access to, utilisation and quality of SNNG facilities to students' competence in the use of ICT facilities?	Students' competency test in ICT	Students	Descriptive statistics and Multiple Regressions

3.11 Methodological Challenges in Conducting this Research and How they were Manipulated.

The theoretical basis of studies on SchoolNet status in secondary school presents methodological challenges. This methodological challenge according to Odinko (2004) affects the design of any study in Nigeria being a multi-cultural and multi-lingual nation. Such studies if applied appropriately seek to promote the quality interactions of not only pre-school classroom but in the use of ICT in promoting teaching and learning in the secondary schools. The following were likely methodological challenges in this study. Multiple programme of SchoolNet in schools, access to data collection, training of research assistants, restriction to access data on the programme, problems of representative samples, implementation of instruments. The problem of getting representative sample in this study was resolved by adopting a purposeful and multi-stage sampling in southwest, Nigeria. SW zone have been purposively selected. Inability to cover all the zones due to finance is a challenge to this study. SNNG digiNet was the focus, websites and online interaction as well as the use of trained ICT teachers served as research assistants to resolve all methodological challenges. The instruments also went through appropriate psychometric properties. Checklist was equally used (to measure quality) to observe the SNNG facilities. This was only done to confirm the state of infrastructure and SNNG facilities.

Of all known related studies in Nigeria, the issue of SchoolNet project in secondary schools has not been addressed especially in the chronological presentation as in this study. For example, studies on learning outcome in ICT is still new and has not been addressed in Nigeria as in this study, studies on access to, utilisation and quality of ICT has not been investigated as in this study and research on the competence of students to the ICT in Nigeria is minimal. The infrastructure, the installation of SNNG facilities including the connectivity of the schools, how do schools share teaching and learning materials online, and what information they share? What benefits in terms of online registration and its effectiveness is another issue missing in the earlier studies. Connectivity contributes to our economic and social well being as individuals in regions and for the country as a whole. In this study, access to the ICT facilities, the utilisation of the facilities and quality as they predict students learning outcomes in ICT has not been addressed. The integration of course into the

present curriculum will pose problem because a number of teachers in different subjects will still need in-service training. Changing the way students study or do homework or use library to source materials. Even where all the schools are connected the issue of sustainability, financial and human resources remains an area of concern which can only be addressed by applying and emphasising capacity building for improved project management. A study like this will serve as springboard for proper harnessing of SchoolNet's ICT facilities advantage in our schools. In conclusion, manipulating and overcoming the methodological challenges in the study will go a long way to justify the study.

CHAPTER FOUR
RESULTS AND DISCUSSION

4.1 Introduction

This chapter presents the results of the statistical analyses of the data obtained from the investigation. The discussions are made in the order of the research questions posed in chapter one

4.2 **Research Question One**: To what extent do the project schools have access to SNNG facilities? In order to answer research question one the researcher measures the school' accessibility to the ICT from the point of view of the school having enabling infrastructure and website, schools having e-mail address, principals' having e-mail address, telephone as well as students having e-mail address, ease of access to computer, Internet, server, UPS, VSAT, speakers and stabilisers, the number periods available for learning computer, schools with website. However, other ICT facilities in the research instruments are not included in the table because they are not frequently used as the listed facilities. The extent of access in this case gives no restriction as to when students enter the computer laboratory to do their works other than class activity with their teachers. The summary is given as appear on the Table 4.2.1

Table 4.2.1 Frequency of Accessibility to the SNNG Facilities

Students	**Frequency**	**%**	**Frequency**	**%**
	poor		**No**	
Number of students with e-mail	984	89.5	116	10.5
Students' Accessibility rate	**Not easy**	**Fairly easy**	**Easy**	**Very easy**
Students access to computer	275 (25%)	660 (60%)	110 (10%)	55 (5%)
Students access to Internet	45 (15%)	605 (55%)	165 (15%)	165 (15%)
Students access to server	385 (35%)	605 (55%)	110 (10%)	
Students access to UPS	55 (5%)	330 (30%)	660 (60%)	55(5%)
Students access to VSAT	440 (40%)	605 (55%)	55 (5%)	
Students access to speakers	55 (5%)	275(75%)	660 (60%)	110 (10%)
Students access to stabilisers	440 (40%)	605 (55%)	55(5%)	
School	**N**	**N**	**N**	**N**
Number of schools with website	2	10 %	18	90%
Principals'				
Number of principals' with handset	20	100	0	0
Number of principals' with e-mail	20	100	0	0
Principals' measure of access to ICT	**Once**	**Twice**	**Thrice**	**Everyday**
Computer, accessories and Internet	0 (0%)	11 (55 %)	9 (45 %)	0 (0%)
Principals' measure of access to ICT	Term	Monthly	Weekly	Daily
Computer, accessories and Internet	0 (0%)	0 (0%)	20 (100%)	0 (0%)

The findings show that 89.5 % of the students have e-mail address while 10.5 %, that is 110 students had not got the e-mail address. Only 10 % of the schools had website but all the schools had e-mail addresses. If we consider the retrieval of saved document and location as accessibility rate, the researcher found that 275 (25 %) did not find it easy to access the computer while 660 (60%) of the participants indicated fairly easy access; 110 (10 %) found easy access to computer and 55 (5 %) found access to computer very easy. It means therefore that 75 % of the students had access to computer. Considering students' accessibility to Internet, the result indicated that 45 (15%) did not find easy access to the Internet, while 605 (55%); 165 (15 %) and 165 (15 %) indicated fairly easy, easy and very easy respectively. This suggests that 85 % of the students had access to Internet and other ICT facilities.

Despite the attestation of students' accessibility to computer, stabilisers, speakers,/ Internet; only 2(10 %) of the schools had website while 18 (90%) did not have website as at the time of the study. All the principals' had e-mail addresses and

handsets which connote 100% representation. The issue of principals' having e-mail addresses and handsets are relevant because from the inception of the installation of ICT facilities, the status of the schools had to change in terms of monitoring the infrastructure as well as the access and usability of not only the students but for other educational purposes of training teachers and government officials, even some students in the neighbouring communities might have access to these facilities. The results further explained principals' ratings of students' access to SNNG facilities were 11 (55 %) and 9 (45 %). It means that all the principals' granted the students access to SNNG facilities. Generally, from this result, it can be said that the stakeholders in education will find the outcome of access to the facilities beneficial. The study corroborates the earlier findings of Lelliot et al, (2000) who report that students that had access to learning facilities performed better than these did not have access to learning facilities. Therefore, students and principals had access to SNNG facilities.

Research Question Two: What is the level of utilisation of the SNNG facilities? In order to answer question two, the researcher measures the instrument by considering students' ratings of the utilisation of the SNNG facilities (computer, Internet, server, etc) with their teachers and the use of the facilities to do homework. The researcher also reports the principals' rating of utilisation of the facilities. All these are presented in Table 4.2.2

Table 4.2.2 Frequency of the Utilisation of the SNNG facilities

Students' Ratings	**None**	**Once**	**Twice**	**Thrice**
Computer		385(35%	605(55%)	110(10%)
Internet	55(5%)	330 (3%0)	660(60%)	55(5%)
Server		440(40%)	605(55%)	55(5%)
UPS	55(5%)	275(25%)	660(60%)	110 (10%)
VSAT		385(35%)	605(55%)	110 (10%)
Speakers	55(5%)	330 (3%0)	660(60%)	55(5%)
Stabilisers		440(40%)	605(55%)	55(5%)
Principals' ratings	**None**	**Once**	**Twice**	**Thrice**
Computer, accessories and Internet	0 (0%)	0 (0%)	0 (0%)	20 (100%)
	None	**One**	**Two**	**Three**
Computer, accessories and Internet	0 (0%)	11 (55%)	9 (45%)	0 (0%)

Table 4.2.2 presents the results of utilisation of the SNNG facilities. 385 (35%)

of the students spent one time in a week to do computer with their teachers; 605 (55%) and 110 (10%) of the students indicated that they spent twice and thrice the time they work with their teachers in a week to do computer respectively. Other indicated ICT facilities in the research instruments are not included in the table because they are not frequently used as the listed facilities. This suggests that 100% of the students utilise the ICT facilities with their teachers in a week. Considering the students' utilisation of Internet with their teachers; 55 (5%) of the students did not spend time with their teachers. While 330 (30%) of the students spent one time, 660 (60%) of the students spent twice; and 110 (10%) of the students spent thrice the time with the ICT teachers to work on the Internet facilities respectively. This means that 95 % of these students utilise the Internet facilities with their teachers in a week. Considering the hours the students spent to do home work on computer, 440 (40%); 605 (55%) and 55 (5%) spent one, two and three hours respectively on their own to do homework.

This means that 100% of the students spent one or two or three hours to utilise the facilities to do homework. 55 (5%) indicated no hour spent on Internet to do homework, whereas, 275 (25%) of the students indicated one hour for the use of Internet, 660 (60%) of them indicated two hours and 110 (10%) of the students indicated three hours in a week to do homework. In order to corroborate or otherwise the results just presented, there is the need to consider the principals' rating of the utilisation of the facilities. The 20 principals' (100%) indicate the utilisation of the SNNG facilities. However, their rating of time used to grant students' usability of the SNNG facilities indicated 11 (55%) for one hour and 9 (45%) for two hours respectively. The difference in their ratings depended on their understanding of the concepts of utilisation. At the same time, a close perusal of the students and principals' results tend towards the same continuum (between two perceptions we observed 95% and 100%) respectively.

The Table reveals the rate at which students are allowed to make use of the SNNG's ICT facilities in their schools. Computer education is accorded the same status as other vocational subjects such as Business Studies, Home Economics, Fine Art and Agricultural Science. However, one period of 33 ⅓% is granted for practical class per week. At the interactive sessions, the principals' confirmed the use of SNNG facilities once for practical per week but teaching and learning of computer studies go on in the computer laboratory. They only complained of power failure, a prevailing problem in Nigeria and as remedy to this challenge, every school was mandated to get

generators (that is, the one that must be able to carry 21 or more computers with other infrastructure). The principals' and their ICT teachers confirmed that diesel had been bought to supplement the poor power supply. Out of all the 20 schools, only one had stopped the practical classes for the past few months before the fieldwork. The reasons adduced for this were malfunctioning of their generator and some of the computers supplied initially were becoming obsolete which as at the time of research were still receiving attention. The principals' gave precise time they allow students to have access to the facilities under close supervision of their ICT teachers.

As a prerequisite for installation of ICT facilities, the selected schools were given specifications of what the nature of infrastructure. These include well-ventilated room that would contain at least four teacher seats, not less than 4 fans, four to six A/C windows, generator to specification that would carry computers not less than 21 workstations. Apart from these conditions, teachers must equally have attended the required training organised by SNNG. In all the schools, the ICT teachers had their seats and teaching materials (see Appendix viii) in the computer laboratory. In a nutshell, this study concludes that students had access to the SNNG's ICT facilities, hence that were utilised for the teaching and learning processes. The result of this study could be generalised in the sense that any investment to bring positive learning when fully tapped is always beneficial. This study confirms the similar studies which had recorded success (at corporate level) in Lesotho, Mozambique, Angola, Namibia, South Africa, Senegal and Zimbabwe according to International Development and Research Centre's (IDRC, 1997) reports.

Research Question Three: What is the quality of the SNNG's facilities supplied to the schools? In order to answer the research question three, there is a need to note that the quality is measured in terms of computer speed to boot and how long it takes Internet to connect. In this case, students' and the principals' ratings were considered in Tables 4.2.3 and 4.2.4. We measured the speed using the approximate minutes for a typical computer to boot and a website to open when using search engines. In this study, we consider 1-5 minutes as being fast for a computer to boot, 6-10 minutes as a fair speed, 11-15 minutes as being slow and 16-20 minutes as not functioning well. Also, we measured the other quality in terms of number of replacement; repair and service performed within the last six months (see Table 4.2.5).

Table 4.2.3 Quality of ICT as Measured by the Students

Computer speed in minutes			Internet speed in minutes		
Measure of quality	**Frequency**	**%**	**Measure of quality**	**Frequency**	**%**
Fast (1-5)	**495**	**45**	**Fast (1-5)**	**165**	**15**
Fair (6-10)	**330**	**30**	**Fair (6-10)**	**660**	**60**
Slow (11-15)	**275**	**25**	**Slow (11-15)**	**275**	**25**
Total	**1100**	**100**	**Total**	**1100**	**100**

Table 4.2.4 Quality of ICT as Measured by the School Principals'

Computer speed in minutes			Internet speed in minutes		
Measure of quality	**Frequency**	**%**	**Measure of quality**	**Frequency**	**%**
Fast	**19**	**95**	**Fast**	**6**	**30**
Fair	**1**	**5**	**Fair**	**14**	**70**
Total	**20**	**100**	**Total**	**20**	**100**

From the Tables 75 % of the students attested to the fact that their computers were fast, while 75 % also said that their Internet connectivity was fast. These assertions were corroborated by the school principals' who equally indicated computer being fast (95%) and fair (5%) and Internet (30%) being fast and fair (70%). The difference in students' and principals' ratings might be due to their level of exposure in the usage and what they understood by being fast. With these ratings the researcher concludes that the facilities were of quality capable of sustaining teaching and learning processes these facilities were meant for. Similar project like SNNG in Zambia generally recorded the problems and obstacles of the Internet as 1) the network ability was slow and often had technical difficulties 2) computers for Internet services were inadequate and with low capability, and 3) software were not up to date and with limitation, and 4) allowed time and service time were short. But the case of SNNG facilities in South West was different. For example, computer of 40 GG capacities and server of 80GG were all in use. The Internet seems to be of high speed (this is limited to their judgement). If judgement was made by what the instruments were designed for, averagely in the Nigerian context the computer speed and that of Internet service provided were of fair quality as at the time of this study.

Other aspects used to measure the quality of the ICT facilities, as explained earlier across the states were presented on Table 4.2.5. This was done by considering total number of the facilities installed based on the specified infrastructure. The

researcher ascertained the number at inception, asked for any addition from the state government, the ones no more in use, asked for the services in terms of repair within the last six months before the study. All the ICT facilities supplied for use in the schools were added as collected from the schools. The number of replacement made, repairs performed, and specified number of services rendered on the facilities were converted in percentages. This result is presented as shown on Table 4.2.5.

Table 4.2.5: Quality of SNNG Facilities as Measured by the School Checklist

	Computer system	Server	Printer	UPS	VSAT	Internet Connectivity	Curriculum content software	Scanners	White marker board	Smooth board	Projectors	Speakers	Fire extinguisher	Stabiliser
Total Available	420	20	27	217	20	20	20	20	20	20	6	840	40	96
Total no. in use	417	20	27	217	20	20	20	20	20	20	6	840	40	96
Replacement	75	0	0	0	0	0	0	0	0	0	0	0	0	0
Repair	3	0	0	0	0	0	0	0	0	0	0	0	0	0
Service	2	0	0	0	0	0	0	0	0	0	0	0	0	0
s% replacement	8%	0	0	0	0	0	0	0	0	0	0	0	0	0
% repair	0.7 %	0	0	0	0	0	0	0	0	0	0	0	0	0
% service	0.5 %	0	0	0	0	0	0	0	0	0	0	0	0	0

The result from Table 4.2.5 reveals a partial replacement of the ICT instruments (computer, keyboard and cables). In all the schools visited in the state 15 computers have been replaced, with all accessories as listed. The reasons for this action, according to the principals' were only to sustain of computer studies and training. In the remaining states, no serious replacement was made. However, the minor repairs on cleaning few accessories like keyboard, and mouse were done by the school principals'. The power generators used as power source could carry all the computers when the students are in classroom session. Generally, as reported and observed, 90 % of the 20 SNNG project schools could be said to have functional computer laboratories. In all the facilities, as revealed in Table 4.2.5 as yardstick, 99.2% was in use while 0.8 % was not in use. If we judge with the number of services in six months, 3 (three) repairs and 2 (two) services were performed in all, are rated as minute as to compare with repairing and servicing every month. With these, the researcher concludes that the facilities on ground are of high quality and such is

capable and durable to elicit learning outcomes in the students. Replacement had been made in one state which constitutes 20 %, it means 80 % had not been replaced but 8% if number of computer is used, and 5% if generator. Computer repair represents 0.7% of the total (420 computers).

We consider the functionality of the computer as well as the Internet facilities. All the schools as at the time of the study except one, retain these facilities which they claimed to be functional. These facilities with modifications in the areas of Internet connectivity had the problem of subscriptions, on this the principals' told us that with the assistance of their state government had made way for the continuous use. All the school principals' voted money for the maintenance of the alternative power supply except the school that was unable to give clear explanations as to when to put generator and general computer services in place.

In terms of speed, some of the computers that had problems were repaired by the technical officers designed for the purpose. Routine checks according to the principals', had been intermittent in as much as they encounter minor problems on the computer usage. As for the connectivity, all the schools were connected and students make use of them once a week. The report equally indicated that since the installation of the SNNG facilities, the life and status of the students increased in terms of motivation for learning. Almost all the students showed enthusiasm for continuous use of the facilities. To further buttress the results for the question, the status of the ICT facilities, sample component of computer and pictures are attached as appendices.

The status of facilities in terms of maintenance and utilisation across the states, in terms of the present study confirms the quality if the users had access to the facilities. Maintenance was measured in terms of usage. Here the researcher uses the rate of use to buttress the rate of replacement, repair and services performed on the facilities. Maintenance means continuous repair work that is done to keep the computers and other ICT facilities in good conditions or working order. The principals' were able to report that minor repairs, replacement of the simple tools like keyboards and mouse were done by the schools. The major repairs on the Internet connectivity and complete computer sets had been the sole responsibility of the Ministry of Education in the States. As part of the upkeep, the technical officers were trained along with the teachers to oversee the services and minor repairs. All the school principals' attested to the fact that SNNG officers attached to the schools come at least once within six months. This was also confirmed from the head office at

Abuja. The normal services were done as reported by the school technical officers trained for the purpose. Only Ondo State as observed made major replacement by supplying 15 computers to the SNNG project schools with all its pertinent accessories, made the technical officers (on contract) to maintain the laboratories along with the ICT teachers. In Ekiti State, the situation was a little bit different.

The state was on the verge of adding to the existing one and improving the service delivery of the additional ones in the SNNG schools when the study was carried out. In Ogun State, no replacement had been carried out, minor services done for not more than two times within last six months before the field work. In the state, some computers were added to the schools but in separate rooms. This was done by the state government who equally had a project called Ogun State connects where teachers were selected and trained for the purpose of expansion. In Lagos State there was no replacement made, rather, there were similar project of school networking in some so called upgraded schools with all having Internet facilities. To fuel and carryout other maintenance the money generated from the training of teachers as coordinated by the State Ministry of education accordingly were reportedly spent to do the service delivery.

With these results, the researcher's opinions are that the facilities are of good quality, the facilities were utilised as expected and could help students achieve optimally, and students had right attitudes towards its study, thereby increase and elicit the potentiality of competence in the ICT. To conclude and answer the question three, it was observed that the supplied facilities are of good quality that could sustain time as to produce learning outcomes in the students. The results here are in consonance with the similar but executive reports of status of ICT in Ghana secondary schools (Abbey-Mensah, 2001). The report equally corroborates Khanya report 2001 in South Africa as reported by Van (2002), the only difference being the population, time and the difference in location.

Research Question Four: What are the students' performances in ICT achievement test? In order to answer research question four, the performance of students in ICT achievement test was administered on the students. This is measured to find the mean, standard deviation, minimum and maximum scores, as well as skewness and kurtosis of the performances. Table 4.2.6 presents the results

Table 4.2.6 Results of students in ICT Achievement test

State/ Achievement	N	Mean	Std Dev	Minimum	Maximum	Skewness	Kurtosis	%
Ekiti	440	26.93	6.113	10	44	0.072	0.191	53.86
Lagos	165	29.31	6.179	14	44	0.008	-0.151	58.62
Ogun	220	31.65	5.149	16	44	-0.182	0.253	63.30
Ondo	275	29.32	5.975	14	44	-0.131	-0.187	58.64
Total	1100	28.83	6.159	10	44	-0.095	-0.070	57.66

Table 4.2.6 gives the summary of the scores (Means, Standard deviations, skewness kurtosis and percentage) of the subjects on the ICT achievement test with three States: Ondo (58.64%), Ogun (63.30%) and Lagos (58.62%) scoring above the average while only Ekiti State scored below the average. With this cluster of performance, the researcher concludes that the students in these states had experience in ICT facility usage before Ekiti state. However, at the other Measurement Criterion using eta square, all the States put together contribute 8.2% to the knowledge in the ICT achievement test. This performance was irrespective of the location of the schools. In order to see the distributions of the performances in ICT achievement test, the researcher uses kurtosis and skewness to determine degree of peakedness of the distribution of the scores and the degree of departure from symmetry of the distributions respectively. From graph 4.1, the smoothed frequency polygon has longer tail to the right of central maximum score than to the left, the distribution is positively skewed. Its kurtosis in the shape shown is called leptokurtic. Using relative standing on the scores, the researcher showed that 51.4% scored above average, while 48.6 % scored below the average. The Table below presents the distributions.

Figure 4.2.1 showing the kurtosis and skewness of the achievement in ICT

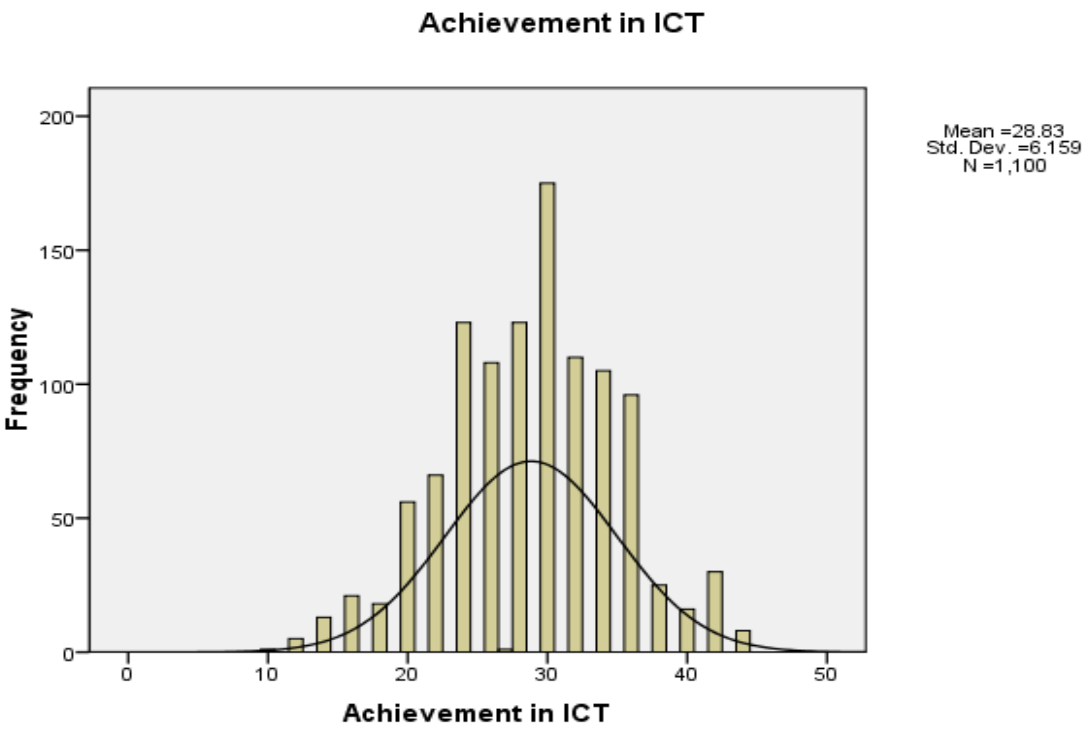

Figure 4.2.1

Figure 4.2.1 further throws more light on the score analysis. For the work to be easy for all to use, the mean scores in form of % helps us to see the average total scores upon which the state scores are explained. This result correlates with the finding (though negative) of (Ravitz, Mergender & Rush, 2002) who recorded that the use of computer in education contributes significantly to higher students' performances.

Research Question Five: What are the attitudes of students to the use of SNNG facilities? In order to answer research question five, the attitudes were measured using the prepared scale. The questionnaire was administered on the students. The mean, standard deviation, minimum and maximum scores as well as skewness and kurtosis were obtained. Table 4.2.7 presents the results

Table 4.2.7 Results of students Attitudes to ICT

State/ Attitudes	N	Mean	Std Dev	Mini mum	Maxi mum	Skewness	Kurtosis	%
Ekiti	440	63.82	8.980	20	89	-1.149	3.577	63.82
Lagos	165	64.20	6.859	52	87	0.319	-0.258	64.20
Ogun	220	64.51	8.467	35	86	-0.516	1.164	64.51
Ondo	275	65.52	9.908	18	92	-0.894	3.684	65.52
Total	1100	64.48	8.855	18	92	-0.830	3.179	64.48

Table 4.2.7 gives the summary of the scores (Means, Standard deviations, skewness, kurtosis and percentage) of the subjects on the attitudes to ICT with two States: Ondo (65.52 %) and Ogun (64.41%) scoring above the average while only Ekiti (63.82%) and Lagos (64.20%) States scored below the average of the overall observations. They all cluster round the average, however, the general attitudes reflected and tended towards the positive use of computer and ICT facilities. However, at the other Measurement Criterion, all the State put together contributes 0.5% to the attitudes of students to ICT. In order to see the distributions of the attitudes towards ICT use, the researcher uses kurtosis and skewness to determine degree of peakedness of the distribution of the scores and the degree of departure from symmetry of the distribution respectively. From the graph 4.2.2, the smoothed curve in which frequency polygon is super imposed has longer tail to the left of central maximum than to the right, the distribution is negatively skewed. Using relative standing (cumulative frequency), the researcher showed that 49.5% scored above average, while 50.5 % scored below the average.

Figure 4.2.2 showing the kurtosis and skewness of the attitudes towards ICT use.

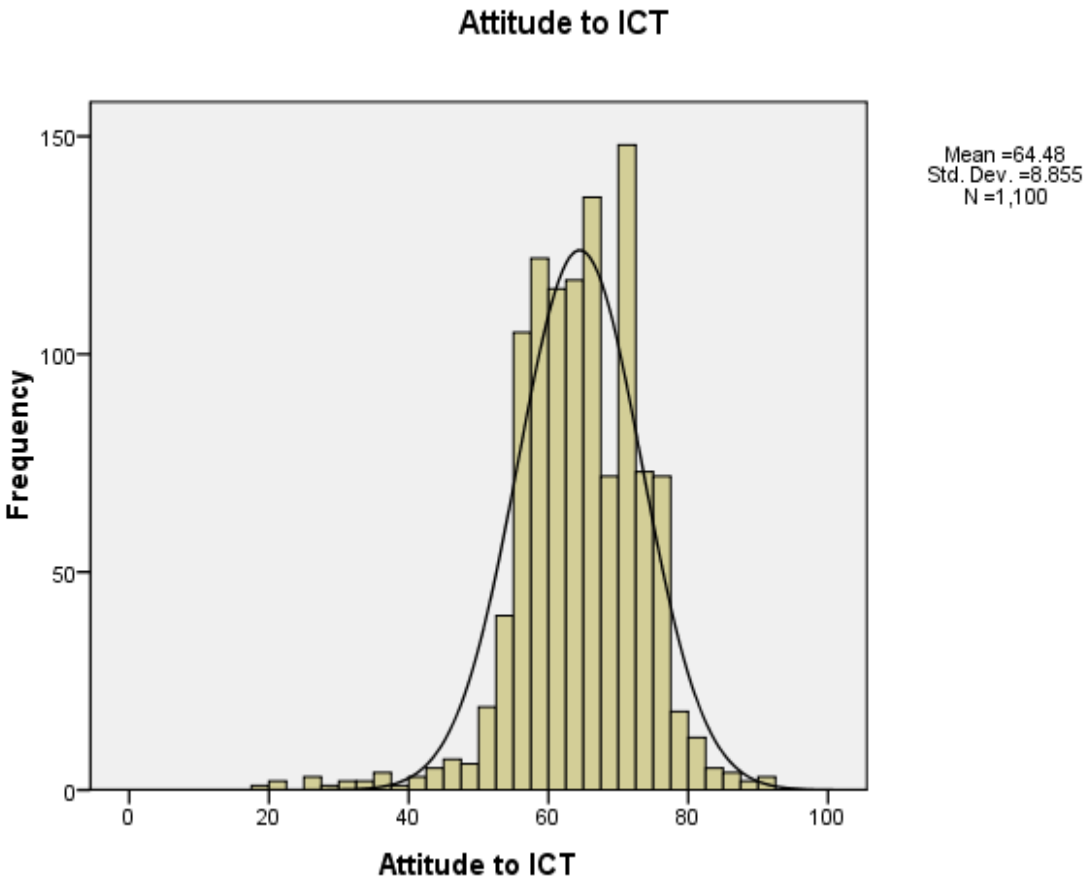

Figure 4.2.2

Figure 4.2.2 further throws more light on the score analysis. For the work to be easy for all to use and interpret, the mean scores which are in form of % help us to see the average total scores upon which the state scores are explained. The results of students' attitudes are in line with the reports of (Rafi, 1998, Hsu & Huang, 1999, Hennessy, 2000, Colley & Comber, 2003, Jacobson & Hunter, 2003) who recorded that the use of computer in education has influence on students dispositions to computer usage.

Research Question Six: What is the level of practical skills acquired by students using SNNG facilities? In order to answer question six, the researcher considers the scores from skills the students had when dealing with ICT concepts. Tables 4.2.8 show the mean, SD, minimum and maximum scores, the skewness kurtosis and percentages for the answer.

Table 4.2.8 Results of Students' Practical Skills in ICT

State/ Competence	N	Mean	Std Dev	Minimum	Maximum	Skewness	Kurtosis	%
Ekiti	440	24.15	2.775	10	33	-0.077	1.995	60.37
Lagos	165	24.93	3.077	18	36	0.686	0.750	62.33
Ogun	220	25.16	2.634	20	32	0.685	0.091	62.90
Ondo	275	24.20	2.515	18	32	0.354	0.933	60.50
Total	1100	24.48	2.763	10	36	0.310	1.372	61.20

Table 4.2.8 gives the summary of the scores (Means, Standard deviations, Skewness and Kurtosis) of the subjects on the ICT Skill acquisition test with only one State and that is Lagos (62.33%) and Ogun (62.90%) scoring above the average while Ekiti (60.37 %), and Ondo States (60.50 %) scored below the average. The possible reason for Lagos and Ogun outshining other states might be due to the nature of urban characteristics in which most of students are exposed to and instructional practices their teachers did. In all, 55% of the schools clustered around the average score with 1 % of it a bit lower. 45% of the schools performed below average in the skill acquisition. The reasons for this result might be connected with other inherent factors off teaching and other classroom interactions like motivation and accommodation of students use towards the subject. In order to see the distributions of the performances in ICT competence test, the researcher uses skewness and kurtosis to determine degree of peakedness of the distribution of the scores and the degree of departure from symmetry of the distribution respectively. From graph 4.3, the smoothed frequency polygon has longer tail to the left of central maximum than to the right, the distribution is negatively skewed. Using relative standing, the researcher showed that 31.1% scored above average, while 68.9% scored below the average. The reasons for this result might be connected with how often these students were exposed to the skills, the time they set aside to practice the skills, the location of the schools and exposure to similar ICT facilities at home or other public places could be contributory to their performances. Graph 4.2.3 further elucidates the distributions of the skill test as

learning outcome

Figure 4.2.3 showing the kurtosis and skewness of the competence in ICT use

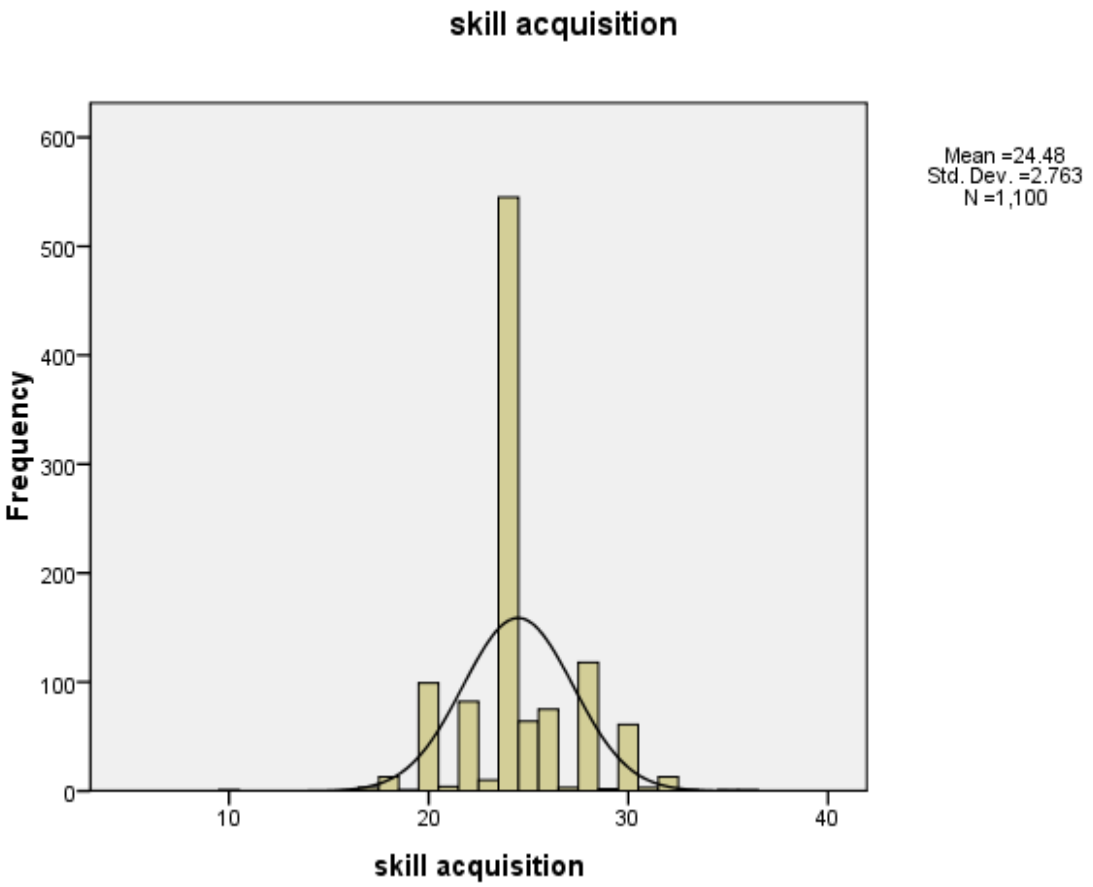

Figure 4.2.3

Figure 4.2.3 further throws more light on the score analysis. For the work to be easy for all to use and easy to interpret, the mean scores in form of % help us to see the average total scores upon which the state scores are explained. The researcher only makes inference from this study to conclude the learning outcome, because he is unaware of the kind of study presented in this chronological order. However, the results of students in skill acquisition test is in line with the reports of (Rafi, 1998, Colley & Comber, 2003) who recorded that the use of computer in education has influence on students performance in computer usage.

Research Question Seven: What are the composite and relative contributions of access, utilisation and quality of SNNG facilities to students' achievement in the use of ICT facilities? To answer the research question seven, the researcher analyses using MR by filling the dependent and independent variables as appropriate, Tables 4.9 and 4.10 present the results of the findings

Table 4.2.9

Summary of Composite contributions (Multiple Regressions) of Access, Utilisation and Quality of SNNG facilities to Achievement in ICT

Variable	MR (Predictor)	R square	Adjusted R square	F value	Sig.	Decision
Achievement	0.305	0.093	0.086	13.9810	0.000	S

Table 4.2.9 shows the composite use of the Access to, Utilisation and Quality of SNNG facilities to predicting Achievement in ICT yielded a coefficient of multiple correlation R of 0.305 and a multiple R square (R^2) of 0.093 and the $F_{(8,\ 1091)}$ = 13.981, P<0.05. R square for this regression equation is 0.093, which means that about 9.3% of the variation in ICT scores of students is explained by regression model.

This suggests that 90.7% of the variation in ICT means scores can be explained by factors other than the independent predictor-variables in regression model. The adjusted R square for this regression equation is 0.086, which means that about 8.6% of the variation in ICT scores of students is explained by regression model. This suggests that 91.4% of the variation in ICT means scores can be explained by factors other than the independent predictor-variables in regression model. In order to get the direction of prediction as reflected in the study, Table 4.9 shows the contributions of each independent variable to Achievement in ICT.

The regression coefficients (ranged from -0.585 to 0.396); Standard Errors (ranged from 0.270 to 1.282) and t- values (ranged from -6.417 to 7.101). The Table show t-values associated with access to computer, utilisation of computer and quality of Internet are statistically significant at P< 0.05 level. The summary of the beta values of the regression of achievement in ICT on all the variables considered for the study. The beta values enable the researcher to generate the required regression equation showing the linear relationship between the dependent and independent variables. That is the relative contributions of the variables enable the researcher to generate equation of the form:

$Y_i = A + B_1X_1 + B_2X_2 + \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots + B_nX_n + e$, equation 4.1, where Y_1 represents the estimated values of Y, A is the Y_i intercept and Bi are regression coefficient. Thus the desired equation for the study is Y_1.estimated achievement in ICT. A is the constant value: X_1 represents the contribution of the access to computer; X_2 represents the contribution of access to Internet; X_3 represents the contribution of (numbers of times students do computer a week with teacher) ; X_4 represents the contribution of (number of time students search for information on Internet facilities in a week with teacher); X_5 represents the contribution of (number of hours students spend on computer for typing to do home work in a week); X_6 represents the contribution of (number of hours students spend on Internet to do homework); X_7 represents the contribution of quality of computer, X_8 represents the contribution of quality of Internet and e represents the likely error in the contributions of all variables to Achievement in ICT. In order to report relative contributions of variables, Table 4.2.10 presents it.

Table 4.2.10: Test of significance of the Regression Coefficient of achievement in ICT

Achievement Variable	**Un-standardised coefficients**		**Standardised Coefficients**		**Sig.**	**Rank**
	B	**Standard Error**	**Beta**	**T**		
Constant	24.387	1.282		19.022	0.000	
Access to computer	3.294	0.464	0.396	7.101	0.000	2nd
Access to Internet	0.137	0.270	0.020	0.507	0.613	8th
Time students spent to do computer in a week with teacher	-5.782	0.901	-0.585	-6.417	0.000	1st
Number of time students search for information on Internet facilities in a week with teacher	0.683	0.988	0.072	0.691	0.490	6th
Hours spent on computer to do homework	3.382	0.910	0.314	3.715	0.000	3rd
Hours students spent on Internet to do homework	-1.038	0.439	-0.118	-0.2.364	0.018	5th
Quality (Computer)	-0.477	0.414	-0.063	-1.154	0.249	7th
Quality (Internet)	1.306	0.471	0.132	2.769	0.006	4th

From the findings from the above Table led to the regression equation for the achievement in ICT using SNNG facilities is $Y = 24.387 - 5.782X_1 + 3.294X_2 + 3.382X_3 + 1.306X_4 - 1.038X_5 + 0.683X_6 - 0.447X_7 + 0.137X_8 + e$. However, the

regression further means that SchoolNet intervention school students would have an average score of 24.387 in ICT if all predictor-variables are zero. The predictor-variables that could improve achievement in ICT significantly are (i) access to computer; (ii) access to Internet; (iii) number of time students search for information on Internet facilities in a week with teacher; (iv) number hours spent on computer to do homework and (v) the quality of Internet. Another strategy that may improve the achievement in ICT is to discontinue with bad quality of computer; unnecessary hour students spend on Internet to do homework and numbers of times students do computer in a week with teacher.

From the above, students' access, utilisation and quality of ICT facilities contributes to achievement in ICT test. The summary of the regression analysis of what constitute access, utilisation and quality to students' achievement in ICT are given above. In short, access to, utilisation and quality of SNNG facilities predicts achievement in ICT. The results here corroborate the quality as predicting learning outcome (Adisa, 2004), utilisation supports the views of (Maliki & Uche, 2007 and Gil Flores, 2007) as innovative characteristics as powerful tools that lead to new order in learning outcomes. Also, in a similar but not the same subjects, this study confirms the earlier studies that led to higher improvement in students' performances or improved scores when students were exposed to computer facilities (Rochelle, 2000, Ravitz, Mergender & Rush, 2002).

Research Question Eight: What are the composite and relative contributions of access (very easy, easy not easy), utilisation (frequency) and quality of SNNG facilities to students attitudes to ICT? To answer the research question eight, the researcher uses attitudinal questionnaire administered on students thereby analyzing the filled instrument with MR. this was done to find out composite and relative contributions of variables. Tables 4.2.11 and 4.2.12 present the results of the findings.

Table 4.2.11: Composite contribution of Access, Utilisation and Quality of SNNG facilities to Attitudes in ICT

Variable	MR (Predictor)	R square	Adjusted R square	F value	Sig.	Decision
Combined Attitudes	0.102	0.010	0.003	1.426	0.181	N/S

P = 0.181, not significant at P<0.005

Table 4.2.11 presents the composite variables contributions to students' attitude to ICT. The Summary of Regression Analysis (RSA) MR = 0.102, R Square = 0.10, Adjusted R = 0.003 and ANOVA. $F_{(8, 1091)} = 1.426$, though not significant at $P<0.05$ but at $P= 0.181$. R square for this regression equation is 0.010, which means that 1% of the variation in attitudes towards ICT of students is explained by regression model. This suggests that 99% of the variation in ICT means scores can be explained by factors other than the independent predictor-variables in regression model. The adjusted R square for this regression equation is 0.003, which means that about 0.3% of the variation in ICT scores of students is explained by regression model. This suggests that 99.7% of the variation in ICT means scores can be explained by factors other than the independent predictor-variables in regression model.

Table 4.2.12 shows the contributions of each of what constituted the access, utilisation and quality to predict the attitudes to ICT. The regression coefficient (ranged from -0.115 to 0.103) Standard error ranged from 0.405 to 1.483 and t-value (ranged from -1.259 to 1.613. The Table shows the t-values associated with access to computer, utilisation 4 are statistically significant while others are not at $P \leq 0.005$, but at P=0.181. The summary of the beta values of the regression of attitudes to ICT on all the variables considered for this study. The beta values enable the researcher to generate the required regression equation showing linear relationship between dependent and independent variables.

The joint or composite contributions enables the researcher to generate a regression equation of the form in (4.1e above) and where Y_1 – Attitudes to ICT; A is constant; X_1 access to computer; X_2 access to Internet; X_3 numbers of time students do computer a week with teacher; X_4 number of time students search for information on Internet facilities in a week with teacher; X_5 number of hours students spend on computer for typing to do home work in a week; X_6 number of hours students spend on Internet to do homework; X_7 quality of computer, X_8 quality of Internet; and, e to attitudes to SNNG facilities. Generally, the findings support Colley & Comber (2003), Osunade & Yara, (2005). However, how significant or otherwise the attitudes of students to the use of Internet and computer are still not concluded. The possible outcome of the result might be due to location and the time the studies were carried out. The test of significance of the RC of attitudes towards ICT is ranked to see the chronological contributions.

Table 4.2.12: Test of significance of the Regression Coefficient of attitudes to ICT use

Attitude Variables	Un-standardised coefficients		Standardised Coefficients		Sig.	Rank
	B	**Standard Error**	**Beta**	**T**		
Constant	60.798	1.925		31.582	0.000	
Access to computer	0.794	0.697	0.066	1.140	0.255	6th
Access to Internet	-0.330	0.405	-0.034	-0.814	0.416	7th
Time students spent to do computer in a week with teacher	-1.633	1.353	-0.115	-1.207	0.228	1st
Number of time students search for information on Internet facilities in a week with teacher	1.401	1.483	0.103	0.944	0.345	2nd
Hours spent on computer to do homework	0.029	1.367	0.002	0.021	0.983	8th
Hours students spent on Internet to do homework	0.844	0.659	0.067	1.280	0.201	5th
Quality (Computer)	-0.782	0.621	-0.072	-1.259	0.208	4th
Quality (Internet)	1.142	0.708	0.081	1.613	0.107	3rd

The findings from the above Table led to the regression equation the attitudes towards ICT using SNNG facilities is $Y = 60.798 - 1.633X_1 + 1.401X_2 + 1.142X_3 - 0.782X_4 + 0.844X_5 + 0.794X_6 - 0.330X_7 + 0.029X_8 + e$. However, the regression further means that SchoolNet intervention school students would have an average attitudinal score of 60.798 in ICT if all predictor-variables are zero. The predictor-variables that could improve attitude in ICT significantly are (i) access to computer; (ii) number of time students search for information on Internet facilities in a week with teachers; (iii) number hours spent on computer to do homework; (iv) number of hours students spend on Internet to do homework; and (v) the quality of Internet. Another set of strategies that may improve the attitude towards ICT use is to discontinue with bad quality of computer and unnecessary time students spend to do computer a week with teacher.

The summary of the regression analysis of what constitutes access, utilisation and quality to students' attitudes to ICT use is given in form of equation above. These results confirm earlier study of Popoola (2002) who posited that quality of computer based system enhanced and consistent with learners' attitudes. In this case the computer system quality was significantly and favourably disposed to learners. The

possible reasons for these results might be that whether a child utilises the instrument or not, so far they are taught, the attitudinal aspect could still be students are disposed to the use in as much some might learn this somewhere else other than in the school system. With this report, the researcher concludes that access to, utilisation and quality of SNNG facilities contributed and had positive attitudes towards ICT use. However, it is pinpointed here that utilisation of the facilities had more influence than other variables as compared with the views of (Bovee, Voogt & Meelisen, 2007 and Jegede, 2009).

Research Question Nine: What are the composite and relative contributions of access, utilisation and quality of SNNG facilities to students' competence in the use of ICT facilities? To answer the research question nine, the researcher uses the result of various skills the students displayed during field work. The scores were coded to measure their competence or how they had mastered some skills. Tables 4.2.13 and 4.2.14 present the results of the findings.

Table, 4.2.13: Composite contributions of Access, Utilisation and Quality of SNNG facilities to Students' Practical Skills in ICT

Variable	MR (Predictor)	R square	Adjusted R square	F value	Sig.	Decision
Combined	0.232	0.054	0.047	7.740	0.000	S

Table 4.2.13 presents the composite variables contributions to students' competence towards ICT. The Summary of Regression Analysis (SRA) MR = 0.232, R Square = 0.054 Adjusted R = 0.047 and ANOVA. $F_{(8,\ 1091)} = 7.740$, though significant at $P<0.05$ because it was calculated at P=0.000. R square for this regression equation is 0.054, which means that about 5.4% of the variation in ICT competence scores of students is explained by regression model. This suggests that 94.6% of the variation in ICT skill means scores can be explained by factors other than the independent predictor-variables in regression model.

The adjusted R square for this regression equation is 0.047, which means that about 4.7% of the variation in ICT scores of students is explained by regression model. This suggests that 95.3% of the variation in ICT means scores can be explained by factors other than the independent predictor-variables in regression model. However, Table 4.2.14 shows the contributions of each of what constituted the access, utilisation and quality to predict the competence in ICT use.

The regression coefficient (ranged from -0.168 to 0.163) Standard error ranged from 0.124 to 0.587 and t-value (ranged from -4.171 to 3.511. The Table shows the t-values associated with access to computer, Internet, quality of Internet, quality of computer, number of time students search for information on Internet facilities in a week with teacher are statistically significant while others are not at $P \leq 0.05$, but others at $P>0.05$. The summary of the beta values of the regression of Skill acquisition or competence to ICT use on all the variables considered for this study. The beta values enable the researcher to generate the required regression equation showing linear relationship between dependent and independent variables.

The relative contributions enables the researcher to generate a regression equation of the form in (4.1e above) and where Y_1 – Competence in ICT use; A is constant; X_1 access to computer; X_2 access to Internet; X_3 numbers of time students do computer a week with teacher; X_4 number of time students search for information on Internet facilities in a week with teacher; X_5 number of hours students spend on computer for typing to do home work in a week; X_6 number of hours students spend on Internet to do homework; X_7 quality of computer, X_8 quality of Internet; and, e to competence to SNNG facilities' ICT use.

The possible outcome of the results might be due to location, the nature of the schools and the time the studies were carried out. The directions of individual contribution of the variables are presented on Table 4.2.14.

Table 4.2.14: Test of significance of the Regression Coefficient to Students' Practical Skills in ICT

Competence Variables	Un-standardised coefficients		Standardised Coefficients		Sig.	
	B	**Standard Error**	**Beta**	**T**		
Constant	22.941	0.587		39.053	0.000	
Access to computer	0.746	0.213	0.200	3.511	0.000	1st
Access to Internet	-0.516	0.124	-0.168	-4.171	0.000	2nd
Time students spent to do computer in a week with teacher	0.000	0.413	0.000	-0.001	0.999	8th
Number of time students search for information on Internet facilities in a week with teacher	0.111	0.453	0.026	0.246	0.806	7th
Hours spent on computer to do homework	-0.439	0.417	-0.091	-1.053	0.293	6th
Hours students spent on Internet to do homework	0.581	0.201	0.147	2.889	0.004	5th
Quality (Computer)	-0.558	0.190	-0.164	-2.943	0.003	3rd
Quality (Internet)	0.723	0.216	0.163	3.346	0.001	4th

The findings from Table 4.2.14 led to the regression equation for the skill acquisition in ICT using SNNG facilities:

$Y = 22.941 + 0.746X_1 – 0.516X_2 - 0.558X_3 + 0.723X_4 + 0.581X_5 - 0.439X_6 + 0.111X_7 + e.$

However, the regression further means that SchoolNet intervention school students would have an average competence score of 22.941 in ICT if all predictor-variables are zero. The predictor-variables that could improve skills in ICT significantly are (i) access to computer; (ii) number of time students search for information on Internet facilities in a week with teacher; (iii) number hours spent on Internet to do homework and (iv) the quality of Internet. Another strategy that may improve the skill acquisition in ICT is to discontinue with bad access of Internet; unnecessary hours students spend on computer to do homework; computer with bad quality; and numbers of times students do computer a week with teacher.

The summary of the regression analysis of what constitutes access, utilisation and quality to students' competence in ICT use is given in form of equation above. The possible reasons for these results might be that whether a child utilises the instrument or not, so far they are taught, the psychomotor aspect could still be in as much some might learn this somewhere else other than in the school system. In a

nutshell, this outcome is as a result of access to, utilisation and quality in SNNG facilities, more importantly, access to and quality of these facilities showed prominence in skill acquisition of the students. This is in line with competence in the use of computer to perform tasks (Mumtaz & Hammond, 2002) and Turn's (2008) report on computer skills, though the focus was on teachers. When this work is compared with (Karsten & Roth, 1998, Karchmer, 2001 and Mumtaz & Hammond, 2002) seemed to be in congruence.

4.2 Discussion of the findings

How Students had access to the SNNG facilities in the project schools were surveyed. The answer to the research question one the researcher used measures the accessibility of students to the ICT from the point of view of the school having enabling infrastructure at the same time schools having website, schools having e-mail address, principals' having e-mail address, telephone as well as students having e-mail address, telephone, ease of access to computer and Internet, the number periods available for learning computer, schools with website. How accessible in this case gives no restriction as to when students enter the computer laboratory to do their works other than class activity with their teachers. The summary of the finding was that students, principals' had access to the SNNG facilities. Generally, from this result, it can be said that the stakeholders in education will find the outcome this access to the facilities beneficial. The study corroborates the earlier findings of Lelliot et al, (2000) who reported that students that had access to learning facilities performed well than who did not have access to learning facilities.

The level of utilisation (amount of use, frequency) as revealed from the students' ratings of the utilisation of the SNNG facilities (computer and Internet) with their teachers and the use of the facilities to do homework. The researcher also reports the principals' rating of utilisation of the facilities. These showed that principals' utilisation as well as the students' utilisation of the facilities was testimony to the fact that the facilities were used for teaching and learning processes. This study confirms the similar studies which had recorded success (at corporate level) in Lesotho, Mozambique, Angola, Namibia, South Africa, Senegal and Zimbabwe according to International Development and Research Centre's (IDRC, 1997) reports. In a nutshell, this study concludes that students had access to the SNNG's ICT facilities,

hence utilised for the teaching and learning processes. The result of this study could be generalised in the sense that any investment to bring positive learning when fully tapped is always beneficial.

The quality of the SNNG's facilities supplied to the schools was measured in terms of computer speed to boot and how long it takes Internet to connect. In this case, students' and the principals' ratings were used to explain the quality of the SNNG facilities. We measured the speed using the approximate minutes for a typical computer to boot and a website to open when using search engines. Also, we measured the other quality in terms of number of replacement, repair and service performed within the last six months to study. The researcher's opinions from the respondents ratings are that the facilities are of good quality, the facilities were utilised as expected and could help students achieve optimally, and students had right attitudes towards its study, thereby increase and elicit the potentiality of competence in the ICT. It was observed that the supplied facilities are of good quality that could sustain time as to produce learning outcomes in the students. The results here are in consonance with the similar but executive reports of status of ICT in Ghana secondary schools (Abbey-Mensah, 2001). The report equally corroborates Khanya report 2001 in South Africa as reported by Van (2002), the only difference being the population, time and the difference in location.

The students' performances in ICT achievement test was administered on the students. This was measured to find the mean, standard deviation, minimum and maximum scores, as well as skewness and kurtosis of the performances. This further throws more light on the score analysis. For the work to be easy for all to use, the mean scores in form of % helps us to see the average total scores upon which the state scores are explained. The students' achievement in ICT test can be generaliesd using the state or overall average score in a similar set up. This result correlates with the finding (though negative) of (Ravitz, Mergender & Rush, 2002) who recorded that the use of computer in education contributes significantly to higher students' performances.

The attitudes of students toward the use of SNNG facilities were reported in this study. The questionnaire was administered on the students to ascertain the level of attitudes toward the use of computer and the Internet facilities. The mean, standard deviation, minimum and maximum scores as well as skewness and kurtosis were obtained. The score in this study could be generalised to further elicit positive attitudes

towards ICT use. However, the results of students' attitudes are in line with the reports of (Rafi, 1998, Hsu & Huang, 1999, Hennessy, 2000, Colley & Comber, 2003, Jacobson & Hunter, 2003) who recorded that the use of computer in education has influence on students' dispositions to computer usage.

The competence of the students in the use of SNNG facilities was studied. The researcher considers the scores from skills the students had when dealing with ICT concepts. The students performed well in this test. If other schools have the facilities, the report of this study could be generalised to bring the potentials in the students.

The researcher only makes inference from this study to conclude the learning outcome, because he is unaware of the kind of study presented in this chronological order. However, the results of students in skill acquisition test is in line with the reports of (Rafi, 1998, Colley & Comber, 2003) who recorded that the use of computer in education has influence on students performance in computer usage.

The composite and relative contributions of access, utilisation and quality of SNNG facilities to students' achievement in the use of ICT were answered. The researcher analyses the data using MR by filling the dependent and independent variables as appropriate. The results here corroborate the quality as predicting learning outcome (Adisa, 2004), utilisation supports the views of (Labo-Popoola,2002, Samuel and Bakar, 2005, and 2006, Maliki & Uche, 2007 and Gil Flores, 2007) as innovative characteristics as powerful tools that lead to new order in learning outcomes. Also, in a similar but not the same subjects, this study confirms the earlier studies that led to higher improvement in students' performances or improved scores when students were exposed to computer facilities (Rochelle, 2000, Ravitz, Mergender & Rush, 2002).

The composite and relative contributions of access (very easy, easy not easy) utilisation (frequency) and quality of SNNG facilities to students attitudes to ICT was questionnaire administered on students thereby analyzing the filled instrument with MR. this was done to find out composite and relative contributions of variables.

Generally, the findings support Colley & Comber (2003), Osunade & Yara, (2005), Kwapong (2006 and 2007). However, how significant or otherwise the attitudes of students to the use of Internet and computer are still not concluded. The possible outcome of the result might be due to location and the time the studies were carried out. The test of significance of the RC of attitudes towards ICT is ranked to see the chronological contributions.

With this report, the researcher concludes that access, utilisation and quality of SNNG facilities contributed and had positive attitudes towards ICT use. However, it is pinpointed here that utilisation of the facilities had more influence than other variables as compared with the views of (Mumtaz & Hammond, 2002Newa, 2007; and Bovee, Voogt & Meelisen, 2007).

The composite and relative contribution of access, utilisation and quality of SNNG facilities to students' competence in the use of ICT facilities was aanswered. The scores obtained were coded to measure their competence or how they had mastered some skills in computer and Internet. The predictor-variables that could improve skills in ICT significantly are (i) access to computer; (ii) number of time students search for information on Internet facilities in a week with teacher; (iii) number hours spent on Internet to do homework and (iv) the quality of Internet. Another strategy that may improve the skill acquisition in ICT is to discontinue with bad access of Internet; unnecessary hours students spend on computer to do homework; computer with bad quality; and numbers of times students do computer a week with teacher.

The summary of the regression analysis of what constitutes access, utilisation and quality to students' competence in ICT use is given in form of equation above. The possible reasons for these results might be that whether a child utilises the instrument or not, so far they are taught, the psychomotor aspect could still be in as much some might learn this somewhere else other than in the school system. In a nutshell, this outcome is as a result of access to, utilisation and quality in SNNG facilities, more importantly, access to and quality of these facilities showed prominence in skill acquisition of the students. This is in line with competence in the use of computer to perform tasks (Mumtaz & Hammond, 2002) and Turn's (2008) report on computer skills, though the focus was on teachers. When this work is compared with (Karsten & Roth, 1998, Karchmer, 2001 and Mumtaz & Hammond, 2002) seemed to be in congruence.

This research has brought to focus the access, utilisation and quality of SNNG facilities as predictors of learning outcomes of Students in ICT in Southwest Nigeria. The outcome of Access to ICT can be categorised into (i) Communication (ii) Retrieval of documents and (iii) Technological development of the students. The influence of access increased the level of commitment to the use of ICT in schools. The study acquainted the users of research reports to the fact that most schools visited

except one was not fully using the facilities as at the time of the study. All the computers and all the relevant accessories are found in the computer laboratory. This implies that schools had 21 computers connected to the Internet. The concept of building network of schools was embedded in the objectives of SNNG. Therefore, the provision access to the Internet and digital resources is at the core of the SNNG. Results of the survey showed significant relationship to achievement in ICT test, attitudes and competence all which, are products of communication, retrieval and technological advancement. The principals', ICT teachers and what students reported indicated those infrastructure available at schools were widely used during the week. The outcome of the results shows the amount of time that computer and Internet are used for different activities during the weeks. On the whole, students show that level of access range from fairly easy to very easy.

Utilisation of SNNG facilities to learning outcome was considered in the present study. ICT use can be categorised into communication, teaching and learning, recreation and productivity. For communication, students send e-mail and others learn how to do it, chat online, the see the need to read about themselves and others. In this setting too, principals' were not left out. For productivity, students could create and print documents, save documents. Principals' and their teachers do the same as students. This aspect is purely using ICT for study related purposes. For recreational purposes, students play games and music. For communication purposes, students send e-mail and the same time chat with their friends, even the researcher is not left out of the scheme.

The qualities in the infrastructure and the SNNG facilities were observed to improve the conditions of the schools. The status has changed the results of the students as evident from the principals' and in the achievement in ICT test, attitudinal results and the competence or skill acquisition conducted. This study has created awareness on how ETF has been wisely experimented in developing this sector of our educational policy. This study has espoused the confidence in the use of ICT to achieve positive learning outcomes in other subjects in secondary schools. The results of this study has to some extent exposed the need to have feedback on what is happening in the secondary school system so as to encourage the NGO to focus more in overcoming this challenge of developmental projects in schools. The study has shown the performance of students in ICT learning outcomes thereby showing the joint contributions in the popular Taxonomy of Educational Objectives.

The chapter dealt with methods and patterns of data collection and analyses. It equally discussed presentations with appropriate references.

CHAPTER FIVE

SUMMARY, RECOMMENDATIONS AND CONCLUSION

5.0 Introduction

This chapter is discussed under the following subheadings: summary of findings, implication of findings, recommendations and suggestion for further studies.

5.1 Summary of the findings

This study investigated the access, utilisation and quality of SchoolNet facilities as predictors of secondary school students learning outcomes in ICT in southwest, Nigeria. Nine research questions were answered in order to give meaning to the study. Results of the study show that:

1. students and principals' have access to the SNNG facilities in terms of making use of computer (Table 4.2.1) its accessories and the Internet facilities during and after classroom interactions due these reasons. That 89.5 % of the students have e-mail address while 10.5 % of students had not got the e-mail address. Only 10 % of the schools had website but all the schools had e-mail address. All the principals' had e-mail addresses and handsets, implying 100% representation. On the whole 75 % of the students had access to Internet with computer in a week, while 85 % of the students indicated the access to Internet.
2. if we consider the usability of the SNNG facilities, the results (Table 4.2.2) show that100% of the students utilise the ICT facilities with their teachers in a week and 95 % of these students utilise the Internet facilities with their teachers in a week. Also, 100% of the students spent one or two or three hours to utilise the facilities to do homework. While 95 % of them utilise and spent more than one hour on the Internet to do their homework. The principals,' 20 (100%) indicated the utilisation of the SNNG facilities, the principals' rating of what time they used to grant students' usability of the SNNG facilities indicated 11 (55%) for one hour and 9 (45%) for two hours. The difference in time they searched for information and the hours spent online might be what they do outside the classroom interactions. At the same time, a close perusal of the students' and principals' results tend towards the same continuum (between two perceptions we observed 95% and 100%) respectively. The study shows the rate

at which the subject is exposed to the students like some other vocational subject such as Business Studies, Home Economics, Fine Art, and Agricultural Science. The computer education as a school subject is equally accorded the same status as similar vocational subjects as earlier stated. However, one period of 33 ⅓% is granted for practical class per week. The students and principals' utilised the facilities

3. the quality of the SNNG facilities supplied to the schools in term of their durability as measured using checklist revealed that all were functional with minor repairs and few replacements (Tables 4.2.3, 4.2.4 and 4.2.5). The students and principals' ratings reflected this. The status of facilities in terms of maintenance and utilisation across the states showed that all the facilities provided were intact in terms of quality. Some state governments' added values to the existing ones. Frequent visits by the ministry monitoring the ICT facilities and occasional visit by SNNG staff contributed to sustaining and maintenance of these facilities.

4. the students' scores in ICT achievement test (Table 4.2.6) across the states provided evidence on the access, utilisation and quality of SNNG facilities. The average score across the states is 57.66%. Three states, Ondo (58.64%), Ogun (63.30%) and Lagos (58.62%) scoring above state average score while Ekiti (53.86%) scored below average. The four states jointly contributed 8.2% to ICT knowledge. Using relative standing, 51.4 % of the students scored above average. The results showed an encouraging achievement in ICT test.

5. the students' attitudes towards ICT provided evidence on the access, utilisation and quality of SNNG facilities (Table 4.2.7). The attitudes of students to ICT across four states revealed 64.48%. The average score clustered around average, using a method of relative standing showed 49.5% and 50.5% above and below average scores respectively. However, Ondo (65.52%) and Ogun (64.41%) above average while Ekiti (63.82%) and Lagos (64.20%) scored below average. In a nutshell, the students showed positive attitudes towards the use of ICT.

6. to measure how competent or level of skills the students are in the use of SNNG facilities, evidence of the performance of students on competence (Table 4.2.8) show 61.20%. Specifically, the score as measured showed Lagos (62.33%) and Ogun (62.90%) above average while Ekiti (60.37%) and Ondo (60.50%) scored below average. In all, 55% of the schools score above average while 45% performed below average. The method of relative standing generally showed that 31.1% of the students scored above average while 68.9% scored below it. The distributions of mean show negative skewness and this is because the polygon has longer tail to the left of central maximum than to the right. The results revealed an encouraging competence in the use of the ICT facilities

7. the composite and relative contributions of access, utilisation and quality of SNNG facilities to students' achievement in the use of ICT facilities (Tables 4.2.9 and 4.2.10). The composite use of the access to, utilisation and quality of SNNG facilities to predicting Achievement in ICT yielded a coefficient of multiple correlation R of 0.305 and a multiple R square (R^2) of 0.093, adjusted R of 8.6% and the $F_{(8, 1091)} = 13.981$, $P<0.05$. The regression coefficients (ranged from -0.585 to 0.396); Standard Errors (ranged from 0.270 to 1.282) and t- values (ranged from -6.417 to 7.101). The regression equation for the achievement in ICT using SNNG facilities is:

$Y = 24.387 – 5.782X_1 + 3.294X_2 + 3.382X_3 + 1.306X_4 - 1.038X_5 + 0.683X_6 – 0.447X_7 + 0.137X_8 + e.$

8. the composite and relative contributions of access, utilisation and quality of SNNG facilities to students attitudes to ICT (Tables 4.2.11 and 4.2.12). The Summary of Regression Analysis (SRA) MR = 0.102, R Square = 0.10 Adjusted R = 0.003 and ANOVA. $F_{(8, 1091)} = 1.426$, though not significant at $P<0.005$ but are significant at $P=0.181$. The result shows the contributions of each of what constituted the access, utilisation and quality to predict the attitudes to ICT. The regression coefficient ranged from -0.115 to 0.103, standard error ranged from 0.405 to 1.483 and t-value ranged from -1.259 to 1.613. The result shows the t-values associated with access to computer, utilisation four are statistically significant while others are not at $P \leq 0.05$, but significant at P= 0.181. The beta values enable the researcher to generate the required regression equation showing linear relationship between dependent and independent variables. From the findings, the regression equation for the achievement in ICT using SNNG facilities is:

$Y = 60.798 – 1.633X_1 + 1.401X_2 + 1.142X_3 - 0.782X_4 + 0.844X_5 + 0.794X_6 – 0.330X_7 + 0.029X_8 + e.$

9. the composite and relative contributions of access, utilisation and quality of SNNG facilities to students' competence in the use of ICT facilities (Tables 4.2.13 and 4.2.14). The researcher made use of adjusted R^2. This represents multiple regressions (MR) of dependent on independent variables. The Summary of Regression Analysis (SRA) MR = 0.232, R Square = 0.054 Adjusted R = 0.047 and ANOVA. $F_{(8, 1091)} = 7.740$, though significant at $P<0.05$ because it was calculated at P=0.000. The contributions of each of identified variable constituted the access, utilisation and quality to predict the competence in ICT use. The regression coefficient ranged from -0.168 to 0.163, standard error ranged from 0.124 to 0.587 and t-value ranged from -4.171 to 3.511. The summary of the beta values of the regression of skill acquisition or competence to ICT use on all the variables considered for this study. The

beta values enable the researcher to generate the required regression equation showing linear relationship between dependent and independent variables. The regression equation for the competence in ICT using SNNG facilities is:

$Y = 22.941 + 0.746X_1 – 0.516X_2 - 0.558X_3 + 0.723X_4 + 0.581X_5 - 0.439X_6 + 0.111X_7 + e.$

5.2 Educational Implication of the findings

The study has implications for the following categories of individuals and experts.

1. **Computer Studies teachers:-** These teachers are not to skip the ICT part of the curriculum, they are to fully teach the practical aspects of the subject. They should develop positive attitudes in the students to learning computer and related ICT.

2. Curriculum planners: - It will help the planners to include new things in ICT curriculum, this will serve as a springboard for introducing the students to lifelong and life coping skills in ICT and computer as well as other vocational subjects.

3. School principals':- The school principals' will find this report useful in the area of helping the teachers to serve the school better in the use of ICT facilities. This will equally serve as energising the principals' on the need to encourage all teachers to be ICT compliant so as to cope with the challenges of this e-learning.

4. Non-governmental Organisations (NGOs): They will find this report as impetus for channelling the course of improving ICT education by their activities.

5. Teacher preparation Institutions: The teacher preparation will find the report useful by increasing the training of experts in ICT who will eventually improve the future of the greater tomorrow.

6. Students: Students at this level of education will be aware of the activities of the SchoolNet. The achievement test, attitudes to ICT use and competence test will serve as impetus to understanding the computer studies in schools and also, the usefulness of ICT in their academic pursuit.

7. Parents: The parents will find the report useful in the area of what their wards use ICT for in the area of academics.

8. Examination Bodies: The achievement test can serve as basis for selection to ICT based subjects at Senior Secondary Schools.

9. Educational Evaluator: The evaluators will find the reports of this research as baseline data for further evaluations and researches.

10. Government:- Government and her agents will be sensitised on the ways the expenses on education are handled. The need to increase funding to improve the school infrastructure and at the same time spend money on supervision of the existing ICT facilities in schools is essential.

Policy & enabling environment that is all policy regulation, legislation and infrastructure development should be gender sensitive and adjusted to meet the needs of marginalised and vulnerable groups such as women, the youth, the illiterate, and the economically disadvantaged, differently-able and rural peoples.

States should ensure that all businesses operating in the field of ICT infrastructure development should be required to invest in and deliver services and infrastructure to under- and un-served areas with particular sensitivity to the needs of marginalised and vulnerable groups in society. States should develop national infrastructure policies that are affordable, sustainable, upgradeable and expandable and that enable ICT to develop without restrictions created by current technological standards.

Government should enact legislation and help create an enabling environment that would give communities the ability to develop relevant capacities to use ICTs for their own well-being and advancement. The principle of universal access should be applied to include cultural, information/communications and educational opportunities. Civil society should organise together and engage in the governance of the Internet and other information and communication media, at local, national and regional perspectives. At the international level, civil society should engage further in the Internet governance process.

12. Civil Society Organisations (CSOs): They need to be included in all consultative processes including government-led delegations in regional and international forums, especially the World Summit on the Information Society WSIS process.

CSOs are encouraged to create a flexible coordinating mechanism with readily available regional networking and outreach capabilities. The mission of such a mechanism will be to encourage discussions, work towards a much broader inclusion of other CSOs and interested stakeholders and defend common positions on outstanding issues.

Civil society organisations in Nigeria should gather knowledge about the policy processes, meet in order to discuss a policy position and then lobby governments to adopt and implement fair policy processes in relation to ICT.

13. Information and communications societies: They entail the promotion of free and fair flow of information and communications as well as the implementation of support and access to local ICT manufacturing capabilities especially with regard to open source, low cost,

appropriate and people centred technologies. The principle of the Information & Communication Society should include issues of human rights and equitable and sustainable socio-economic development, and not just be restricted to technological and financial matters.

That information and communications processes and technologies be utilised to tackle outstanding challenges related to peace and security, education, cultural empowerment and democratic and sustainable human development.

5.3 Recommendations

Based on the findings in this study, it is recommended that government should set aside fund to repair the ailing infrastructure in the schools. These should include the building of laboratories and making Internet facilities in the SchoolNet schools functional where there are problems. The principals' should be tutored on the need to allow students more access to the ICT facilities in such a way to benefit the students more than the way it is now. The principals' should evolve ways to repair the ICT facilities through parents' efforts or old students associations in case the government is not responding in time. There should be monitoring teams set aside to visit the schools from time to time on the general supervision of the ICT facilities. The Ministries of Education of the various states should help upgrade the old computers and possibly employ the technical officers to help improve the ICT infrastructure in the schools. More donor companies should participate in the educational set up. A research like this needs serious funding to put schools on their toes to produce students to make use of ICT facilities for academic purposes; to develop more skills in the use of ICT; to create awareness on the need to share academic ideas that will assist them in mastering other subjects in their schools.

5.4 Limitations of the Study

The results of this study are limited to the 20 SchoolNet centres located in four states selected in south west, Nigeria. It is valid for the class selected but can be adapted or adopted for other schools with similar characteristics.

5.5 Suggestions for further studies

It is suggested that similar study be replicated to affirm the results of this study or repudiate it. The same can be conducted in other zones of the country. Other aspects of the SchoolNet activities not covered in this study can be examined by interested researchers. Other variables not included like school funding can be included in future research. General evaluation of SNNG facilities, objectives in schools can be studied to affirm or reject the findings in this report. The results relating to the study of this nature can be investigated along with other schools with similar facilities or even without ICT facilities. Impact evaluation is equally recommended to be carried out within the context and scope of this study. Collaborative studies are equally recommended to be carried out on the need to connect all schools and at the same time on the use of ICT facilities at this level of education.

5.6 Conclusion

Presently, the facilities are in the project schools where they are situated now, there is the need to extend the facilities to other schools and should be encouraged. The infrastructure are promising, the students in those schools had access to the SNNG facilities, the fact that ICT facilities are presently in the laboratory is due to the existing educational policy in Nigeria. Additionally, the relatively high percentage of the schools connected to the Internet enables ICT-related activities and use of SNNG facilities. Focusing on the learning outcomes using the three domains of Taxonomy's classifications of educational objectives, the thesis shows remarkable performances in achievement test and skill acquisitions as well as positive attitudes to learning ICT. Low attitude recorded might be as a result of continuous use which has become routine which made it not to produce tangible effects. Relating the use of computers and Internet in the schools, majority of the schools visited indicated the intensive use of SNNG facilities. The reasons for these results might be due to the various strategy these schools use in maintaining the infrastructure and facilities. The key factor as the researcher observes that promote access, utilisation and quality of SNNG facilities has been the need for change in information and communication system across the globe. Summarising the results in this thesis, it has helped to deepen the understanding of the types of activities the schools use SNNG facilities for. Of course the study brings up questions relating to the way to shape specific ICT access, utilisation and quality of SNNG facilities in order to impact students' achievement, attitudes and skill acquisition and probably take this advantage to develop

further the teachers' pedagogical skills in ICT to improve on what students and teachers already do with ICT. The influence of the most predictors of achievement and practical skills for example are the access to computer, hours the students spend to do homework as well as quality of Internet they (students and principals) use should further be explored to improve on the use of SNNG facilities.

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Appendix I

University of Ibadan, Ibadan
Institute of Education
International Centre for Educational Evaluation
Status of secondary schools with SNNG in Nigeria

Introduction: Kindly complete this questionnaire, which is relevant to SchoolNet status of secondary schools in Nigeria. For each question, please mark the answer that comes closest to your view. Where no options are provided, please answer the questions concisely as possible in the spaces provided. Be assured that whatever information supplied will be confidentially treated, the researcher appreciates your cooperation. Thank you

Section A: School Data

1. Name of School…….
2. Address of the School:……
3. Year of establishment:……
4. Local Government of the school:……
5. Type of School Federal,……. State,….. Mission,…… Private,…. …….
6. State where the school is established…….. …
7. School location: Rural Semi-urban Urban
8. Respondent (Circle the correct option) (a) Teacher (b) Parent (c) Head teacher (d) SNNG Officer (e) ICT teacher (f) others (specify)……
9. Gender: Male Female
10. Highest Qualification: (a) BSC.ED (b) BA. ED (c) B. ED (d) B. SC (d) BA (e) HND (f) NCE (g) ND (h) Other Qualifications (specify)……
11. Total number of Staff (if the respondent is Head teacher):
    Teaching. ……Non- teaching……..
12. Number of students in your school: Male……..Female…….
13. Email:……
14. Website:……

SECTION B: Instruction: Please fill this instrument. It was designed to collect data on the infrastructure before the SNNG Project facilities were integrated in your school. Feel free to respond to the questionnaire, as it is for academic research your cooperation is highly solicited. **Thank you**

Here are questions based on Infrastructure-Reach and School readiness in the integration of SNNG ICT facilities in your school

1. Before you possessed the above facilities were you aware of the importance of ICTs for education? Yes No
2. Was there a dedicated space for installing ICT? Yes No
3. Does present curriculum in your school allow the use of ICT facilities provided? Yes No
4. Do you have ICT teachers in your school? Yes No
5. How many ICT teachers are available ……
6. Do you have ICT laboratory in your school? Yes No
7. Briefly describe how you manage the laboratory……
……Dimension of Laboratory: Length……Breadth……Area……

8. How often do student have access ICT facilities in a week? (Access)

None	Once	Twice	Thrice	Everyday

9. How often do you search for information on ICT facilities in a week? Utilisation

None	Once	Twice	Thrice	Everyday

10. How many hours a week do you allow students to use ICT facilities? Utilisation

None	One	Two	Three	>Three

SECTION C: ICT facilities and Laboratory

These are expected ICT and related facilities in your school and give a specific number accessible to students?

	Facilities	Yearly	Term	Monthly	Weekly	Twice a week	Daily	Remark
A	Computer system							
B	Server							
C	Printer							
D	UPS							
E	VSAT							
F	Internet Connectivity							
G	Curriculum content software							
H	Scanners							
I	White marker board							
J	Smooth board							
K	Projectors							
L	Speakers							
M	Photocopiers							
N	Fire extinguisher							
O	Stabiliser							

Please give brief descriptions of the availability of SNNG facilities in your school and accessibility of students to the ICT facilities provided…….……..
……
….……
.....

SECTION D: How often do the following occur when you use the facilities in a term?

	Item	Replacement	Repair	Service	Use
A	Computer system				
B	Server				
C	Printer				
D	UPS				
E	VSAT				
F	Internet Connectivity				
G	Curriculum content software				
H	Scanners				
I	White marker board				
J	Smooth board				

K	Projectors				
L	Speakers				
M	Photocopiers				
N	Fire extinguisher				
O	Stabiliser				

22. Do you consider Internet provided functional? **Yes/No**

SECTION E

23. How would you rate quality of these facilities using 4= fast, 3= fair, 2 = slow, or 1 = not functioning well

Minutes	1-5 (4)	6-10 (3)	11-15 (2)	16-20 (1)
Computer				
Internet				

Describe briefly how you train students, members of staff and others from neighbouring schools

……

SECTION F: Which of these factors are responsible for non-usage of SNNG facilities in recent years?

	Item	Most important	Important	Less important	Not important
A	Functional obsolescence				
B	Damaged beyond repair				
C	Cost of maintenance				
D	Spare component not available				
E	Process speed inadequate				
F	Storage capacity inadequate				
G	Power surge				
H	Thunder problem				
I	Others specify Internet				

Thank you for the thought, patient, time and ability to fill the questionnaire

Appendix II

University of Ibadan, Ibadan
Institute of Education
International Centre for Educational Evaluation
Students' Questionnaire

A Instruction: Read and fill the following about yourself

1. State ……...
2. Name of School…….
3. Address of the School:……...
4. Students Name……
5. Date and Period of observation……..
6. Status of the School: Federal …….State……Private……
7. Student's Gender: Male ……Female..……..
8. Father/Male guardian highest qualification: None, Pry, Secondary, Tertiary(ND, NCE, B. Degree), others specify……..
9. Mother/Female guardian highest qualification: None, Pry, Secondary, Tertiary (ND, NCE, B. Degree), others specify……..
10. Indicate how often time do you spend to do computer with your teacher in ICT class in a week?

None	**Once**	**Twice**	**Thrice**	**Everyday**

11. Indicate how often do you search for information on (Internet) with your teacher in ICT class in a week?

None	**Once**	**Twice**	**Thrice**	**Everyday**

12. How many hours a week do you use computer-ICT facilities to do homework weekly

None	**One**	**Two**	**Three**	**>Three**

13. How many hours do you spend on searching on Internet facilities to do homework weekly?

None	**One**	**Two**	**Three**	**>Three**

14. Whenever you log on to locate and retrieve saved document on computer what is the quality of the access to document?

Not easy	**Poor**	fairly easy	Easy	**Very** easy

15. Whenever you log on to search on computer what is the quality of the access to Internet?

Not easy	**Poor**	fairly easy	Easy	**Very** easy

16. Email:……
17. Website:……
18. Phone number……...
19. School code……..

B ICT Achievement Test

Instruction: Answer all the questions. Shade the correct option in the answer paper provided. Please do not write or tick on the question paper. Time 40 minutes

1. All are ICT gadgets except …….
A the GSM B. the Fax machine C. the Computer D. the generator

2. Loading the operating system into the memory of Personal Computer is called…
A. Booting B. looting C. supervising D. graphing

3. The underline software found on all computers is the…….
A. Microsoft office B. Operating system C. Corel draw D. Adobe photo shop

4. The largest computer network in the world is called…….A. Internet B. Protocol C. Electronic media D. LAN

5. A network that spans on a large city as a(an) ……..A. WWW B. MAN C. LAN D WAN

6. One of the advantages of ICT is…….A. it causes human being to interact with each other in new ways. B. it houses all hardware, C. it processes in one site location. D. a host computer.

7. The following are benefits of Internet except ……..A. modulation B. e-learning C. e-entertainment D. sharing of information

8. The area of misuse of computer education when using any search engine can be found in ……... A. radiography B. photography C. autography D. pornography

9. Which of these is not an advantage of using ICT? A. it is a fax machine B. it makes people to loose job C. it speeds up transaction D. new ways of interaction

10. The protocol for downloading files carries the abbreviation ……
A. HTTP B. FTP C. ISP D. URL.

11. The software on a user's computer that employs graphical interface to access the Internet is called …….. A.FTP B. URL C. a browser D. ISP

12. A web page that hits any size screen is said to be……..
A. live B. liquid C. encapsulated D. jelly

13. The general term used for buying and selling on the Internet is……
A. e-learning B. e-commerce C. e- sorting D. e- browsing

14. A private Internet like network within a company is …… ……
A. Intranet B. extranet C. virtual private network D. ISDN

15. An example of search engine for any data is …….
A. Google.com B. Hyper region C. Packets D. Frames machine

16. The arrangement in which most of the processing is done by the server is known as….A. a client/server B. a tile server relationship C. simplex D. simplex transmission.

17. One of the benefits of digital divide in our economy is that…. A. Modems are good B.

communication links are worse C. it creates new jobs for people D. it rings networks

18. DVD is the abbreviation for…… A. Digital Versatile Disk B. Digital Video Disk C. Digital Versatile Desk D. Digital Video Desk

19. Communication, timing and control, information processing/management are examples of A. ICT B. VDU C. UPS D. URL

20. A resolution to use UPS with computer is an attempt to…….our computer against power problem. A. damage B. control C. safeguard D. manage

21. The importance of computer as a tool for processing data is true because A. it is an efficient storage facility B it is an electronic gun C. it does not control data collations D. it wastes time

22. One of the computer laboratory rules and regulation is that …. A. chairs and Tables can be arranged in any order B. computer and peripherals are in orderly manner C. cable and computers may not be arranged at all D. white marker board may not be in the laboratory

23. Laser printers work in much the same manner as …….
A. Inkjet printer B. plotter C. photocopier D. scanner

24. Which type of optical disk lets you overwrite data that has already been placed on the desk? A. CD- ROM B. CD- R C. CD- RW D. DVD- ROM

25. The measure of the capacity of a communication link is called its…..A. content B. transmission C. DSL. D. Bandwidth

Thank you for the thought, time patience and effort you have put into completing this section

C. Students' Attitudes towards the use of SNNG ICT facilities in schools

Instruction: *Read and follow the instruction as directed by this section. Please do not write on the question paper. USE the answer sheet you were earlier provided. Time 20 minutes*

This instrument was designed to collect data on the attitudes of students to ICT facilities. This contains 25-item questionnaire, feel free to respond as each item occurs to you.

Item no	Item content	Very true	True	Almost true	Not true
1.	The challenge of solving problems with computers does not appeal to me				
2.	Figuring out computer problems does not appeal to me				
3.	I think working with computers would be enjoyable and stimulating				
4.	I would like working with computers and other ICT facilities				
5.	I do not enjoy talking with others about ICT facilities				
6.	I don't understand how some people can spend so much time working with Internet				

	facilities and seem to enjoy it				
7.	Once I start working with computer and software on various subjects, I would find it hard to stop				
8.	I will do as little work with ICT facilities as possible				
9.	Internet facilities do not scare me at all				
10.	I have lots of self-confidence when it comes to working with printed materials from Internet				
11.	I get a sinking feeling when trying to use a computer and multimedia				
12.	I would feel comforTable working with a computer and scanner				
13.	I think using a computer would be very hard for me				
14.	Generally, I would feel okay about trying a new problem on the computer searching engine				
15.	I am no good with computer and Internet connectivity				
16.	I'm not the type to do well with computers practical				
17.	I do not feel threatened when others talk about computer applications				
18.	It would not bother me at all to take a computer studies				
19.	I would feel at ease in a computer studies, when I chat online				
20.	I could get good grades in ICT aspect of computer studies				
21.	I do not think I could handle a computer repair				
22.	I am sure I could handle a photocopier very well				
23.	I am sure I could learn a computer language				
24.	The use of computer to search for assignment is my joy				
25.	With the ICT facilities in my school, I am comforTable				

How often do the following occur when you use the facilities in a term?

	Item	Replacement	Repair	Service	Use
A	Computer system				
B	Server				
C	Printer				
D	UPS				
E	VSAT				
F	Internet Connectivity				
G	Curriculum content software				
H	Scanners				

I	White marker board				
J	Smooth board				
K	Projectors				
L	Speakers				
M	Photocopiers				
N	Fire extinguisher				
O	Stabiliser				

Do you consider Internet provided functional? Yes/No

Rate whether these facilities are slow, fair, fast, or not functioning at all

Minutes	1-5	6-10	11-15	16-20
Computer				
Internet				

Thank you for the thought, time patience and effort you have put into completing this section

D. **Students' Skill Acquisition Test**

***Instruction**: Answer all questions. Read and follow the instruction as directed by this section. Please do not write on the question paper. Note you are to spend 20 minutes in performing the skills.*

1.	Power on your UPS and computer
2.	Open a Microsoft page, type your name, school, class, and the number you are given today
3.	Save your document on the desktop with your name
4.	Open the saved document on the desktop
5.	Type your family member names at least 3
6.	Click file then save your document as Web page on the desktop
7.	Click insert folder, then insert date and time e.g.15/03/2009 10:00:25
8.	Click insert folder again, then insert a pyramid or sphere
9.	Type your name and class on the object
10.	Use keyboard to print your document
11.	Open an e-mail address, write on how you would like to be in future communicate with your teacher during long vacations in your document you earlier opened
12.	Attach your document and mail amooadesina@yahoo.co.uk

Thank you for the thought, time patience and effort you have put into completing this section

Appendix III
University of Ibadan, Ibadan
Institute of Education
International Centre for Educational Evaluation
Students' Questionnaire, Answer Booklet

A Instruction: Read and fill the following about yourself

1. State ……...
2. Name of School……
3. Address of the School:……...
4. Students Name……
5. Date and Period of observation……..
6. Status of the School: Federal …….State……Private……
7. Student's Gender: Male ……Female..……..
8. Father/Male guardian highest qualification: None, Pry, Secondary, Tertiary(ND, NCE, B. Degree), others specify……..
9. Mother/Female guardian highest qualification: None, Pry, Secondary, Tertiary (ND, NCE, B. Degree), others specify……..
10. Indicate how often time do you spend to do computer with your teacher in ICT class in a week?

None	**Once**	**Twice**	**Thrice**	**Everyday**

11. Indicate how often do you search for information on (Internet) with your teacher in ICT class in a week?

None	**Once**	**Twice**	**Thrice**	**Everyday**

12. How many hours a week do you use computer-ICT facilities to do homework weekly

None	**One**	**Two**	**Three**	**>Three**

13. How many hours do you spend on searching on Internet facilities to do homework weekly?

None	**One**	**Two**	**Three**	**>Three**

14. Whenever you log on to locate and retrieve saved document on computer what is the quality of the access to document?

Not easy	**Poor**	fairly easy	Easy	**Very** easy

15. Whenever you log on to search on computer what is the quality of the access to Internet?

Not easy	**Poor**	fairly easy	Easy	**Very** easy

16. Email:…….
17. Website:…….
18. Phone number……...
19. School code……..

B. ICT Achievement Test

Tick the correct options to questions

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

C. Attitudinal statements

Tick how the statements affect you

SN	Very True	True	Almost True	Not True
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				

How often do the following occur when you use the facilities in a term?

	Item	Replacement	Repair	Service	Use
A	Computer system				
B	Server				
C	Printer				
D	UPS				
E	VSAT				
F	Internet Connectivity				
G	Curriculum content software				
H	Scanners				
I	White marker board				
J	Smooth board				
K	Projectors				
L	Speakers				
M	Photocopiers				

N	Fire extinguisher				
O	Stabiliser				

Do you consider Internet provided functional? Yes/No

Rate whether these facilities are slow, fair, fast, or not functioning at all

Minutes	1-5	6-10	11-15	16-20
Computer				
Internet				

Thank you for the thought, time patience and effort you have put into completing this section

D. **Students' Skill Acquisition Test**

***Instruction**: Answer all questions. Read and follow the instruction as directed by this section. Please do not write on the question paper. Note that you are to spend 30 minutes in performing the skills.*

SN		
1	Power on UPS and computer	
2	Open a Microsoft page, type your name, school, class, and the number you are given today	
3	Save your document on the desktop with your name	
4	Open the saved document on the desktop	
5	Type your family member names at least 3	
6	Click file then save your document as Web page on the desktop	
7	Click insert folder, then insert date and time e.g.15/03/2009 10:00:25	
8	Click insert folder again, then insert a pyramid or sphere	
9	Type your name and class on the object	
10	Use keyboard to print your document	
11	Open an e-mail address, write on how you would like to be in future communicate with your teacher during long vacations in your document you earlier opened	
12	Attach your document and mail amooadesina@yahoo.co.uk	

Thank you for the thought, time patience and effort you have put into completing this section

Appendix IV
University of Ibadan, Ibadan
Institute of Education
International Centre for Educational Evaluation
Answer to Students' Achievement test in ICT

SN	CORRECT	LEVEL OF COGNITION
1	D	Knowledge
2	A	Knowledge
3	B	Thinking
4	A	Knowledge
5	B	Knowledge
6	A	Thinking
7	A	Comprehension
8	D	Thinking
9	B	Comprehension
10	A	Thinking
11	C	Comprehension
12	C	Comprehension
13	B	Thinking
14	A	Comprehension
15	A	Comprehension
16	A	Thinking
17	C	Thinking
18	B	Comprehension
19	A	Knowledge
20	C	Knowledge
21	A	Knowledge
22	B	Knowledge
23	C	Comprehension
24	C	Thinking
25	D	Comprehension

Appendix V
University of Ibadan, Ibadan
Institute of Education
International Centre for Educational Evaluation

Students' Skill acquisition Test Marking Scheme

Instruction*: Answer all questions. Read and follow the instruction as directed by this section. Please do not write on the question paper. Note that you are to spend 20 minutes in performing the skills.*

SN	Skills	S
1	Power on UPS and computer	4
2	Open a Microsoft page 2, type your name 1, school 1, class 1, and the number you are given today	6
3	Save your document on the desktop with your name	2
4	Open the saved document on the desktop	2
5	Type your family member names at least three, 1 marks for any two	2
6	Click file then save your document as Web page on the desktop	2
7	Click insert folder, then insert date and time e.g.15/03/2009 10:00:25	2
8	Click insert folder again, then insert a pyramid or sphere	2
9	Type your name and class on the object	2
10	Use keyboard to print your document	2
11	Open an e-mail address, write on how you would like to be in future communicate with your teacher during long vacations in your document you earlier opened	9
12	Attach your document and mail to amooadesina@yahoo.co.uk	5
	Total	40

Appendix VI

University of Ibadan, Ibadan, Institute of Education, International Centre for Educational Evaluation

Score sheet for recording students' skills acquisition test

Name of school……..

Rater's gender: Male…….Female……..

SN	1	2	3	4	5	6	7	8	9	10	11	12	T	
1														
2														
3														
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58														
59														
60														
T														

Appendix VII
University of Ibadan, Ibadan
Institute of Education
International Centre for Educational Evaluation

List of Schools with SNNG facilities in Nigeria

States	Schools	Zone
FCT	1. Government Secondary School, Wuse 2. Model Secondary School, Maitama. 3. Government Secondary School, Garki. 4. Government Technical College, Garki. 5. Gifted School, Gwagwalada. 6. Govt Sec. School, Tudun Wada, Zone 4, Wuse, Abuja 7. Govt. Day Sec. School, Wuse 2 8. Govt. Sec. School, Pyakasa 9. Govt Sec. School, Nyanya	North Central
NIGER STATE	1. Government Secondary School, Minna. 2. Hilltop Model Secondary School ,Minna 3. Government Secondary School, Tunga, 4. Mariam Babangida Girls Sc. Sch., Minna 5. College Of Arts & Islamic Studies, Minna. 6. Girls Day Junior Secondary School, Minna 7. Muhammadu Kobo Secondary School, Lapai 8. Government College, Bida 9. Women Day College, Bosso Road, Minna	North Central
ANAMBRA STATE	1. Igwebuike Grammar School, Awka. 2. Lorreto Special Science School Adazi. 3. Queen of the Rosary College Onitsha. 4. Dennis Mem. Grammar School, Onitsha. 5. Christ the king College Onitsha.	South east
CROSS RIVER STATE	1. Government Science Sch., Akim, Calabar. 2. Government Science Sch., Mayne Avenue 3. Government Sec. Sch. State Housing. 4. West African Peoples Institute, Calabar 5. Pinn Margaret sec. Comm. sch., calabar. 6. Community Technical College, Ikot Effanga, Calabar 7. Army Day Secondary School, Ikot Ansa, Calabar 8. Government Girls Secondary School, Big Qua Town, Calabar 9. NYSC Model Secondary School, Ikot Ansa,	South south

	Calabar	
KANO STATE	1. Government Girls College,Dala. 2. Government Tech. College, Kano. 3. Rumfa College, Kano. 4. Government Secondary School, Gwale. 5. Government Secondary School, Tarauni.	North west
***ONDO STATE	1.CAC Grammar School, Akure. 2. Imade College, Owo. 3. St. Helens Unity School, lle-oluji. 4. Gboluji Grammar school Ondo. 5.Aquinas College, Akure	South West
GOMBE STATE	1.Government Science School Billiri. 2. Government Day Tech. College Gombe 3. Government Girls Science Sec. Sch. Doma. 4. Government Science Sec. School Gombe 5. Government Technical college, Kumo.	North Central
Kogi	1. St. Peter's College, Idah 2. St. Charle's College, Ankpa 3. Government Day Sec. Sch., Ohueta 4. Govt Science Sec. Sch, Lokoja	North Central
Katsina	1. Katsina College, Katsina 2. GGASS, Dutsinma 3. GTC, Mashi 4. GDSS, Funtua	North West
Delta	1. St. ptrick's College, Asaba 2. Delta Secondary School, Warri 3. Oghareki Model Sec Sch Oghareki 4. Our Lady High sch, Effurun	South South
Benue	1. Government Model School, Makurdi 2. Government Sec. School, Gboko 3. Govt. Model School, Katsina-Ala 4. Government Model School, Otukpo	North Central
Yobe	1. Govt. Secondary School, Damaturu 2. Govt Science Tech. College, Potiskum 3. Govt Science Tech. College, Gashua 4. Government College, Nguru	North East
Kebbi	1. Nagari College Birnin Kebbi 2. Govt Arabic & Islamic Sec. School, Argungu 3. Bahago Gomo Day Sec. Sch, Zuru 4. Govt Girls Science School, Yelwa, Yauri	North west
***Ekiti	1. Comprehensive High School, Otun-Ekiti 2. Methodist Girls High sch., Ifaki-Ekiti 3. Aramoko District Comm Sec Sch, Aramoko-Ekiti	South West

	4. St. Louis Grammar Sch, Ikerre-Ekiti 5. Christ Senior Secondary School 6. AUD Grammar School, Ikole-Ekiti 7. Ado Grammar School, Ado-Ekiti 8. Mary Immaculate Grammar School, Ado-Ekiti	
Taraba	1. Govt Senior Science. Sec. School, Jalingo 2. Government College(Senior), Jalingo 3. Govt Day Sec. School, Nukkai, Jalingo 4. Govt Day Sec. Sch., Magami, Jalingo	North Central
Rivers	1. Govt Sec School, Elekahia 2. Govt Girls Sec School, Orominieke 3. Comprehensive Sec School, Oginigba 4. Community Sec School, Amadi-Ama 5. Enitonna High Sch., Port Harcourt 6. Govt. Sec. School, Harbour Road 7. Govt Girls Sec Sch., Rumueme, P/Harcourt 8. Comprehensive Sec Sch, Burukiri	South south
Abia	1. Government College, Umuahia 2. Evangel High. School, Umuahia 3. Girls Secondary School, Umuahia 4. Santa Crux High School, Olokoro, Umuahia	South East
Imo	1. Madonna Snr. Sec. Sch. for Science, Etiti 2. Boys Model Sec School, New Owerri 3. Holy Rosary Sec. School, Ihioma 4. Owerre-Nkwoji Sec Sch, Owerre Nkwoji 5. Egbu Girls' Secondary School, Egbu, Owerri 6. Government College, Owerri 7. Girls' Secondary School, Ikenegbu, Owerri 8. Holy Ghost College, Owerri	South East
Enugu	1. College of Immaculate Conception (CIC), Enugu 2. Queens School, Enugu 3. St Patrick's School, Emene-Enugu 4. Government Technical College, Abakaliki Road, Enugu	South East
Kaduna	1. Queen Amina College, Kakuri, Kaduna 2. Kaduna Capital School, Malali, Kaduna 3. Government College, Kaduna 4. Government Technical College, Malali, Kaduna	North West
***Lagos	1. Government Technical College, Eric Moore, Surulere 2. Model College,Badore- Aja Lagos *3. Queens College, Yaba, Lagos 4. Awori College, Ojo, Lagos *5. Kings College, Victoria Island, Lagos (KC)	South West
Kwara	1. Govt Sec School, Afon 2. Govt High School, Ilorin 3. Govt Girls Day Sec Sch, Oko Erin 4. Okelele Comm Sec Sch, Ilorin	North Central
Bauchi	1. Government Day Secondary School, Kofar Wambai, Bauchi 2. Govt. Girls College, Ran Road, Bauchi	North East

	3. General Hassan Usman Katsina Unity College, Bauchi 4. Government Comprehensive Day Sec. Sch., Bauchi	
***Ogun	1. Iganmode Grammar School, Otta 2. Baptist Boys' High School, Oke Saje, Abeokuta 3. Comprehensive Secondary School, Ayetoro 4. Remo Secondary School, Sagamu	South West

Population: 6 Geo-political Zones, (16%)
24 States including Abuja, (67% of the states)
4 States in SW (22 schools, but 20 schools were visited for the study 100 %)
(20 schools out of which 22 schools are purposively selected)
***the sampled states and schools
*Schools not visited because no Junior School existed as at the time of research
Source; www.schoolnet.org

The scope of the project includes:

- 21 workstations, 1 server, printer, UPS, VSAT and Internet Connectivity
- A server based curriculum education content software covering 9 subjects.
- Technical training involving 4 staff from each school
- Teacher training involving 6 teachers from each school
- A power generator for alternative power supply.

Appendix VIII

University of Ibadan, Ibadan
Institute of Education
International Centre for Educational Evaluation

Schedule of timeTable for the teaching and learning of the Computer in SNNG schools

Name of school	No. of period on the timeTable	No. of practical in the class	% Time for searching every week
School 1	3	1	33 ⅓%
School 2	3	1	33 ⅓%
School 3	3	1	33 ⅓%
School 4	3	1	33 ⅓%
School 5	3	1	33 ⅓%
School 6	3	1	33 ⅓%
School 7	3	1	33 ⅓%
School 8	3	1	33 ⅓%
School 9	3	1	33 ⅓%
School 10	3	1	33 ⅓%
School 11	3	-	-
School 12	3	1	33 ⅓%
School 13	3	1	33 ⅓%
School 14	3	1	33 ⅓%
School 15	3	1	33 ⅓%
School 16	3	1	33 ⅓%
School 17	3	1	33 ⅓%
School 18	3	1	33 ⅓%
School 19	3	1	33 ⅓%
School 20	3	1	33 ⅓%

Sample components of the computer in schools and pictures

Dell Dimension 4100 Set up

BIOS Version	AO5
Processor Type	Intel ® Pentium ® III
Processor Speed	733 MHz
System Bus Frequency	133 MHz
Caches RAM	236KB
Service Tag	9FWG11X
Total Memory	128MB
Memory Bank	Not installed
Memory Bank 1	128MB (PC 100)
HDD	40GG
HDD-server	80GG

Appendix IX

University of Ibadan, Ibadan

Institute of Education

International Centre for Educational Evaluation

Status of the SNNG facilities in the schools visited in southwest, Nigeria.

	Computer system	Server	Printer	UPS	VSAT	Internet Connectivity	Curriculum content software	Scanners	White marker board	Smooth board	Projectors	Speakers	Fire extinguisher	Stabiliser	Generator	Services
School 1	21	1	1	15	1	1	1	1	1	1		42	2	7	1	
Present	21	1	1	15	1	1	1	1	1	1		42	2	7	1	
No. in use	21	1	1	15	1	1	1	1	1	1		42	2	7	1	
Replacement	0	0	0	0	0	0	0	0	0	0		0	0	0	0	
Repair	0	0	0	0	0	0	0	0	0	0		0	0	0	0	
Service	0	0	0	0	0	0	0	0	0	0		0	0	0	0	
School 2	21	1	1	12	1	1	1	1	1	1		42	2	7	1	
Present	21	1	1	12	1	1	1	1	1	1		42	2	7	1	
No. in use	18	1	1	12	1	1	1	1	1	1		42	2	7	1	
Replacement	0	0	0	0	0	0	0	0	0	0		0	0	0	0	
Repair	3	0	0	0	0	0	0	0	0	0		0	0	0	0	
Service	0	0	0	0	0	0	0	0	0	0		0	0	0	0	
School 3	21	1	1	10	1	1	1	1	1	1		42	2	7	1	
Present	21	1	1	10	1	1	1	1	1	1		42	2	7	1	
No. in use	21	1	1	10	1	1	1	1	1	1		42	2	7	1	
Replacement	0	0	0	0	0	0	0	0	0	0		0	0	0	0	
Repair	0	0	0	0	0	0	0	0	0	0		0	0	0	0	
Service	0	0	0	0	0	0	0	0	0	0		0	0	0	0	
School 4	21	1	1	7	1	1	1	1	1	1		42	2	6	1	
Present	21	1	1	7	1	1	1	1	1	1		42	2	6	1	
No. in use	21	1	1	7	1	1	1	1	1	1		42	2	6	1	
Replacement	0	0	0	0	0	0	0	0	0	0		0	0	0	0	
Repair	0	0	0	0	0	0	0	0	0	0		0	0	0	0	
Service	0	0	0	0	0	0	0	0	0	0		0	0	0	0	
School 5	21	1	1	6	1	1	1	1	1	1		42	2	7	1	
Present	21	1	1	6	1	1	1	1	1	1		42	2	7	1	
No. in use	21	1	1	6	1	1	1	1	1	1		42	2	7	1	
Replacement	0	0	0	0	0	0	0	0	0	0		0	0	0	0	
Repair	0	0	0	0	0	0	0	0	0	0		0	0	0	0	
Service	0	0	0	0	0	0	0	0	0	0		0	0	0	0	
School 6	21	1	1	10	1	1	1	1	1	1	1	42	2	3	1	
Present	21	1	1	10	1	1	1	1	1	1	1	42	2	3	1	
No. in use	21	1	1	10	1	1	1	1	1	1	1	42	2	3	1	
Replacement	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Repair	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Service	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
School 7	21	1	1	10	1	1	1	1	1	1		42	2	3	1	

Present	21	1	1	10	1	1	1	1	1	1		42	2	3	1	
No. in use	21	1	1	10	1	1	1	1	1	1		42	2	3	1	
Replacement	0	0	0	0	0	0	0	0	0	0		0	0	0	0	
Repair	0	0	0	0	0	0	0	0	0	0		0	0	0	0	
Service	0	0	0	0	0	0	0	0	0	0		0	0	0	0	
School 8	21	1	1	10	1	1	1	1	1	1		42	2	3	1	
Present	21	1	1	10	1	1	1	1	1	1		12	2	3	1	
No. in use	21	1	1	10	1	1	1	1	1	1		12	2	3	1	
Replacement	0	0	0	0	0	0	0	0	0	0		0	0	0	0	
Repair	0	0	0	0	0	0	0	0	0	0		0	0	0	0	
Service	0	0	0	0	0	0	0	0	0	0		0	0	0	0	
School 9	21	1	1	10	1	1	1	1	1	1		42	2	4	1	
Present	21	1	1	10	1	1	1	1	1	1		42	2	4	1	
No. in use	21	1	1	10	1	1	1	1	1	1		42	2	3	1	
Replacement	0	0	0	0	0	0	0	0	0	0		0	0	0	0	
Repair	3	0	0	0	0	0	0	0	0	0		0	0	0	0	
Service	3	0	0	0	0	0	0	0	0	0		0	0	0	0	
School 10	21	1	1	10	1	1	1	1	1	1		42	2	3	1	
Present	21	1	1	10	1	1	1	1	1	1		42	2	3	1	
No. in use	21	1	1	10	1	1	1	1	1	1		42	2	3	1	
Replacement	0	0	0	0	0	0	0	0	0	0		0	0	0	0	
Repair	0	0	0	0	0	0	0	0	0	0		0	0	0	0	
Service	0	0	0	0	0	0	0	0	0	0		0	0	0	0	
School 11	21	1	1	10	1	1	1	1	2	1	1	42	2	2	1	
Present	21	1	1	10	1	1	1	1	2	1	1	42	2	2	1	
No. in use	0	1	1	10	1	1	1	1	2	1	1	42	2	0	1	
Replacement	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Repair	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Service	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
School 12	21	1	1	12	1	1	1	1	2	1	1	42	2	3	1	
Present	21	1	1	12	1	1	1	1	2	1	1	42	2	3	1	
No. in use	21	1	1	12	1	1	1	1	2	1	1	42	2	3	1	
Replacement	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Repair	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Service	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
School 13	21	1	1	15	1	1	1	1	1	1	1	42	2	3	1	
Present	21	1	1	15	1	1	1	1	1	1	1	42	2	3	1	
No. in use	21	1	1	15	1	1	1	1	1	1	1	42	2	3	1	
Replacement	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Repair	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Service	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
School 14	21	1	3	12	1	1	1	1	1	1	1	42	2	3	1	
Present	21	1	3	12	1	1	1	1	1	1	1	42	2	3	1	
No. in use	21	1	3	12	1	1	1	1	1	1	1	42	2	3	1	
Replacement	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Repair	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Service	0	0	0	0	0	0	0	0	0	0		0	0	0	0	
School 15	21	1	2	15	1	1	1	1	1	1	1	44	2	4	1	

Present	21	1	2	15	1	1	1	1	1	1	1	42	2	4	1	
No. in use	21	1	2	15	1	1	1	1	1	1	1	42	2	4	1	
Replacement	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Repair	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Service	0	0	0	0	0	0	0	0	0	0		0	0	0	0	
School 16	21	1	3	8	1	1	1	1	1	1		42	2	6	1	
Present	21	1	3	8	1	1	1	1	1	1		42	2	6	1	
No. in use	21	1	3	8	1	1	1	1	1	1		42	2	6	1	
Replacement	15	0	0	0	0	0	0	0	0	0		0	0	0	0	
Repair	0	0	0	0	0	0	0	0	0	0		0	0	0	0	
Service	0	0	0	0	0	0	0	0	0	0		0	0	0	0	
School 17	21	1	1	10	1	1	1	1	1	1		42	2	6	1	
Present	21	1	1	10	1	1	1	1	1	1		42	2	6	1	
No. in use	21	1	1	10	1	1	1	1	1	1		42	2	6	1	
Replacement	15	0	0	0	0	0	0	0	0	0		0	0	0	0	
Repair	0	0	0	0	0	0	0	0	0	0		0	0	0	0	
Service	0	0	0	0	0	0	0	0	0	0		0	0	0	0	
School 18	21	1	1	12	1	1	1	1	1	1		42	2	6	1	
Present	21	1	1	12	1	1	1	1	1	1		42	2	6	1	
No. in use	21	1	1	12	1	1	1	1	1	1		42	2	6	1	
Replacement	15	0	0	0	0	0	0	0	0	0		0	0	0	0	
Repair	5	0	0	0	0	0	0	0	0	0		0	0	0	0	
Service	0	0	0	0	0	0	0	0	0	0		0	0	0	0	
School 19	21	1	2	14	1	1	1	1	2	1		42	2	7	1	
Present	21	1	2	14	1	1	1	1	2	1		42	2	7	1	
No. in use	21	1	2	14	1	1	1	1	2	1		42	2	7	1	
Replacement	15	0	0	0	0	0	0	0	0	0		0	0	0	0	
Repair	0	0	0	0	0	0	0	0	0	0		0	0	0	0	
Service	0	0	0	0	0	0	0	0	0	0		0	0	0	0	
School 20	21	1	2	12	1	1	1	1	1	1		42	2	6	1	
Present	21	1	2	12	1	1	1	1	1	1		42	2	6	1	
No. in use	21	1	2	12	1	1	1	1	1	1		42	2	6	1	
Replacement	15	0	0	0	0	0	0	0	0	0		0	0	0	0	
Repair	0	0	0	0	0	0	0	0	0	0		0	0	0	0	
Service	0	0	0	0	0	0	0	0	0	0		0	0	0	0	

Appendix XI

University of Ibadan, Ibadan
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Checklist Report sheet

	Computer system	Server	Printer	UPS	VSAT	Internet Connectivity	Curriculum content software	Scanners	White marker board	Smooth board	Projectors	Speakers	Fire extinguisher	Stabiliser	Generator	Services
School 1																
Present																
No. in use																
Replacement																
Repair																
Service																
School 2																
Present																
No. in use																
Replacement																
Repair																
Service																
School 3																
Present																
No. in use																
Replacement																
Repair																
Service																
School 4																
Present																
No. in use																
Replacement																
Repair																
Service																
School 5																
Present																
No. in use																
Replacement																
Repair																
Service																
School 6																
Present																
No. in use																
Replacement																
Repair																
Service																
School 7																
Present																

No. in use																
Replacement																
Repair																
Service																
School 8																
Present																
No. in use																
Replacement																
Repair																
Service																
School 9																
Present																
No. in use																
Replacement																
Repair																
Service																
School 10																
Present																
No. in use																
Replacement																
Repair																
Service																
School 11																
Present																
No. in use																
Replacement																
Repair																
Service																
School 12																
Present																
No. in use																
Replacement																
Repair																
Service																
School 13																
Present																
No. in use																
Replacement																
Repair																
Service																
School 14																
Present																
No. in use																
Replacement																
Repair																
Service																
School 15																
Present																

No. in use																
Replacement																
Repair																
Service																
School 16																
Present																
No. in use																
Replacement																
Repair																
Service																
School 17																
Present																
No. in use																
Replacement																
Repair																
Service																
School 18																
Present																
No. in use																
Replacement																
Repair																
Service																
School 19																
Present																
No. in use																
Replacement																
Repair																
Service																
School 20																
Present																
No. in use																
Replacement																
Repair																
Service																

Appendix XI

University of Ibadan, Ibadan
Institute of Education
International Centre for Educational Evaluation

Quality as measured by the Checklist

	Computer system	Server	Printer	UPS	VSAT	Internet Connectivity	Curriculum content software	Scanners	White marker board	Smooth board	Projectors	Speakers	Fire extinguisher	Stabiliser	Generator	Services
Total	420	20	27	217	20	20	20	20	20	20	6	840	40	96	20	
Ekiti State	168	8	8	80	8	8	8	8	8	8	1	336	16	43	8	
No. in use	165	8	8	80	8	8	8	8	8	8	1	336	16	43	8	
Replacement	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Repair	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Service	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Lagos State	63	3	3	30	3	3	3	3	3	3	1	126	6	9	3	
No. in use	63	3	3	30	3	3	3	3	3	3	1	126	6	9	2	
Replacement	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Repair	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	
Service	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Ogun State	84	4	4	54	4	4	4	4	4	4	4	168	8	11	4	
No. in use	84	4	4	54	4	4	4	4	4	4	4	168	8	11	4	
Replacement	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Repair	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Service	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Ondo State	105	5	12	53	5	5	5	5	5	5		210	10	33	5	
No. in use	105	5	12	53	5	5	5	5	5	5		210	10	33	5	
Replacement	60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Repair	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Service	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

Appendix XII

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The analysis of the infrastructure as observed on the field of study

	Item	Frequency	Ekiti	Lagos	Ogun	Ondo
A	Computer laboratory	20	8	3	4	5
B	Generator	20	8	3	4	5
C	Student chairs	840	336	126	168	210
D	Computer desks	200	80	30	40	50
E	Air Conditions	80	32	12	16	20
F	Ceiling Fans	120	48	18	24	30
G	Fire Extinguisher	40	16	6	8	10
H	Teachers Table	80	32	12	16	20

Appendix XIII

University of Ibadan, Ibadan
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SCHEME OF WORK FOR JSS ONE COMPUTER STUDIES
THEME: INFORMATION AGE

1. Technology of different information ages.
   Different Ages:
   i. Stone Age
   ii. Iron Age (Hoe and Cutlass).
   iii. Middle Age (Feather pen ink).
   iv. Industrial Age (Machine)
   v. Electronic Age computer and Internet
2. Data and Information
   a) Brings relevant materials to the class
   b) Guides discussion on the qualities of good information
   c) Guides students to:
      - Bring related materials to the class
      - Gather facts by counting, weighing, measuring, observation, etc.
      - Recognize these facts as unprocessed data.
3. Qualities of good information
   i. Accurate
   ii. Meaningful
   iii. Comprehensive
   iv. Relevant
   v. Timely
   vi. SuiTable
4. Information Transmission
   (a) Ancient methods of transmitting information:
      i. Oral
      ii. Beating Drums
      iii. Fire lighting
      iv. Town crying
      v. Whistling
      vi. Drawing diagram
      vii. Making representation
   (b) Modern methods of transmitting information:
      i. Prints
      ii. Telephone
      iii. Telex
      iv. Radio
      v. Television

vi. Fax
vii. Satellite
viii. Internet
ix. GSM

(c) Classification of means of transmitting information
i. Electronic
ii. Non-Electronic
iii. Modes of receiving information

(d) Modes of receiving information
i. Audio
ii. Visual
iii. Audio-Visual

Information Evolution
Evolution of information and Communication Technology (ICT):
i. Invention of printing
ii. Invention of computer
iii. Linking up of computers with Information and Communication (ICT)

5. Data processing
i. Definition
ii. Data processing cycle:
i. Data gathering
ii. Definition
iii. Data Collation
iv. Input stage
v. Processing stage
vi. Storage Stage
vii. Output stage

3. Importance of the computer as a tool computer as a tool for processing data
i. increased accuracy
ii. Efficient storage facilities
iii. Fast access to information
iv. Handles respective tasks

Historical Development of Computers
i. Early counting devices
i. Fingers
ii. Stones
iii. Sticks
iv. Pebbles
v. Cowries, etc.
ii. Mechanical counting and calculating devices:
i. Abacus

ii. Side rule etc.

iii. Electro-mechanical counting devices:
   i. John Napier bone
   ii. Blaire Pascal machine
   iii. Gottfried Leibniz machine
   iv. Joseph Jacquard loom
   v. Charles Babbage analysis machine
   vi. Philip Emeagwali

iv. Electronic counting devices and modern computer:
   i. Herman Hollerith punch cards
   ii. John Von Neumann machine
   iii. Modern machines

v. Generations of computers:
   i. First generation computers
   ii. Second generation computers
   iii. Third generation computers
   iv. Fourth generation computers
   v. Fifth generation computers

THEME: BASIC COMPUTER OPERATIONS AND CONCEPTS

1. Basic Computer Concepts
   (a) Definition of a computer
   (b) Description of a computer as an Input Process – Output (IPO) system.
   (c) Parts of a computer system:
      i. System unit
      ii. Monitor (VDU)
      iii. Keyboard
      iv. Mouse
      v. Printer
      vi. Speakers
   (d) Input Devices:
      i. Keyboard
      ii. Mouse
      iii. Scanner
      iv. Light pen etc.
   (e) Output Devices:
      i. Monitor (VDU)
      ii. Printer
      iii. Speaker etc.
   (f) System Unit:
      i. Central Processing Unit
      ii. Memory Unit
2. Input Devices

   Function of input devices:

i. Keyboard
ii. Mouse

3. Output Devices
   Function of output devices:
   i. Monitor
   ii. Printers
4. System Unit
   Function of:
   i. Central Processing Unit (Arithmetic Logical Unit – ALU, Control Unit)
   ii. Main Memory
5. Fundamental Computer Operators
   (a) System startup:
      i. Cold booting
      ii. Warm booting
      iii. System shutdown
   (b) Word processing
      i. Definition
      ii. Uses of word processor
      iii. Examples of word processor
      iv. Loading an existing word processor
      v. Creating, saving and retrieving files

THEME: INFORMATION AND COMMUNICATION TECHNOLOGY (ICT)
ICT Appplication in everyday life

1. Uses of ICT:
   i. Communication
   ii. Timing and control
   iii. Information processing/management
2. ICT and the society

THEME: COMPUTER ETHICS AND HUMAN ISSUES
Computer Ethics

1. Computer Room Management Ethics
   i. Maintaining a dust-free environment
   ii. Appropriate lighting system
   iii. Setting computer
2. Laboratory rules and regulations:
   i. Arrange chairs and Tables in a comforTable manner
   ii. Arrange the computers and their peripherals in an orderly manner

Word Processing

i. Definition
ii. Uses of word processor
iii. Examples of word processor
iv. Loading and existing word processor

v. Creating, saving and retrieving files

THEME: INFORMATION AND COMMUNICATION TECHNOLOGY (ICT)
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   i. Communication
   ii. Timing and control
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THEME: COMPUTER ETHICS AND HUMAN ISSUES
Computer Ethics

1. Computer Room Management

   Ethics:
   i. Maintaining dust-free environment
   ii. Appropriate ventilation
   iii. Appropriate lighting system
   iv. Setting computer
2. Laboratory rules and regulations
   i. Arrange chairs and Tables in a comforTable manner
   ii. Arrange the computers and their peripherals in an orderly manner

SCHEME OF WORK FOR JSS TWO COMPUTER STUDIES
THEME: BASIC COMPUTER OPERATIONS AND CONCEPTS

1. Classification of computers

   Classification of computers by:

   (a) Generation:
      i. First generation computers
      ii. Second generation computers
      iii. Third generation computers
      iv. Fourth generation computers
      v. Fifth generation computers

   (b) Types:
      i. Analog
      ii. Digital
      iii. Hybrid

   (c) Size:
      i. Micro computer
      ii. Mini Computer
      iii. Mainframe
      iv. Super computer

   (d) Degree of versatility
      i. General purpose
      ii. Special purpose
2. The Computer System

(a) The concept of computer system
(b) Components of computer system:
   i. Hardware components:
      - Arithmetic and logic unit
      - Control unit
      - Memory
      - Output device
      - External storage device
   ii. Software components:
      - System software
      - Applications software
   iii. People-ware components:
      - Computer professionals
      - Computer users

3. Computer Software
   i. Definition of software
   ii. Types and examples of software;
      - System software (operating system)
      - Application software (word processing, spreadsheet, graphics etc)

4. Operating systems
(a) Definition of an Operating System (OS)
(b) Examples of operating systems:
   i. DOS
   ii. Windows
   iii. Linux
   iv. Unix
(c) Function of Operating Systems:
   i. Resources allocation
   ii. System Monitoring
   iii. Utilities
(d) Number bases
   i. Decimal
   ii. Binary
   iii. Octal
   iv. Hexadecimal
(e) Units of storage in the computer
   i. Bit
   ii. Nibble
   iii. Byte
   iv. Word

THEME: COMPUTER PROBLEM SOLVING SKILLS

1. Programming Language
   (a) Meaning of Computer Programme

(b) Computer Programming Language:
   i. Meaning
   ii. Examples (Logo, BASIC, etc)

2. BASIC
   (a) BASIC language
      i. Meaning of BASIC
      ii. BASIC character set
   (b) Key BASIC statements:
      i. Line number
      ii. Remark (REM)
      iii. Assignments (LET, INPUT, DATA)
      iv. Output Statement
      v. Print
      vi. Programme Terminator (END, STOP)
   (c) Simple BASIC statements

THEME: COMPUTER APPLICATION PACKAGES

1. Graphic Packages I
   (a) Meaning of graphic packages
   (b) Examples of graphic packages:
      i. Paint
      ii. Corel draw
      iii. Instant artist
      iv. Harvard graphics
      v. Photo shops
      vi. Logo graphic etc.
   iii. Features:
      i. Tool bar
      ii. Menu bar
      iii. PrinTable area
      iv. Colour palette, etc.
2. Graphic Packages II

   The Paint:
      i. Paint environment
      ii. Paint tools and their functions

THEME: INFORMATION AND COMMUNICATIONS TECHNOLOGY (ICT)

1. ICT as a transformational tool
   (a) Meaning of ICT (Information and Communication Technology)
   (b) Examples:
      i. Computers
      ii. Telephone (GSM)
      iii. Cellular networks
      iv. Satellite Communication

v. Television
vi. Internet

(c) Benefits of ICT

i. Timely, better and cheaper access to knowledge and information;
ii. Speeds up transactions and processes;
iii. Causes human beings to interact with each other in new ways
iv. Distance becomes irrelevant in business transaction and dealings
v. Innovative ways of interaction

(d) Disadvantages of ICT:

i. Job loses
ii. Threatens other area/field of human endeavour, etc.

2. ICT Gadgets

i. The GSM
ii. Fax machine
iii. Telephone etc

3. Internet I

(a) Definitions

i. Internet (the largest computer network in the world)
ii. E-mail address
iii. Worldwide web (www)

(b) Internet browser:

i. Microsoft Internet Explorer
ii. Netscape, Mozilla.

(c) Creating e-mail account

(d) Samples of e-mail address e.g.:

i. musa@hotmail.com
ii. emeka@yahoo.com
iii. kola@onebox.com
iv. amooadesina@yahoo.co.uk
v. drsikiruamoo@yahoo.co.uk

(e) Benefits of Internet:

i. Information exchanges
ii. E-learning
iii. E-entertainment
iv. Faster and cheaper

(f) Abuses of Internet:

i. Fraud
ii. Pornography

4. Internet II

(a) Internet environment

(b) Uses of the Internet:

i. Sending mails
ii. Chatting

(c) Network groups

THEME: COMPUTER ETHICS AND HUMAN ISSUES

1. Computer Ethics
    a. Responsible use of computers and Internet
        i. Avoiding liquid dropping into the system
        ii. Using dust cover
        iii. Protection from power problem
        iv. Unplugging the system when not in use for long
        v. Check your e-mail regularly
        vi. Give prompt and polite response to mails
    b. Areas of misuse of computers:
        i. Invasion of privacy (hacking)
        ii. Computer virus
        iii. Fraud
        iv. Stealing
        v. Pornography
        vi. Cyber war
        vii. Piracy of software
        viii. Plagiarism
    c. Safety Measures
        i. The sitting posture
        ii. Using the antiglare protector
        iii. Positioning of monitor base
        iv. Illumination the computer room
        v. Maintaining a dust-free environment
        vi. Keep liquids away from computers

SCHEME OF WORK FOR JSS THREE COMPUTER STUDIES

THEME: INFORMATION AND COMMUNICATION TECHNOLOGY

1. Internet
    a. Examples of Search Engines
        i. Google.com
        ii. Mama.com
        iii. Ask.com
        iv. Yahoo.com
    b. Uses of Search Engines
2. Digital Divide
    a. Concept of digital divide
    b. Features of old economy
        i. Time consuming
        ii. Labour based
        iii. Mechanical
        iv. Constrained by space, time and distance etc.
    c. Features of new economy
        i. Digital

ii. Time, space and distance is irrelevant
iii. Technology driven
iv. Knowledge based, etc.

d. Limitations of the old economy
e. Benefits of new economy
    i. Low capital to start business
    ii. Creates new jobs etc.

THEME: COMPUTER APPLICATION PACKAGES

1. Database
    a. Definition
    b. Database terminologies
        i. Fields
        ii. Records
        iii. File
        iv. Database
        v. Key, etc.
    c. Forms of database:
        i. Flat file
        ii. Hierarchical
        iii. Relational etc.
2. Spreadsheet Packages
    a. Spreadsheet Packages
        i. Excel
        ii. LOTUS 123
        iii. STATVIEW, etc
    b. Uses of spread sheet packages
        i. Preparation of daily sales
        ii. Budget
        iii. Examination results
    c. Spreadsheet features and terminologies
        i. Row
        ii. Column
        iii. Cell
        iv. Worksheets
        v. Chart
        vi. Data range etc.
    d. Loading and exiting spread packages
3. Worksheets
    a. Starting worksheet
        i. Data entry
        ii. Editing
        iii. Saving
        iv. Retrieving worksheets

b. Formatting worksheet (text, cell and columns, naming etc).
c. Calculations
    i. Addition
    ii. Average
    iii. Counting
    iv. Multiplication
    v. Division, etc.
d. Printing of worksheets

4. Graphs
    a. Creating graphs
        i. Line graphs
        ii. Histograms
        iii. Pie-charts
        iv. Legends etc.
    b. Editing graphs
    c. Formatting graphs:
        i. Line graphs
        ii. Histograms
        iii. Pie-charts
        iv. Legends etc.

THEME: COMPUTER ETHICS AND HUMAN ISSUES

1. Human Issues
    a. Computer Professionals
        i. Computer Manager
        ii. System Analyst
        iii. Programmers
        iv. Computer educator
        v. Computer engineers and technicians
        vi. Operators
    b. Qualities of good computer professionals
    c. Computer Professional Bodies:
        i. Nigeria Computer Society (NCS)
        ii. Institute of Management Information System (IMIS)
        iii. Computer Professional Registration Council of Nigeria (CPRN)
        iv. Nigeria Internet Group (NIG)
2. Computer Viruses
    a. Meaning
    b. Types of computer virus
        i. Boot Sector
        ii. ExecuTable file virus
        iii. Attack on document
    c. Example of viruses:
        i. Trojan horse

ii. Sleeper
iii. Logic bomber
iv. Alabama virus
v. Christmas virus

d. Sources of viruses
i. Infected diskettes
ii. Infected CD-ROMs
iii. Emails
iv. Internet downloads
v. Illegal duplication of software, etc.

e. Virus warning signs
i. Slowing down of response time
ii. Presence of tiny dots
iii. Wandering across the screen
iv. Incomplete saving of file
v. Corruption of the system set-up instructions
vi. Appearance of strange characters

f. Virus detection (Antivirus)
i. Norton Antivirus
ii. McAfee Virus scan
iii. Dr Solomon's Took kit
iv. Penicillin

Appendix XIV

University of Ibadan, Ibadan
Institute of Education
International Centre for Educational Evaluation
Computer output

Frequency Table

Utilising computer

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Once	385	35.0	35.0	35.0
	Twice	605	55.0	55.0	90.0
	Thrice	110	10.0	10.0	100.0
	Total	1100	100.0	100.0	

Utilising internet

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	None	55	5.0	5.0	5.0
	Once	330	30.0	30.0	35.0
	Twice	660	60.0	60.0	95.0
	Thrice	55	5.0	5.0	100.0
	Total	1100	100.0	100.0	

Utilising Server

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Once	440	40.0	40.0	40.0
	Twice	605	55.0	55.0	95.0
	Thrice	55	5.0	5.0	100.0
	Total	1100	100.0	100.0	

Utilising UPS

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	None	55	5.0	5.0	5.0
	Once	275	25.0	25.0	30.0
	Twice	660	60.0	60.0	90.0
	Thrice	110	10.0	10.0	100.0
	Total	1100	100.0	100.0	

Utilising VSAT

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Once	385	35.0	35.0	35.0
	Twice	605	55.0	55.0	90.0
	Thrice	110	10.0	10.0	100.0
	Total	1100	100.0	100.0	

Utilising Speakers

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	None	55	5.0	5.0	5.0
	Once	330	30.0	30.0	35.0
	Twice	660	60.0	60.0	95.0
	Thrice	55	5.0	5.0	100.0
	Total	1100	100.0	100.0	

Utilising Stabilizer

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Once	440	40.0	40.0	40.0
	Twice	605	55.0	55.0	95.0
	Thrice	55	5.0	5.0	100.0
	Total	1100	100.0	100.0	

Access to computer

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Poor	275	25.0	25.0	25.0
	Fairly easy	660	60.0	60.0	85.0
	Easy	110	10.0	10.0	95.0
	Very easy	55	5.0	5.0	100.0
	Total	1100	100.0	100.0	

Access to internet

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Poor	165	15.0	15.0	15.0
	Fairly easy	605	55.0	55.0	70.0
	Easy	165	15.0	15.0	85.0
	Very easy	165	15.0	15.0	100.0
	Total	1100	100.0	100.0	

Acess to Server

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Poor	385	35.0	35.0	35.0
	Fairly easy	605	55.0	55.0	90.0
	Easy	110	10.0	10.0	100.0
	Total	1100	100.0	100.0	

Access to UPS

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not easy	55	5.0	5.0	5.0
	Poor	330	30.0	30.0	35.0
	Fairly easy	660	60.0	60.0	95.0
	Easy	55	5.0	5.0	100.0
	Total	1100	100.0	100.0	

Access to VSAT

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Poor	440	40.0	40.0	40.0
	Fairly easy	605	55.0	55.0	95.0
	Easy	55	5.0	5.0	100.0
	Total	1100	100.0	100.0	

Access to Speakers

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not easy	55	5.0	5.0	5.0
	Poor	275	25.0	25.0	30.0
	Fairly easy	660	60.0	60.0	90.0
	Easy	110	10.0	10.0	100.0
	Total	1100	100.0	100.0	

Access to VSAT

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Poor	440	40.0	40.0	40.0
	Fairly easy	605	55.0	55.0	95.0
	Easy	55	5.0	5.0	100.0
	Total	1100	100.0	100.0	

Reliability

```
[DataSet1] C:\Users\User\Documents\NEWDATAMODE.sav
```

Scale: ALL VARIABLES

Case Processing Summary

		N	%
Cases	Valid	1100	100.0
	Excluded[a]	0	.0
	Total	1100	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
.950	.954	7

Item Statistics

	Mean	Std. Deviation	N
Utilising computer	2.75	.623	1100
Utilising internet	2.65	.654	1100
Utilising Server	2.65	.573	1100
Utilising UPS	2.75	.699	1100
Utilising VSAT	2.75	.623	1100
Utilising Speakers	2.65	.654	1100
Utilising Stabilizer	2.65	.573	1100

Inter-Item Correlation Matrix

	Utilising computer	Utilising internet	Utilising Server	Utilising UPS	Utilising VSAT	Utilising Speakers	Utilising Stabilizer
Utilising computer	1.000	.891	.877	.431	1.000	.891	.877
Utilising internet	.891	1.000	.875	.246	.891	1.000	.875
Utilising Server	.877	.875	1.000	.407	.877	.875	1.000
Utilising UPS	.431	.246	.407	1.000	.431	.246	.407
Utilising VSAT	1.000	.891	.877	.431	1.000	.891	.877
Utilising Speakers	.891	1.000	.875	.246	.891	1.000	.875
Utilising Stabilizer	.877	.875	1.000	.407	.877	.875	1.000

Scale Statistics

Mean	Variance	Std. Deviation	N of Items
18.85	14.941	3.865	7

ANOVA

		Sum of Squares	df	Mean Square	F	Sig
Between People		2345.750	1099	2.134		
Within People	Between Items	18.857	6	3.143	29.438	.000
	Residual	704.000	6594	.107		
	Total	722.857	6600	.110		
Total		3068.607	7699	.399		

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items

Grand Mean = 2.69

Reliability

```
DataSet1] C:\Users\User\Documents\NEWDATAMODE.sav
```

Scale: ALL VARIABLES

Case Processing Summary

		N	%
Cases	Valid	1100	100.0
	Excluded[a]	0	.0
	Total	1100	100.0

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

Reliability Statistics

Cronbach's Alpha	Part 1	Value	.857
		N of Items	4[a]
	Part 2	Value	.956
		N of Items	3[b]
	Total N of Items		7
Correlation Between Forms			.953
Spearman-Brown Coefficient	Equal Length		.976
	Unequal Length		.976
Guttman Split-Half Coefficient			.967

a. The items are: Utilising computer, Utilising internet, Utilising Server, Utilising UPS.

b. The items are: Utilising VSAT, Utilising Speakers, Utilising Stabilizer.

Item Statistics

	Mean	Std. Deviation	N
Utilising computer	2.75	.623	1100
Utilising internet	2.65	.654	1100
Utilising Server	2.65	.573	1100
Utilising UPS	2.75	.699	1100
Utilising VSAT	2.75	.623	1100
Utilising Speakers	2.65	.654	1100
Utilising Stabilizer	2.65	.573	1100

Inter-Item Correlation Matrix

	Utilising computer	Utilising internet	Utilising Server	Utilising UPS	Utilising VSAT	Utilising Speakers	Utilising Stabilizer
Utilising computer	1.000	.891	.877	.431	1.000	.891	.877
Utilising internet	.891	1.000	.875	.246	.891	1.000	.875
Utilising Server	.877	.875	1.000	.407	.877	.875	1.000
Utilising UPS	.431	.246	.407	1.000	.431	.246	.407
Utilising VSAT	1.000	.891	.877	.431	1.000	.891	.877
Utilising Speakers	.891	1.000	.875	.246	.891	1.000	.875
Utilising Stabilizer	.877	.875	1.000	.407	.877	.875	1.000

Scale Statistics

	Mean	Variance	Std. Deviation	N of Items
Part 1	10.80	4.564	2.136	4[a]
Part 2	8.05	3.150	1.775	3[b]
Both Parts	18.85	14.941	3.865	7

a. The items are: Utilising computer, Utilising internet, Utilising Server, Utilising UPS.

b. The items are: Utilising VSAT, Utilising Speakers, Utilising Stabilizer.

ANOVA

		Sum of Squares	df	Mean Square	F	Sig
Between People		2345.750	1099	2.134		
Within People	Between Items	18.857	6	3.143	29.437	.000
	Residual	704.000	6594	.107		
	Total	722.857	6600	.110		
Total		3068.607	7699	.399		

Grand Mean = 2.69

Reliability

[DataSet1] C:\Users\User\Documents\NEWDATAMODE.sav

Scale: ALL VARIABLES

Case Processing Summary

		N	%
Cases	Valid	1100	100.0
	Excluded[a]	0	.0
	Total	1100	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
.900	.913	7

Item Statistics

	Mean	Std. Deviation	N
Access to computer	2.95	.740	1100
Access to internet	3.30	.900	1100
Acess to Server	2.75	.623	1100
Access to UPS	2.65	.654	1100
Access to VSAT	2.65	.573	1100
Access to Speakers	2.75	.699	1100
Access to VSAT	2.65	.573	1100

Inter-Item Correlation Matrix

	Access to computer	Access to internet	Acess to Server	Access to UPS	Access to VSAT	Access to Speakers	Access to VSAT
Access to computer	1.000	.548	.624	.584	.431	.556	.431
Access to internet	.548	1.000	.491	.518	.495	.517	.495
Acess to Server	.624	.491	1.000	.891	.877	.431	.877
Access to UPS	.584	.518	.891	1.000	.875	.246	.875
Access to VSAT	.431	.495	.877	.875	1.000	.407	1.000
Access to Speakers	.556	.517	.431	.246	.407	1.000	.407
Access to VSAT	.431	.495	.877	.875	1.000	.407	1.000

Scale Statistics

Mean	Variance	Std. Deviation	N of Items
19.70	14.523	3.811	7

ANOVA

		Sum of Squares	df	Mean Square	F	Sig
Between People		2280.143	1099	2.075		
Within People	Between Items	377.929	6	62.988	303.979	.000
	Residual	1366.357	6594	.207		
	Total	1744.286	6600	.264		
Total		4024.429	7699	.523		

Grand Mean = 2.81

Reliability

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Scale: ALL VARIABLES

Case Processing Summary

		N	%
Cases	Valid	1100	100.0
	Excluded[a]	0	.0
	Total	1100	100.0

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

Reliability Statistics

Cronbach's Alpha	Part 1	Value	.845
		N of Items	4[a]
	Part 2	Value	.800
		N of Items	3[b]
	Total N of Items		7
Correlation Between Forms			.805
Spearman-Brown Coefficient	Equal Length		.892
	Unequal Length		.894
Guttman Split-Half Coefficient			.846

a. The items are: Access to computer , Access to internet, Acess to Server, Access to UPS.

Case Processing Summary

		N	%
Cases	Valid	1100	100.0
	Excluded[a]	0	.0
	Total	1100	100.0

b. The items are: Access to VSAT, Access to Speakers, Access to VSAT.

Item Statistics

	Mean	Std. Deviation	N
Access to computer	2.95	.740	1100
Access to internet	3.30	.900	1100
Acess to Server	2.75	.623	1100
Access to UPS	2.65	.654	1100
Access to VSAT	2.65	.573	1100
Access to Speakers	2.75	.699	1100
Access to VSAT	2.65	.573	1100

Inter-Item Correlation Matrix

	Access to computer	Access to internet	Acess to Server	Access to UPS	Access to VSAT	Access to Speakers	Access to VSAT
Access to computer	1.000	.548	.624	.584	.431	.556	.431
Access to internet	.548	1.000	.491	.518	.495	.517	.495
Acess to Server	.624	.491	1.000	.891	.877	.431	.877
Access to UPS	.584	.518	.891	1.000	.875	.246	.875
Access to VSAT	.431	.495	.877	.875	1.000	.407	1.000
Access to Speakers	.556	.517	.431	.246	.407	1.000	.407
Access to VSAT	.431	.495	.877	.875	1.000	.407	1.000

Scale Statistics

	Mean	Variance	Std. Deviation	N of Items
Part 1	11.65	5.933	2.436	4[a]
Part 2	8.05	2.450	1.565	3[b]
Both Parts	19.70	14.523	3.811	7

a. The items are: Access to computer , Access to internet, Access to Server, Access to UPS.

b. The items are: Access to VSAT, Access to Speakers, Access to VSAT.

ANOVA

		Sum of Squares	df	Mean Square	F	Sig
Between People		2280.143	1099	2.075		
Within People	Between Items	377.929	6	62.988	303.979	.000
	Residual	1366.357	6594	.207		
	Total	1744.286	6600	.264		
Total		4024.429	7699	.523		

Grand Mean = 2.81

Reliability

[DataSet1] C:\Users\User\Documents\NEWDATAMODE.sav

Descriptive Statistics

	Mean	Std. Deviation	N
Utilising computer	2.75	.623	1100
Utilising internet	2.65	.654	1100
Utilising Server	2.65	.573	1100
Utilising UPS	2.75	.699	1100
Utilising VSAT	2.75	.623	1100
Utilising Speakers	2.65	.654	1100
Utilising Stabilizer	2.65	.573	1100

Descriptive Statistics

	Mean	Std. Deviation	N
Access to computer	2.95	.740	1100
Access to internet	3.30	.900	1100
Acess to Server	2.75	.623	1100
Access to UPS	2.65	.654	1100
Access to VSAT	2.65	.573	1100
Access to Speakers	2.75	.699	1100
Access to stabilizer	2.65	.573	1100