THE IMPACT OF DIGITAL TECHNOLOGY IN TEACHING AND LEARNING COMPUTER SCIENCE IN SECONDARY SCHOOL

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PSC1511266

DEPARTMENT OF COMPUTER SCIENCE

FACULTY OF PHYSICAL SCIENCES

UNIVERSITY OF BENIN

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A PROJECT REPORT SUBMITTED TO THE DEPARTMENT OF COMPUTER SCIENCE, FACULTY OF PHYSICAL SCIENCES, UNIVERSITY OF BENIN, BENIN CITY, IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE AWARD OF A BACHELOR OF SCIENCE (B.Sc.) DEGREE IN COMPUTER SCIENCE.

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DEDICATION

This work is dedicated to the Almighty God for his grace towards my life and my academic pursuit and also to my mother Mrs. Helen Godfrey for her encouragement and my late father Mr. Napoleon Godfrey for bringing me into this part of eternity.

CERTIFICATION

This is to certify that this project was carried out by Godfrey Erere Juliet with Matriculation Number PSC1511266 of the Department of Computer Science in partial fulfillment of the requirements for the award of Bachelor Degree (B.Sc.) in Computer Science, University of Benin.

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Dr. F. Chete **Date**
(Project Supervisor)

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APPROVAL

This project work is hereby approved in partial fulfillment of the requirements for the award of Bachelor Degree (B.Sc.) in Computer Science, University of Benin.

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Head of Department

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ABSTRACT

This study investigates the impact of digital technology in teaching and learning computer science in secondary school. The study adopted the survey design on the basis of which data was sourced using questionnaire on a sample of 250 students in Benin Metropolis. The data was analysed using chi-square statistical tool. The result revealed that there is significant difference in the computer science teachers' attitude towards the use of technology Tools. Secondly, the result shows that there is significant difference in the computer science students' attitude towards the use of Technology Tools in learning. Similarly, the result indicated that there is no significant difference of self-efficacy in the use of Technology Tools in teaching of computer science. The result also shows that there is significant difference of self-efficacy in the use of Technology Tools in learning of computer science. The study recommends that since Technology Tools depends on power supply, the entire erratic power supply needs to be improved upon throughout the country. Also, school authority should improvise for alternative source of power supply such as generator set in case of power failure. More time should be allocated to the teaching of computer science on the time-table in our secondary schools so that there will be enough time for the teaching of computer science. Also, computer science teachers should not be too overwhelmed with too many assignments so that they will have time to plan technology enhanced classes. Teachers must be aware that for meaningful learning to take place, teacher-student interaction is an essential factor that must be strictly considered. It is therefore admonished that when integrating Technology Tools in computer science teaching, teachers should interact with the students while computer science teaching is going on.

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

The nature and purpose of education have changed as a result of digital technologies. Smart devices, the Internet of Things (IoT), artificial intelligence (AI), augmented reality (AR), virtual reality (VR), blockchain, and software applications are examples of versatile and disruptive technological innovations that have created new opportunities for improving teaching and learning (Gaol & Prasolova-Frland, 2021; OECD, 2021). Because of this, school systems around the world have emphasized their educational agendas to adapt strategies or policies around information and communication technology (ICT) integration in recent years (Fernández-Gutiérrez et al., 2020; Lawrence & Tar, 2018).

The latter created problems with regard to the effectiveness of ICT-based teaching and learning (Bates, 2015), particularly with regard to the comprehension, adaption, and design of educational systems in line with contemporary technology developments (Balyer & Oz, 2018). The process of changing behavior in the appropriate direction is called education. Education is, in other words, a social process that covers the growth of every aspect of human life. By fostering the intellect and preparing a student to face reality, education serves to teach students how to live their lives. The purpose of education is to enhance our minds so that we can think for ourselves and become more aware of other people's thoughts. It is not to teach us how to think or what to think (Escueta, Quan, Nickow & Oreopoulos, 2017). The only true goal of education is to leave a person in a state of constant inquiry (Bishop Creighton). Learning experiences that are facilitated by a human being are referred to as teaching (Not a computer-based, video, TV, or text-based program).

Technology is a term that originated from the Greek word *technologia*, which is a combination of *techne*, meaning "craft" and *logia* meaning "saying". As a result, technology might be considered the articulation of a craft. In a formal manner, it is a branch of knowledge that deals with the creation and use of technical means and their interrelation with life, society and the environment, drawing upon such subjects as industrial arts, engineering, applied science and pure science (Random House Dictionary, 2013).

Technology, which is known to be a growing part of any society today pervasively, had brought significant changes in the different fields like health, medicine, entertainment, business, trade and commerce, leisure, etc. The use of technology is at least one unavoidable reality twenty years after the introduction of personal computer (Matulac, 2013). Moreover, Matulac (2013) stated that closing our awareness regarding the changes brought by technology would mean death especially to educators. Integrating into education, it is also a key factor on the radical changes in the educational system (Bates, 2011). It turned classroom environment from teacher-centered to student-centered one. It increasingly moved the boundary of educational resources. The use of computer has transformed the traditional concepts of education (Shirley, Philip & Jennifer, 2007) confirming the statements of historic educationists: Thomas Edison (1922) 'motion pictures would replace textbooks in classrooms', William Levenson (1945) 'radio receivers would be as common in classrooms as the blackboard, and B. F. Skinner (1960s) 'new technology devices would vastly increase students' interest in learning'. Researchers conducted worldwide indicate that using technology has a positive impact on teaching and learning (Almekhlafi & Almeqdadi, 2010).

The idea that teaching and learning can successfully take place through the application of electronic communication facilities between teachers and students is one which had generated,

sometimes, hope and dismay and at other times, excitement and fear. Hope that many more learners can be reached at a more convenient pace that had erstwhile been the case, dismay that the infrastructures necessary for deploying an effective Technology Tools platform is lacking in low-income countries like Nigeria (Olakulehin, 2007). However, the use of Technology Tools in the education process has been divided into two broad categories: Technology Tools for Education and Technology Tools in Education. Technology Tools for education connote the development of information and communications technology specifically for teaching/learning purposes, while the Technology Tools in Education involves the adoption of general components of information and communication technologies in the teaching learning process (Olakulehin, 2007).

Computer is regarded as add-on rather than a replacing device. The pedagogic uses of the computer necessitate the development, among teachers as well as students, of skills and attitude related to effective use of Technology Tools. Aside of literacy, Technology Tools also facilitates learning to programme, learning in subject areas and learning at home on one's own, and these necessitate the use of new methods like modeling, simulation, use of data bases, guided discovery, closed-word exploration etc. The implications in terms of changes in the teaching strategy, instructional content, role of the teachers and context of the curricula are obvious as well as inevitable (Tella, Tella, Toyobo, Adika & Adeyinka, 2010). Pedagogy through the application of Technology Tools has the advantage of heightening the motivation; helping recall previous learning; providing new instructional stimuli; activating the learner's response; providing systematic and steady feedback; facilitating appropriate practice; sequencing learning appropriately; and providing a viable source of information for enhanced learning. Teachers who use this system of instructional strategy would be able to kindle in the hearts of the learners a

desirable attitude towards technology tools in their entire way of life (Tella, Tella, Toyobo, Adika & Adeyinka, 2010).

Technology plays a vital role in teaching and learning of computer science. Technology tools may enable student-centered learning activities and facilitate learner interaction in courses that are taught online. Based on their function, technology tools may fall into categories such as communication, organization and presentation, and course management systems (Zhu & Kaplan, 2002). These arrays of tools include not only the existing technology, but new ones being developed rapidly that often outperform the old ones. New technology tools like blogs, podcast, wikis, computers, wifi technology & internet, cell phones, smart white boards, projectors, smart board interactive displays, tablets, digital cameras, digital audio recorder, CD/DVD digital players, laser printers, microphones, megaphones, public address equipments, projection marker boards, classroom amplification system are changing the nature of tools from single to multiple functions, and capable of supporting teaching and learning of computer science.

Technology in teaching and learning of computer science can be understood as implementation of technology tools and equipments in computer science teaching and learning process. It is the pedagogical integration of technology in the teaching of computer science to bring about effective learning. That is, technology in computer science is not only limited to the establishment of networks and or the installation of equipments, but includes the use of technology tools in schools to improve the teaching quality and methods adopted by teachers in schools and to facilitate learning and educational development. It implies a process of appropriate, regular and regulated use of interactive technology with incurred beneficial changes in school practices and student learning.

Despite the abstract nature of computer science, its teaching is to bring about scientific thinking in students, a mindset that requires students to test out, through experiment. However through the use of Technological Tools, whether computers, projectors, power points, smart boards, internet etc the teaching and learning of computer science is very interesting, effective and efficient. According to Osunade (2003), internet is a valuable source of information for students looking for ideas for project and assignment. Agommuoh & Nzewi (2003) believe that secondary school students who were exposed to video-based instructions in computer science had significantly better results than those who were taught using the conventional method.

It is against this background of looking at Technology Tools as a medium of instruction in teaching and learning of computer science in secondary schools that this study is conceived. Therefore, the study is an attempt to establish through statistical analysis the influence of Technology Tools on teaching and learning of computer science in secondary schools.

1.2 Statement of the problem

Today, as the educational sector is faced with series of changes and reforms, it is good to reflect on matters concerned with computer science and the dissemination of computer science knowledge and lessons. Numerous teaching methods/strategies have been developed which corresponds to the accommodation of students' need and diverse learning method. One of such strategy involves the use of technology tools. The use of technology tools in teaching is a relevant and functional way of providing education to learners that will assist in imbibing in them the required capacity for the worth of work. Technology tools as been viewed as an agent of change just as stakeholders in education have expressed the need for teachers to use and integrate technological tools in education (Adeyemo, 2010).

Investigations during a Teaching Practice in Edo state revealed to that many learners at the senior secondary school strongly detest the manners in which the computer science teachers handle and deliver computer science knowledge and lessons in classrooms due to the fact that teachers were only limited to textbooks and chalkboard in passing out computer science knowledge to their students.

Technology tools are used in managing and processing information with the use of electronic computer system and computer software to convert, store, protect, process, transmit and retrieve information. Computer science on its own requires observation and knowledge to solve natural problems. Oshodi (1999) states that awareness towards the use of technology tools is increasing in the classroom in the developing world such that mere verbalization or over verbalization of words alone in the room to communicate ideas, skills and attitude to educate learners is futile. Angaye (2005) noted that the problem of technology illiteracy was a serious one among teachers in the country as it cuts across primary, secondary schools and tertiary institutions. He said that many teachers in the country did not have basic computer appreciation and skills and noted that the problem was a hindrance to efforts at achieving the use of technological tools for educational purposes in schools. Busari (2006) is of the view that poor reading skills of science and technology students, the state of laboratory facilities, and death of science textbooks affect effective teaching and learning of science subjects. If computer science Teachers and students in senior secondary schools are exposed to technological tools in classroom teachings, would it bring about an influence on teaching and learning of computer science?

As a response to this situation, there is an increasing emphasis on provision and improvement on the use of technology in teaching and learning. The concern or thrust of this

study therefore is to investigate the relative influence of technology tools on teaching and learning of computer science in secondary schools.

1.3 Aim and Objectives of the study

The main purpose of this study is to investigate the influence of Technology Tools on teaching and learning of computer science in Benin metropolis, Edo state. Specifically, the study will investigate the;

1. Influence of teachers' attitude towards the use of Technology Tools on computer science teaching in secondary schools.
2. Influence of students' attitude towards the use of Technology Tools on computer science learning in secondary schools.
3. Level of usage of Technology Tools in teaching of computer science in secondary schools.
4. Influence of self-efficacy in the use of Technology Tools on teaching and learning of computer science in secondary schools.

1.4 Research Questions

The following questions will be answered to guide the focus;

1. What is the influence of teachers' attitude towards the use of Technology Tools in computer science teaching in secondary schools?
2. What is the influence of students' attitude towards the use of Technology Tools on computer science learning?
3. What is the level of usage of Technology Tools in computer science teaching?
4. What is the level of usage of Technology Tools in computer science learning?
5. What is the influence of teachers' self-efficacy on the use Technology Tools in teaching computer science?

6. What is the influence of students' self-efficacy on the use of Technology Tools in learning computer science?

1.5 Scope of the study

The study focused on the influence of using Technology Tools on teaching and learning of computer science. The sample was selected secondary schools in Benin metropolis, Edo State. The study covered the teachers and students in selected schools in Benin metropolis. This is because attempt to all the secondary schools in Nigeria will be futile due to limited resources therefore the research work was limited to its present scope.

The limitations of this study were limited to teachers and students of senior secondary schools of the selected secondary schools in Benin metropolis, Edo state.

1.6 Methodology

This study adopted the survey design on the basis of which questionnaire was structured for targeted population. The questionnaire which is the instrument for data collection was in two basic instruments namely; (1) Influence of Technology Tools on Teaching Computer science Questionnaire (ITTTPQ) and (2) Influence of Technology Tools on Learning Computer science Questionnaire (TTILPQ). The two (2) instruments were structured questionnaires that featured section A, B and C (in the case of the teachers' questionnaire). However, the targeted population consisted of the secondary school computer science students and teachers in selected secondary schools in Benin metropolis, Edo State.

1.7 Significance of the study

The study will help students to understand the benefits of Technology by reducing the amount of direct instructions given to them by their teachers and enable them to get authentic

information on any area of knowledge they desire. It may also help reduce students' total dependence on teachers and enable them to work on their own.

The study will play a role in the development of students' skills and helps students' motivation towards learning of computer science in secondary schools and also offers the opportunities for students particularly those living in the rural communities, to broaden their employment prospects.

The study will help teachers to understand the importance of Technology Tools in computer science teaching and enable them to effectively utilize and implement Technology Tools in their pedagogical practice. It may help the educational administrators to critically monitor the activities of both students and teachers in order to ensure the implementation of Technology Tools in computer science teaching-learning process in secondary schools and to make the school system advance technologically. Since the governments are the curriculum planners, the study will enable them to understand the importance of Technology Tools in computer science teaching and learning and the need to implement it into computer science curriculum and also enable them to provide the necessary facilities and equipments for Technology implementation to be possible.

Definition of Terms and Variables

The following terms are here by clarified as used in the study.

TECHNOLOGY: The application of scientific knowledge for practical purposes, especially in industry.

TECHNOLOGY TOOLS: These are the applied scientific tools used in the application of scientific knowledge.

COMPUTER BASED TRAINING (CBT): is any course of instruction whose primary means of delivery is a computer. A CBT course (sometimes called courseware) may be delivered via a software product installed on a single computer, through a corporate or educational intranet, or over the Internet as Web-based training.

COMPUTER: An electronic device for storing and processing data, typically in binary form, according to instructions given to it in a variable program.

PROJECTOR: An object that is used to project rays of light, especially an apparatus with a system of lenses for projecting slides or film onto a screen.

SMART WHITE BOARD: Is a large interactive display that connects to a computer. A projector projects the computer's desktop onto the board's surface where users control the computer using a pen, finger, stylus, or other device.

INTERNET: The Internet is the global system of interconnected computer networks that use the Internet protocol suite (TCP/IP) to link billions of devices worldwide.

PODCAST: A digital audio file made available on the Internet for downloading to a computer or portable media player, typically available as a series, new installments of which can be received by subscribers automatically.

BLOG: A regularly updated website or web page, typically run by an individual or small group that is written in an informal or conversational style.

TECHNOLOGY ACCEPTANCE MODEL (TAM): is an information systems theory that models how users come to accept and use a technology.

PROFESSIONAL DEVELOPMENT: encompasses all types of facilitated learning opportunities including credentials such as academic degrees to formal coursework, conferences and informal learning opportunities situated in practice.

SELF EFFICACY: one's belief in one's ability to succeed in specific situations or accomplish a task.

PEDAGOGY: the method and practice of teaching, especially as in academic subject or theoretical concept.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

In this chapter, related review of literatures on the Influence of Technology Tools on teaching and learning of computer science were reviewed under the following sub-headings;

Theoretical Framework of the study

The Role of Computer science in the Society

The Role and Functions of ICT and Technology Tools in Computer science

Influence of Self-Efficacy on the Use of Technology Tools in Teaching and learning of computer science

Level of Usage of Technology Tools in Teaching and learning of computer science

Attitude of Computer science Teachers and Students Towards the Use of Technology Tools

Barriers to the Integration of Technology Tools in computer science teaching and learning

Appraisal of the Reviewed Literature

2.1 Theoretical Framework of the Study

One way of understanding how Technological Tools influences the teaching and learning environment of students which is linked to theoretical tools such as constructivism (Resnick, 1987). Constructivists believe that learning is construction of knowledge gotten from one's experiences rather receiving information from globe (Resnick, 1987). Constructivism therefore, refers to a learning approach that emphasizes on the importance of experiential exploratory

learning. It is evolved from the writings of Piaget and Bruner who focused on the relevance of direct meaningful knowledge construction through experience of the world (Collins & Green, 1992). Well-established scholars such as, Dewey (1916), Piaget (1972), Vygotsky (1978) and Bruner (1990), defines constructivism-learning theory as an active construction of new knowledge based on a learner's prior experience. Further, Bruner (1990) expounds it as a learning process in which the learner is able to build on present and previous information. Constructivist emphasizes on critical thinking, problem solving, authentic learning experiences, social negotiation of knowledge, and collaboration pedagogical methods that change the role of teacher from disseminator of information to learning facilitator, helping students as they actively engage with information and materials to construct their own understandings. Both the knowledge frameworks of students (prior knowledge) and of the knowledge domains relevant to the learning activities must be considered in the integration of Technology Tools. Many educators have argued that the appropriate use of Technology Tools by students can assist teachers in determining and catering for the prior knowledge of students.

Further, it is argued that Technology Tools can assist students in engaging them cognitively to a greater depth with knowledge domains. That is students are supported in employing the full range of thinking skills within authentic contexts. The educator who believes in constructivism should be concerned with personal conceptual frameworks, prior knowledge, students understandings, the relationship of formal knowledge to spontaneous frameworks, and the attitude of the learner to formal knowledge (Osborne & Wittrock, 1985; von Glasersfeld, 1991). Vosniadou (1994) argues that a belief in constructivism will determine the type of computer software used in classrooms and the manner in which computer-use is integrated with the curriculum and implemented in the classroom. However, this may be a little overstated, as

the fundamental focus for a constructivist starts with the individual student within the context of the environment in which that student is placed. Skinner believed that people could learn more effectively if their environment is carefully controlled.

He developed the principles of operant (behavior) conditioning. In the constructivist, view the learner as an active participant is involved in structuring his or her own learning experiences. Papert worked with Piaget who emphasized the way in which knowledge is structured and organized as well as how the learner's own perceptions of their prior experiences pre-form the knowledge structure. The importance of how the learner relates new experiences to existing knowledge becomes paramount. Snowman and Biehler (2003) describe constructivism in terms of four facets.

The first facet of constructivism is that "meaningful learning is the active creation of knowledge structures from personal experiences" (Snowman and Biehler 2003, 303). This suggests that learning occurs when people use their existing knowledge to understand and explain new ideas.

The second facet of constructivism is that it rejects standardization of curriculum and promotes customization based on the student's prior knowledge. Constructivism does not speculate a total transfer of knowledge from one person to another since individuals interpret and make meaning for them. It advocates the principles of multiple realities. Constructivism disputes assessment based on standard tests, and promotes testing which is part of the learning process.

The third principle of constructivism maintains that the truth is "in the mind of the beholder" (Snowman and Biehler 2003, 304). In other words, though people may generally agree on an issue, since they interpret their own meaning, which is influenced by their environment, they can have their own specific explanations for any issue.

The final facet of constructivism, "has to do with the formation and changing of knowledge structures" (Snowman and Biehler 2003, 304) Constructivist principles involve an open-ended environment, where learners get greater control of the learning process. According to social constructivism, learning generally is a socially mediated activity (Snowman and Biehler 2003). Thus, applying Vygotsky's theory of cognitive apprenticeship to the use of computers, Snowman and Biehler (2000) argue that computers can play a crucial role in facilitating learning for children. A computer can be used to link the learner to more knowledgeable peers and experts. Such a relationship mediated through ICT based modes of communication is referred to as 'Tele-apprenticeship' (Snowman and Biehler 2000).

ICT-based modes of communication help learners create strong relationships with mentors, experts and peers. Constructivism is the assimilation of experimentalist, humanistic, behaviorist and cognitive ideals and theory. When applying this theory in teaching and learning of Computer science, it is essential to understand that we need to consider the cultural environment in which this learning takes place. Moreover, constructivist-learning approach involves educators building school curriculum around the experience of their students. Constructivists believe learner-centric instructional classroom methods will strengthen the commitment and involvement of self-motivated learners because of their high level of interaction.

The focus of this study is based on what happens in the classroom and how Technology Tools are used in teaching and learning of Computer science. It responds to the reasons why and the ways in which teachers use Technology Tools in the classroom and how they are determined by their overall teaching attitude and competence of teachers and students. The presence and use of the Technology Tools resources by computer science students and teachers provides an avenue of interaction. These interactions provide feedback which acts as and reinforce towards

the learning process. Multimedia applications like games, drills, animation and other graphical applications provides practices that take the form of problem to be solved and answer frames which exposes the students to the subject in steady steps consequently generating more interest in the subject matter which in the long run affects their academic performance and gives them the desire to try and use these acquired knowledge in a different setting. The emphasis on equipping schools with Technology Tools has influenced the use of computers in schools, Pelgrum (2001) lists some of these as: personal ideas about the contribution that technology can make to the processes of teaching and learning and classroom management; Teachers‟ characteristics such as knowledge and skills; the number of computers and Technology Tools infrastructure; and difficulty in integrating ICTs instruction in classrooms. Mooij and Smeets (2001) explain that if teachers are not confident in their ability or competence to handle computers this may influence their willingness to introduce Technology Tools in their classrooms. This Technology Tools competence factor is the same that Zhao and Cziko (2001) refer to as Control Principle. Other factors significantly influencing Technology Tools use in schools according to Mooij and Smeets (2001) are school manager's policy and budgetary decisions.

2.1.1 The Role of Computer science in the Society

Science is recognized widely as being of great importance internationally both for economic well-being of nations and because of the need for scientifically literate citizenry (Fraser & Walberg, 1995 in Kiunga, 2014). Knowledge of science and technology is therefore a requirement in all countries and all people globally due to the many challenges that are facing them. These challenges include emergence of new drug resistant diseases, effects of genetic experimentation and engineering, ecological impact of modern technology, dangers of nuclear

war and explosions, tsunamis, earthquakes and global warming among others (Alsop & Hicks, 2001). As a result, there are rapid changes taking place in industry, communication, agriculture, and medicine. Science as an instrument of development plays a dominant role in bringing about these changes by advancing technological development, promoting national wealth, improving health and industrialization (Validya, 2003). This suggests that other sciences depend upon the knowledge obtained through the study of Computer science. Computer science is therefore an important base in science and technology since it studies the essence of natural phenomena and helps people understand the increasingly technological changing society (Zhaoyao, 2002).

Computer science as a branch of Science has many applications for example in medicine; where throughout this century advances in Computer science and medicine have gone hand in hand. Medical community to devise new techniques for diagnosing and treating a variety of illness has rapidly exploited the most fundamental discoveries in Computer science Kiunga (2014). Even in the continuing research necessitated by the challenges posed by diseases such as Ebola, and HIV/AIDS, the development of high precision equipment employing principles of Computer science remain necessary (Minishi et.al, 2004).In information technology, which has reduced the world into a global village through use of satellites and computers, the use of principles of Computer science has, been very useful. A wide range of application of Computer science is used in industrial development for improvement of materials useful to the wellbeing of human race.

The study of Computer science involves the pursuit of truth; hence, it inculcates intellectual honesty, diligence, perseverance and observation in the learners (Das, 1985 in Kiunga 2014). Computer science education therefore enables the learner to acquire problem-solving and decision-making skills that provides ways of thinking and inquiry, which help them

to respond to widespread and radical changes in industry, health, climatic changes, information technology and economic development. These changes are demanding knowledge of scientific principles in order to tackle them (Mohanty, 2003). The teaching of Computer science provides the learners with understanding, skills and scientific knowledge needed for scientific research, fostering technological and economic growth in the society, where they live thus improving the standards of living (Kenya Institute of Education (K.I.E., 2002), currently called Kenya Institute of Curriculum Development (KICD).

In spite of the recognitions given to the Computer science subject as one of the essential sciences at the secondary school level as contained in the National Policy of Education, the achievement of students and the number of candidates who choose Computer science have become worrisome to the generality of the people, most especially Computer science educators and researchers (Akinlaye, 1998 in Kiunga. 2014). Many researchers have identified different solutions among which is the use of different Instructional methods such as guided discovery, concept mapping, field trip, demonstration method and use of ICT. Okebukola (1992) confirmed that the use of appropriate instructional strategies can influence the performances of low achieving students as well as making the lesson interesting.

2.1.2 The Role and Functions of ICT and Technology Tools in Computer science

The role of Technology in teaching and learning is rapidly becoming one of the most important and widely discussed issues in contemporary education policy (Thierer, 2000). Most experts in the field of education agreed that, when properly used, information and communication technology hold great promise to improve teaching and learning in addition to shaping workforce opportunities. Poole (1996) has indicated that computer illiteracy is now regarded as the new illiteracy. The ICT stands for Information and Communication Technologies

and is defined as a “Diverse set of Technological tools and resources used to communicate, and to create, disseminate, store and manage information” (Blurton C, 2005). He further notes that ICT has become a very important part of the educational delivery and management process because it is changing methods of teaching and learning by adding elements of vitality to learning environments including virtual environments for the purpose. New Technology Tools make it possible for complicated collaborative activities of teaching and learning by dividing it in space and time, with seamless connectivity between them. Due to its capability to offer anytime and anywhere, access to remote learning resources, ICT is a potentially powerful tool for offering educational opportunities.

The new digital ICT is not single technology but combination of hardware, software, multimedia, and delivery systems (Mooij, 1999). In connection, (Farrell, 2007) points out that, ICT in education encompasses a great range of rapidly evolving technologies such as desktop, notebook, and handheld computers, digital cameras, local area networking, Bluetooth, the Internet, cloud computing, the World Wide Web, streaming, and DVDs; and applications such as word processors, spreadsheets, tutorials, simulations, email, digital libraries, computer-mediated conferencing, videoconferencing, virtual environment, simulator, emulator, mobile apps etc. It is further noted that the use of newer ICT is being integrated with use of older technologies, enabling the existing resources and services to be of continuous use in teaching and learning computer science. Today ICT is being used as a tool for improving the quality of life by improved efficiency and enhanced effectiveness in teaching of computer science. Different types of Technology tools assist the teachers and students of computer science by providing them with learning opportunities, capabilities and also increase potential of the exposure. ICT makes them capable by providing the ability to access knowledge with the help of suitable digital media. ICT

is playing very important role in communicating with peers, thereby promoting collaborative and social learning environment (Blurton, 2005).

These Technology Tools range from learning objects, multimedia, mobile learning, internet and social media, interactive white boards and slides presentations to modeling and simulations etc. According to the University of Sydney, Faculty of education and social work, the teacher requires very basic ICT skills for integration of Technology Tools in teaching and learning computer science such as; internet browsing, word processor, PowerPoint, excel, publisher, online classes windows explorer and navigation. The use of the Technology Tools and skills needed is supported by the constructivism theories which is a learning theory found in psychology which explains how people might acquire knowledge and learn. It therefore has direct application in education. The theory suggests that humans construct knowledge and meanings from their experiences. Piaget's theory of constructivist learning has had a wide ranging impact on learning theories and teaching methods in education and is underlying theme of many educations reform movements.

Computers can be put to different types of use in teaching Computer science which include, simulations, computer data acquisition, animation and many more. Educational software can be used to teach difficult concepts or observe difficult skills in Computer science. For example teaching of electric motor in Computer science can be done with the aid of Encarta educational software. The rotation of the coil in the magnetic field will be best appreciated by student when seeing it demonstrated through this software. Most Computer science teachers could not explain the mechanism of either electric motor or generator to student properly because of its complexity; when demonstrated in a computer through software the problem of complexity will be over and student learning is enhance.

Apart from using educational software as earlier discussed, video is another resource that can be used for teaching and learning of Computer science. Brekke and Hogstad (2010) stated: SimVideo are interactive learning tools integrated with SimReal which contains video-lectures, video-simulations, interactive simulations, task review and applications with opportunities for continuous exchange between different elements without losing the focus in the temporarily abandoned item. Community resource is a good learning resource teacher can always explore in teaching Computer science (Besty, 2012). In Nigeria there is problem of electric power supply, because of this many electronic experiments in Computer science that requires the use of electricity is not always reliable. For example, soldering of resistors, transistors and other active electronics components may be done showing videos of electronics technician at work already recorded in the town to the students. Through this method students can learn how to perform this activity even though not taught in the class directly by their teacher. There are many experiments very difficult to carry out in the laboratory due to its nature, such experiment could be simulated.

Chain reaction and radioactive decay in nuclear Computer science cannot be easily carried out in classroom situation; students can still learn these topics by simulation and it will be real to them. Microcomputer can be used to acquire data from thermisitor, photodiodes and pressure transistors. There are phenomena that looked abstract to students like optical phenomena, magnetic and mechanic phenomena; some of them are too fast for the student to comprehend, computer simulation will slow down the speed while students will be able to study them and learn. Movement of air molecules, its interactions and collision cannot be well taught except through computer simulation and video. There are some theoretical topics in Computer science that are difficult to learn in Computer science such as the working of transistors, inductors, transformer which computer animation can assist to learn effectively. Matlab is very

good at solving students' problem in wave mechanics, electricity and magnetism, classical mechanics and atomic Computer science. It can be used to solve problem of separating complimentary variables, simple harmonic motion, free and damp fall. Also used to present measured data; the measured data can be controlled by the student after the documentation has been studied. Student can learn hydraulic mechanism; weight of air and common property of air and water through Computer science Pro. Yenka electricity and magnetism is a good Computer science resource that can simulate power stations, draw and simulate circuit diagram; parameters like resistance or capacitance, graph, quantities like voltage and current can also be edited.

Computer Assisted Instruction (CAI) tools like spreadsheet and word-processor is used to collect and analyzed data. For example, in waves, there are graphs and functions difficult to accurately draw but when spreadsheet is use; it can display various types of graphs for students to learn. When it comes to presenting information in various ways such as text, picture, tables and graph, ICT is a powerful tool to be used, especially to visualize a complex process in Computer science teaching. This information can be manipulated on a computer so that Computer science students can make changes and at the same time evaluate the changes made. Feedback is very important in teaching and learning process (Aina & Adedo, 2013), because it improve student learning. This could be done through computer. For example in a word-processor student can learn how to spell words correctly when text is being underlined by the computer. There are situations when student is given a task to perform on a computer that has already been programmed; when the student make mistake there will be response from the computer either by talking or any other means. Without the presence of a teacher such student can learn any activity prepared for that period. ICT improve student learning when they spend quality time working or practicing any skill already learnt in Computer science.

Learning activities could be communicated through e-mail system (Nguyen, Williams & Nguyen 2012). Teacher could be away from school and yet be in contact with the student by sending learning activities through e-mail. Many students project have been supervised through this system without the meeting of student and teacher for more than just once. Social network and online chat are another means by which teacher and student can communicate. Both teacher and student can communicate together without necessarily be in face to face classroom situation through internet. This could be done through Yahoo messenger or Skype; many Computer science concepts could be learnt by student through these methods. Internet is a good resource for learning Computer science; students can learn through Google, Wikipedia and other internet website or blog. Computer science articles in Journal are uploaded into website or blog to access for learning; example of such article is refraction and absorption of microwaves in wood through European Journal of Computer science to an e-mail address.

2.1.3 Influence of Self-Efficacy on the Use of Technology Tools in Teaching and Learning of Computer science

Recent years have witnessed rapid and extensive advances in education technologies. Aligned with drastic changes in technology-assisted instructional methods, not surprisingly, teachers are expected to keep pace with the advancements and latest developments in the instructional technologies. Not only school managers urge teachers to be tech-savvy with up-to date technology trainings but also social expectations give rise to observable difference in teacher behaviors towards the technology (Papa 2010).

According to social cognitive theory (Bandura, 1997) self-efficacy is a form of self-judgment that influences decisions about what behaviors to undertake, the amount of effort and persistence put forth when faced with obstacles, and finally, the mastery of the behavior.

According to Bandura, self-efficacy is not a measure of skill; rather, it reflects what individuals believe they can do with the skills they possess. As it can be understood from the definition, self-efficacy "is concerned… with judgments of what one can do with whatever skills they possess" (Bandura, 1986: 391). It consists of two components, efficacy expectations, which are related to belief in personal capacity to affect behavior, and outcome expectations, which is a belief that the behavior will result in a particular outcome (Albion, 2001).

Several research studies indicate that depending on these sources of judgments, individuals have negative or positive ideas about a behavior before they undertake it and these ideas affect their course of action (Bandura, 1986; Albion, 2001). In discussing self-efficacy in computer use, Compeau and Higgins (1995) distinguished between component skills such as formatting disks and booting up the computer and behaviors individuals can accomplish with such skills, such as using software to analyze data. Thus, computer science teachers' perception of their self-efficacy focuses on what they believe can accomplish with the knowledge they master during their learning. It does not refer to a person's skill at performing specific learning related tasks (e.g. class management, integrate technology in their teaching and mastering a content area). Instead, it assesses a person's judgment of his or her ability to apply knowledge and skills in a broader context. Computer science teachers participating in technology tools integration course learn skills and knowledge of teaching with technology in an actual classroom. Self-efficacy beliefs are a key component for computer science teachers' success in overcoming the fear they may experience in this new area. For example, Compeau and Higgins (1995) empirically show that there is a relationship between computer self-efficacy and computer use. Consequently, novice teachers enrolled in a technology integration course are required to develop set of skills to prepare them to teach with technology and to perform successfully a

distinct set of behaviors required to establish, maintain and utilize effectively teaching with technology tools beyond basic personal Internet and computer skills.

As the pedagogical effectiveness of using computers is widely recognized, all teachers are expected to use them as teaching and learning tools in their classrooms. To do this, however, teachers themselves should be willing to use them. Different studies investigating the relationship between teachers' use of computer technologies and different variables such as self-efficacy beliefs, attitudes towards and knowledge about computer technologies, perceptions of computers as educational tools so and so forth have revealed that there is a significant correlation between all these variables (Koç, 2005). In other words, the acceptance of computers and their use in the teaching and learning processes as a tool is largely determined by the beliefs, perceptions, and attitudes of teachers (Bitner and Bitner, 2002; Aşkar and Umay, 2001; Milbrath and Kinzie, 2000; Albion, 2001). Therefore, not only should all these psychological constructs be investigated closely but also ways to improve them should be sought.

Making science issues relevant to students and the social group they live in (peers and relatives) counters the wide-spread perception of computer science as being dry, impersonal and irrelevant. We can therefore assume that it has positive effects on their interest in science and technology, their self-efficacy and their learning. Self-efficacy is understood here as confidence in one's own abilities to handle tasks effectively and overcome difficulties (OECD, 2007). With regard to technology in teaching and learning, multiple domains of self-efficacy beliefs may play a role in a teacher's thoughts and actions regarding technology in the classroom. Albion (2001) argued that instructional strategies such as problem-based learning (PBL) influence self-efficacy beliefs and can serve as a way to improve a teacher's ability to effectively use technology in classroom teaching practices. In a later study, Albion (2001) found that the amount of time spent

using a computer was positively correlated with self-efficacy beliefs regarding computer use. Albion suggested that coursework in teacher education programs "should be structured and taught using approaches which build the confidence of students in their capacity for effective computer use" (p. 345) as a means for supporting effective technology use in their future profession.

Researchers have suggested that self-efficacy beliefs relating to computer use as well as technology tools integration into teaching influence a teacher's ability to create learning environments that use technology in meaningful ways. Bandura acknowledged, however, that these beliefs "partly determine how they structure academic activities in their classroom" (1997, p. 240). As such, beliefs about one's abilities to use technology tools in a classroom environment are only part of what should be considered when preparing computer science teachers for effective and meaningful technology tools integration in the teaching and learning environments. Bandura's theory of self-efficacy would suggest that increasing teacher knowledge would lead to increased self-efficacy beliefs and, potentially, to an increase in technology use in the classroom as well as an increased likelihood that this technology use will be based on knowledge of pedagogy and content.

2.1.4 Level of Usage of Technology Tools in the Teaching and Learning of Computer science

Africa have witness the development of ICTs in various sectors over the last decade including education. The change from teacher-centered education system to learner centered

education the world over in the past view years contributes to the use of Technology Tools in education . Borrowing from the word "Knowledge –Driven world" as conceived by (Hawkins, 2004; Inwent, 2004), it means that education reform practices should focus on equal access and quality of education which should highlight the importance of change in the education sector through use of Technology Tools and equipping new generations with enhanced skills to operate in the 21st century. The use of Technology Tools in Nigeria and African countries generally is increasing and dramatically growing. However, while there is a great deal of knowledge about how Technology Tools are being used in developed countries, there is not much information on how Technology Tools are being introduced into schools in developing countries (Beukes-Amiss & Chiware, 2006). Looking at the developing countries according to these authors, there is generally limited access time per month using Technology Tools by both the teachers and students, and even less time spent with reliable Internet access. It should be noted that availability of Technology Tools vis-à-vis access in term of ratio of teachers and students differs significantly. Despite this, the new and emerging technologies challenges the traditional process of teaching and learning, and the way education is managed.

While information communication technology is an important area of study in its own right, it is having a major impact across all curriculum areas. Easy worldwide communication provides instant access to vast array of data, challenging assimilation and assessment skills (Fowowe, 2006). Rapid communication plus increased access to Technology Tools in the home, at work, and in educational establishment, could mean that learning becomes a truly lifelong activity- an activity in which the pace of technological change forces constant evaluation of teaching process itself.

Formerly, the term IT was used to mean ICT, the term which was synonymous with computer but as the passage of time, it covered other equipment created to enhance acquisition, storage and dissemination of information materials (Tella, Tella, Toyobo, Adika & Adeyinka, 2010). Most of these equipments were initially confine to the vicinity of offices. Libraries in the course of time embraced the use of these equipments to carry out their day-to-day activities as usage was adapted to carry out some routine activities. It functions does not end there. The current issue is the use of Technology Tools in the classroom by the teachers. This includes specifically the use of computers, Internet, telephone, digital camera, data projector, etc. As the world continues to revolve around technology, teachers need to continue incorporating these new technology tools into their teaching (Tella, Tella, Toyobo, Adika & Adeyinka, 2010).

Meanwhile, it is observed that some studies have been conducted on uses of Technology Tools by teachers particularly on the issue of their professional development. Most of these studies were carried out in developed countries where the use of Technology Tools has come of age, and where there are resources and material to maintain them. However, the use of Technology Tools by teachers in Nigeria is just beginning to gain popularity and researches in the area have just started emerging (Tella, Tella, Toyobo, Adika & Adeyinka, 2010). Emphatically, the use of Technology Tools by teachers to teach the students is highly advantageous. This is because its enable them to demonstrate understanding of the opportunities and implications of the uses for learning and teaching in the curriculum context; plan, implement, and manage learning and teaching in open and flexible learning environment (UNESCO, 2004). In the light of these therefore, more research is needed to showcase further development of Technology Tools use by secondary school teachers in Nigeria. Many different types of technology tools can be used to support and enhance learning. Everything from video content

and digital moviemaking to laptop computing and handheld technologies has been used in classrooms. Similarly, new uses of technology tools such as pod casting are constantly emerging (Marshall, 2002). To Marshal, various technologies deliver different kinds of content and serve different purposes in the classroom. Word processing and e-mail promote communication skills; database and spreadsheet programs promote organizational skills; and modeling software promotes the understanding of Science and Computer science concepts. Technology Tools available in classrooms today ranges from simple tool-based applications (such as word processors), to online repositories of scientific data. Others are primary historical documents, handheld computers, closed-circuit television channels, and two-way distance learning classrooms (Tella, Tella, Toyobo, Adika & Adeyinka, 2010). Pensky (2005) asserted that even the cell phones that many now carry with them can be used to learn. According to Lei & Zhao (2006) each technology is likely to play a different role in students learning. Rather than trying to describe the impact of all technology tools as if they were the same, researchers need to think about what kind of Technology Tools are being used in the classroom and for what purposes. Two general distinctions could then be observed from the literature. Students can learn from computers where technology tools are used essentially as tutors and serve to increase student's basic skills and knowledge. Moreover, they can learn with computers where technology is used as tool that can be applied to a variety of goals in the learning process and can serve as a resource to help develop higher order thinking, creativity and research skills (Ringstaff & Kelley, 2002).

According to Murphy, et al., (2001), the primary form of student learning from computers is described as Discrete Educational Software (DES), Integrated learning System (ILS), Computer-assisted Instruction (CAI), and Computer-based instruction (CBI). These software applications are also the most widely available applications of technology tools in

schools today, along with word-processing software, and have assisted in classroom for more than 20 years (Becker, Ravity & Wong, 1999). Murphy et al., (2001) explains that teachers use DES not only to supplement instruction, as in the past, but to introduce topics, provide means for self study, and offer opportunities to learn concepts otherwise inaccessible to students. The software also manifests two key assumptions about how computers can assist learning. First, the users' ability to interact with the software is narrowly defined in ways designed specifically to promote learning with the tools. Second, computers are viewed as a medium for learning, rather than as tools that could support further learning.

As DES is recognized as the commonly used approach to computer use in student learning, in more recent years, use of computers in schools has grown more diversified as educators recognize the potential of learning with technology tools as a means for enhancing students reasoning and problem solving abilities. Zhang (2005) notes that "this shift which has been driven by the plethora of new information and communication devices now increasingly available to students in school and at home, each of which offers new affordances to teachers and students alike for improving student achievement and for meeting the demand for 21st century skills." It should be noted at this juncture that there appear to be three main approaches to Technology Tools taken by teachers according to (UNESCO, 2004). These are:

Integrated approach: planning the use of Technology Tools within the subject to enhance particular concepts and skills and improve students' attainment. This involves a careful and considered review of the curriculum area, selecting the appropriate ICT resource which will contribute to the aims and objectives of the curriculum and scheme of work, and then integrating that use in relevant lessons.

Enhancement approach: planning the use of Technology Tools resources which will enhance the existing topics through some aspect of the lessons and tasks. For example, using an electronic whiteboard for presenting theory about a topic. In this approach, the teacher plans to complement the lesson with an innovative presentation method to promote class discussion and the visualization of problems.

Complementary approach: using Technology Tools resources to empower the students' learning, for example by enabling them to improve their class work by taking notes on the computer, or by sending homework by email to the teacher from home, or by word processing their homework. All three approaches can enhance attainment, but the effects may be different. In the integrated approach, students' learning is enhanced because they are confronted with challenges to their existing knowledge and given deeper insights into the subject being studied. The enhancement approach could improve students' learning through presenting knowledge in new ways, promoting debates among students, and encouraging them to formulate their own explanations. The complementary approach draws on the approach that suggests that learning can be enhanced by reducing the mundane and repetitive aspects of tasks such as writing essays and homework by hand, freeing the learner to focus on more challenging and subject-focused tasks (Kemmis et al., 1977 in UNESCO, 2004). These different types of use require the teacher to have an extensive knowledge of Technology Tools and to be able to fit its use either into their existing pedagogy or to extend their pedagogical knowledge so they can accommodate Technology Tools effectively in their teaching.

2.1.5 Attitude of Computer science Teachers and Students towards the Use of Technology Tools

Technology Tools offers enticing possibilities for new approaches to teaching and hence for learning across the curriculum. The research and professional literature suggests that the new approaches may enhance learning through cognitive, meta-cognitive and affective channels. The cognitive and Meta-cognitive channels for improving learning by using technology are clearly strong and important to study. Technology Tools are computer based tools used by people to work with information and communication processing needs of an organization. Its purview covers computer hardware and software, the network, and other digital devices like video, audio, camera, and so on, which convert information (text, sound, motion, etc,) into digital form. Successful integration of Technology Tools in the school system depends largely on the competence and on the attitude of teachers towards the role of modern technologies in teaching and learning. Thus, experienced teachers, newly qualified, and student-teachers need to be confident in using Technology Tools effectively in their teaching (Kyriakidou, Chrisostomou, & Bank, 2000).

Simply having Technology Tools in schools will not guarantee their effective use. Regardless of the quantity and quality of technology placed in classrooms, the key to how those tools are used is the teacher; therefore teachers must have the competence and the right attitude towards technology (Kadel, 2005). Attitudes refer to one's positive or negative judgment about a concrete subject. Attitudes are determined by the analysis of the information regarding the result of an action and by the positive or negative evaluation of these results. There is a common saying that attitude determines altitude. Studies have established close links and affinities between teachers' attitude and their use of Technology Tools. More positive attitudes towards the computer were associated with a higher level of computer experience (Teo, 2008). Students' confidence on Technology Tools can be explained through the attitude and behaviors of their

teachers. Teachers' behavior is a critical influence on students' confidence and attitude towards Technology Tools as they provide important role model to their students (Derbyshire, 2003). The literature suggests that lack of adequate training and experience is one of the main reasons why teachers do not use technology in their teaching. This also eventuates in teachers' negative attitude towards computer and technology. In addition, lack of confidence leads to reluctance to use computers by the teachers (Kumar & Kumar, 2003). Attitude of pre-service and in-service teachers towards computer and technology tools skills can be improved by integrating technology tools into teacher education. Findings have revealed that a significant relationship exist between computer attitude and its use in institutions for pre-service teachers (Khine, 2001), and also for serving teachers in the affective attitude, general usefulness, behavioral control, and pedagogical use (Yuen & Ma, 2002). Attitude is a major predictor of future computer use. Thus, there is the need to take care of the emotional needs of students and teachers as attitude is a major predictor of future Technology Tools use.

The success of any initiatives to implement technology in an educational program depends strongly upon the support and attitudes of teachers involved. It has been suggested that if teachers believed or perceived proposed computer programs as fulfilling neither their own or their students' needs, they are not likely to attempt to introduce technology into their teaching and learning. Among the factors that affect the successful use of computers in the classroom are teachers' attitudes towards computers (Huang & Liaw, 2005). Attitude, in turn, constitutes various dimensions. Some examples of these are perceived usefulness, computer confidence (Rovai & Childress, 2002), training (Tsitouridou & Vryzas, 2003), gender (Sadik, 2006), knowledge about computers, anxiety, confidence, and liking (Yildirim, 2000). In many developed countries, nearly all schools are equipped with the infrastructure to conduct ICT

mediated teaching and learning. Positive teacher attitudes towards computing are critical if computers are to be effectively integrated into the school curriculum. A major reason for studying teachers' attitude towards computer use is that it is a major predictor for future computer use in the classroom (Myers & Halpin, 2002). Khine (2001) studied 184 pre-service teachers and found a significant relationship between computer attitude and its use in the institution. This finding was corroborated by Yuen and Ma (2001) who, using the Chinese Computer Attitude Scale for Teachers (CAST), found that 216 secondary teachers in Hong Kong had reported the instructional use of computers and their results revealed that affective attitudes, general usefulness, behavioral control, and pedagogical use to be significant in determining the use of ICT. Kumar and Kumar (2003) reported that most teachers believe that the amount of computer experience has a positive effect on attitude towards computers. Jackson, Ervin, Gardner and Schmitt (2001) indicated that female users, compared with males, are more inclined to hold negative reactions to computers and such differences may have resulted in the different ways of using computers. In support of the importance of teachers' attitude towards computer use, Zhao, Tan and Mishra (2001) provided evidence to suggest that the attitudes of teachers are directly related to computer use in the classroom. For example, teachers often view the computer as a tool to accomplish housekeeping tasks, manage their students more efficiently, and to communicate with parents more easily. The success of student learning with computer technology tools will depend largely on the attitudes of teachers, and their willingness to embrace the technology (Teo, 2006). Gaining an appreciation of the teachers' attitudes towards computer use may provide useful insights into technology tools integration and acceptance and usage of technology tools in teaching and learning.

Although the term Technology Tools implies far more than simply access to personal computers, students generally perceive using computers as having a positive effect on their learning. Kulik (1994) reinforces the claims of earlier empirical studies, it has been found that using computer technologies in developmental classrooms positively influenced students' attitudes toward writing and improved both the appearance and quantity of student writing. Attitudes affect teachers' behaviors. Additionally, they have a considerable effect on openness to new experiences, as well as on reflecting and implementing change. Positive attitudes towards Technology Tools, though too limited, support their use in classes. The effectiveness of Technology Tools investments can be achieved with their effective application in the classroom as a part of the curriculum. By this way, learner-based learning environments can be created. As Kozma and Wagner (2003) claim, ICTs can affect the pace at which the learning gap is bridged in developing countries, both domestically and in relation to other nations. The great challenge is to harness the advantages of these technologies, in order to improve the delivery and quality of educational services, as well as to accelerate the rate at which knowledge is distributed and learning chances and outcomes are equalized throughout society (Wagner, and Kozma, 2003). Drent and Meelissen (2007) conducted a study about factors which stimulate or limit the innovative use of Technology Tools by teacher educators in the Netherlands. The study used questionnaires for 210 teachers and interviews for 4 of those teachers who had responded. Their findings showed that several factors such as a student–oriented pedagogical approach, a positive Technology Tools attitude, computer experience, and personal entrepreneurship of the teacher educator have a direct positive influence on the innovative use of Technology Tools by the teacher. Also, comparison between these factors in predicting computer use identified that attitude toward computer contributed more in explaining Technology Tools use by teachers.

Teachers' attitudes have been found to be major predictors of the use of new technologies in instructional settings (Almusalam, 2001). The successful use of technology tools in the classroom depends to a large extent on the teachers' attitudes toward these tools. Positive attitudes often encourage less technologically capable teachers to learn the skills necessary for the implementation of technology-based activities in the classroom. Harrison and Rainer (1992) found that participants with negative computer attitudes were less skilled in computer use and were therefore less likely to accept and adapt to technology than those with positive attitudes. They concluded that changing individuals' negative attitudes is essential for increasing their computer skills. Therefore, if teachers want to successfully use technology in their classes, they need to possess positive attitude to use technology. Such attitude is developed when teachers are sufficiently comfortable with technology and are knowledgeable on its use.

CHAPTER THREE

RESEARCH METHODOLGY

3.0 Introduction

This chapter deals with the research methodology that was used in the study, to know the influence of Technology Tools on teaching and learning of computer science in secondary schools. The chapter will be presented under the following sub-headings**:**

Research Type

Population Sample and Sampling Techniques

Research Instruments

Validation of Research Instruments

Procedure for Data Collection

Data Analysis Techniques

3.1 Research Type

This is a descriptive research of the survey type, questionnaire is use to retrieve information from the respondents. In this study, data will be obtained from the sample population on the influence of Technology Tools on Teaching and learning of computer science in secondary schools in Benin metropolis, Edo state, Nigeria.

3.2 Population Sample and Sampling Techniques

The target population for this study comprised the secondary school computer science students and teachers in some selected secondary schools in Benin metropolis, Edo state. Twenty

five (25) students were randomly selected from each of the ten (10) senior secondary schools and in the case of the teacher; one (1) teacher was randomly selected from thirty (30) senior secondary schools. In all, a total of two hundred and fifty (250) students and thirty (30) teachers form the study sample.

3.3 Research Instruments

The researcher made use of questionnaire for the study. In carrying out this research, data was collected using two basic instruments namely; (1) Influence of Technology Tools on Teaching Computer science Questionnaire (ITTTPQ) and (2) Influence of Technology Tools on Learning Computer science Questionnaire (TTILPQ). The two (2) instruments were structured questionnaires that featured section A, B and C (in the case of the teachers' questionnaire). Section A was used to collect information on respondent bio-data such as gender, class, name of school, length of service and academic qualification in the case of teachers' questionnaire. Section B of the teachers' questionnaire contains sixteen (16) items statement while that of the students contains fifteen (15) items statement each develop on a 4-point Likert scale. Section C of the teachers' questionnaire contains the list of Technology Tools used by teachers in computer science class. The respondents will be expected to write where necessary or tick appropriate option in the space that will be provided in front of each item. These options were Strongly Agree (SA), Agree (A), Disagree (D) and Strongly Disagree (SD). The teachers and students will be required to indicate which choice that best represent their interest.

3.4 Validation of Research Instruments

The validation of questionnaire on the Influence of Technology Tools on Teaching and Learning of Computer science in Benin Metropolis, Edo State will be adopted from validated set

of questionnaires and was given to the researcher's supervisor and two other lecturers from Science Education Department for their comment or suggestion.

3.5 Procedure for Data Collection

The researcher visited each of the selected schools for the study to seek the permission/consent of the principal and the vice-principal in order to administer the questionnaire personally to the teachers and students in the sample schools. The researcher then explained to the respondents the procedure for filling the questionnaires and the questionnaires was collected after it has been duly filled by the respondents.

3.6 Data Analysis Techniques

The questionnaire was analyzed using chi-square (X^2) statistical technique. The frequency count of each item in the questionnaire was tallied and raw score computed into simple percentages. Also, chi-square (X^2) statistical technique was employed to analyze the research hypothesis stated in the previous chapter.

CHAPTER FOUR

DATA ANALYSIS AND RESULTS

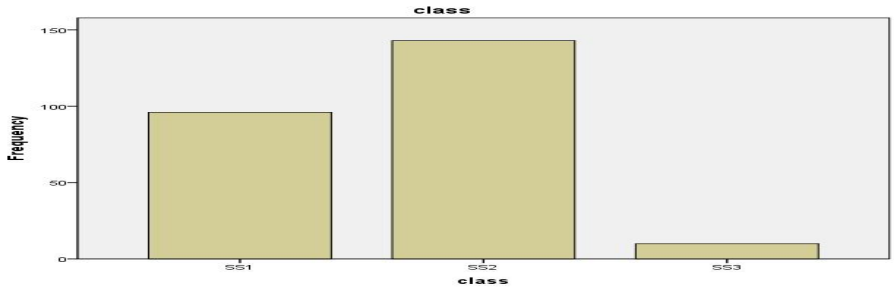
This chapter presents the analysis and interpretation of the data collected for the study. The findings presented in this chapter were based on data collection of two hundred and fifty students and thirty teachers from ten secondary schools and it was analyzed using frequency count and percentage.

Data were analyzed based on the research questions in line with class of students, sex of students, sex of teachers, teachers' educational qualification and years of teaching experience.

4.1 Presentation of Results

Table 4.1: Distribution of students by class

Class	Frequency	Students distribution (%)
S.S.S 1	96	38.4
S.S.S 2	143	57.2
S.S.S 3	11	4.4
Total	250	100.0

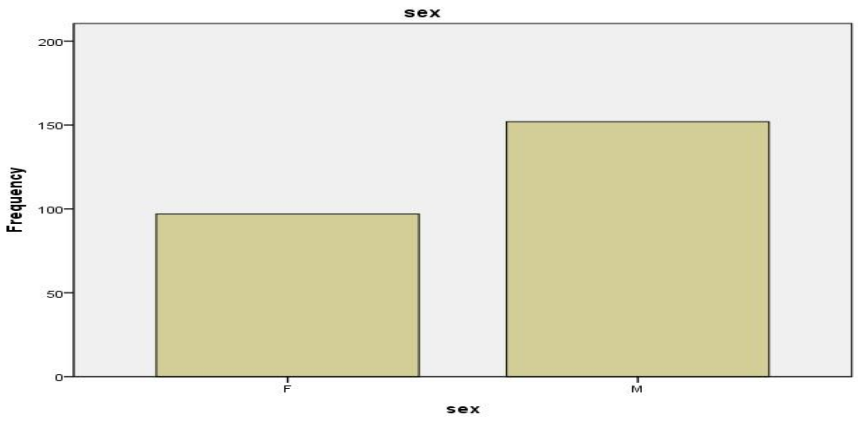


Bar chart showing the distribution of students by class

Table 4.1 shows the distribution of students based on their classes. Ninety six (96) students out of two hundred and fifty (250) students involved in the study are in S.S.S 1, one hundred and forty three (143) of the students are in S.S.S 2 while eleven (11) students are in S.S.S 3.

Table 4.2: Distribution of students by sex

Sex	Frequency	Students distribution (%)
Male	152	61.0
Female	97	39.0
Total	249	100.0

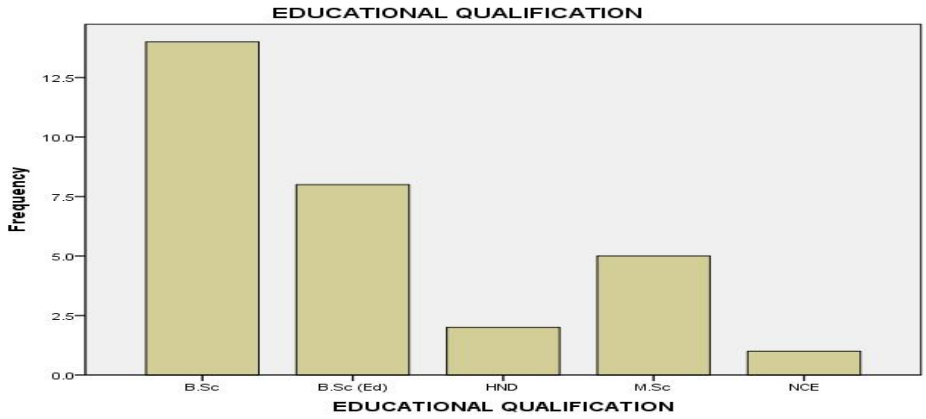


Bar chart showing distribution of students by sex

Table 4.2 shows that one hundred and fifty two (152) out of the two hundred and fifty students used for the sample are male and ninety eight (98) students are female.

Table 3: Distribution of teachers by educational qualification

S/N	Educational qualification	Teacher distribution	Percentage of distribution
1	N.C.E	1	3.3
2	H.N.D	2	6.7
3	B.Sc.	14	46.7
4	B.Sc. (Ed.)	8	26.7
5	M.Sc.	5	16.7
	Total	30	100.0

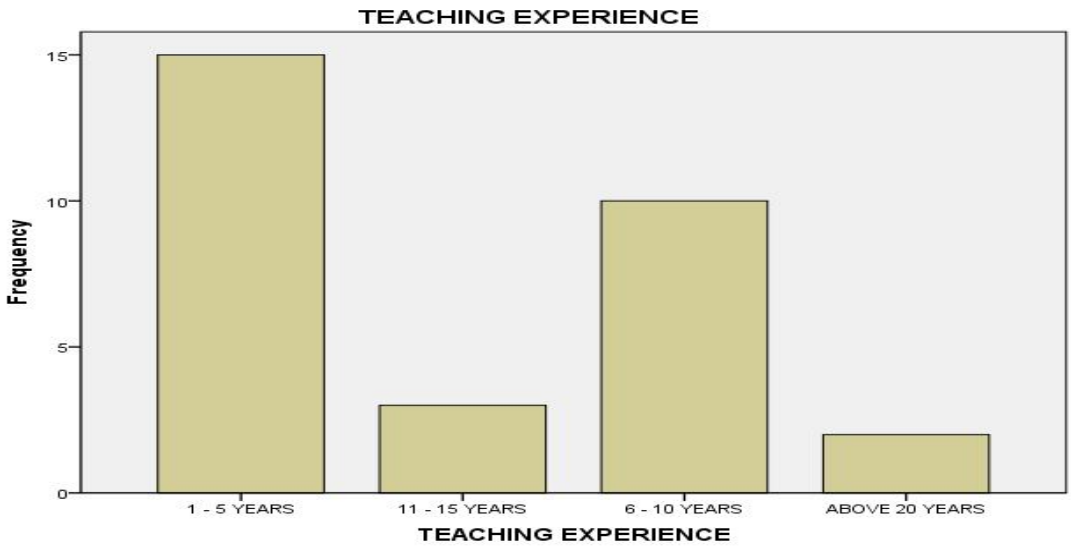


Bar chart showing the distribution of teachers by educational qualification

Table 3 shows the distribution of teachers based on educational qualification. One (1) out of the thirty (30) teachers of the sampled secondary schools used for this study has N.C.E, two (2) of the teachers have H.N.D while fourteen (14) of them has B.Sc. and eight (8) have B.Sc. (Ed.) while five (5) of the teachers have M.Sc.

Table 4.4: Distribution of teachers by number of years of teaching experience

Years of teaching Experience	number of distribution	percentage of distribution
1 – 5	15	50.0
6 – 10	10	33.3
11 – 20	3	10.0
Above 20	2	6.7
Total	30	100.0



Bar chart showing the teachers' years of teaching experience

Table 4.4 shows that fifteen (15) out of the thirty (30) teachers have between 1 – 5 years of teaching experience, ten (10) of the teachers have between 6 – 10 years of experience while three (3) of them have between 11 – 20 years of experience and two (2) have more than twenty (20) years of teaching experience.

RESULTS OF STUDENTS' RESPONSE TO QUESTIONNAIRE

Table 4.5: ***Influence of teachers' attitude towards the use of Technology Tools in computer science teaching***

Teachers' attitude	SA	A	SD	D	Total
1	17	12	0	1	30
2	12	15	1	2	30
3	3	6	4	17	30
4	15	13	0	2	30
5	12	15	0	3	30
Total	59	61	5	25	150

Table 4.6: ***Influence of students' attitude towards the use of Technology Tools on computer science learning***

Students' attitude	SA	A	SD	A	Total
1	100	132	8	10	250
2	44	70	40	96	250
3	134	93	3	20	250
4	21	57	62	110	250
5	25	83	53	89	250
Total	324	435	166	325	1250

Table 4.7: ***Influence of self-efficacy on the teaching of computer science using Technology Tools***

Teachers' self-efficacy	SA	A	SD	D	Total
1	6	13	1	10	30
2	10	16	1	3	30
3	5	16	0	9	30
4	4	15	0	11	30
5	13	13	0	4	30
Total	38	73	2	37	150

Table 4.8: ***Influence of students' self-efficacy on the use of technology tools in learning of computer science***

Students' self-efficacy	SA	A	SD	D	Total
1	113	103	4	28	250
2	53	97	33	67	250
3	51	108	26	65	250
4	103	117	7	23	250
5	119	94	2	37	250
Total	439	521	78	212	1250

4.2 Discussion of Findings

HYPOTHESES TESTING

Research Question 1

What is the influence of teachers' attitude towards the use of Technology Tools in computer science teaching in secondary schools?

Hypothesis 1

HO_1: There is no significant difference in the computer science teachers' attitude towards the use of Technology Tools in teaching.

Table 4.9, revealed that the calculated value (62.621) has probability significance value of 0.000 which is less than the desirable level of significance (α) value of 0.05. Since the probability significance level 0.000 is less than the alpha level of significance 0.05 therefore the hypothesis one is rejected. There is significant difference in the computer science teachers' attitude towards the use of technology Tools.

Table 4.9: Analysis of influence of teachers' attitude towards the use of technology tools in computer science teaching

	Value	df	Asymp. Sig. (2 sided)
Pearson Chi-Square	62.621[a]	12	.000
Likelihood Ratio	56.422	12	.000
No of Valid Cases	150		

Research Question 2

What is the influence of students' attitude towards the use of Technology Tools on computer science learning?

Hypothesis 2

HO_2: There is no significant difference in the computer science students' attitude towards the use of Technology Tools in learning.

Table 4.10, revealed that the calculated value (450.208) has probability significance value of 0.000 which is less than the desirable level of significance (α) value of 0.05. Since the probability significance level 0.000 is less than the alpha level of significance 0.05 therefore the hypothesis two is rejected. There is significant difference in the computer science students' attitude towards the use of Technology Tools in learning.

Table 4. 10: Analysis of students' attitude towards the use of technology tools on learning of computer science

	Value	**df**	**Asymp. Sig..(2-sided)**
Pearson Chi-Square	450.208[a]	12	.000
Likelihood Ratio	512.082	12	.000
N of Valid Cases	1250	12	

Research Question 3

What is the influence of self-efficacy on the Teaching of computer science using Technology Tools?

Hypothesis

HO_3: There is no significant difference of self-efficacy in the use of Technology Tools in teaching of computer science.

Table 4.11, revealed that the calculated value (18.346) has probability significance value of 0.106 which is greater than the alpha level of significance (α) value of 0.05**.** Since the probability significance level 0.106 is greater than the alpha level of significance 0.05 therefore the hypothesis three was accepted. There is no significant difference of self efficacy in the use of Technology Tools in teaching of computer science.

Table 11: Analysis on influence of self-efficacy on the teaching of computer science using technology tools

	Value	**df**	**Asymp. Sig..(2-sided)**
Pearson Chi-Square	18.346[a]	12	.106
Likelihood Ratio	19.515	12	.077
N of Valid Cases	150		

Research Question 4:

What is the influence of students' self-efficacy on the use of Technology Tools in learning computer science?

Hypothesis Four

HO_4: There is no significant difference of self-efficacy in the use of Technology Tools in learning of computer science.

Table 4.12, revealed that the calculated value (141.691) has probability significance value of 0.000 which is less than the alpha level of significance (α) value of 0.05. Since the probability significance level 0.000 is less than the alpha level of significance 0.05 therefore the hypothesis four is rejected. There is significant difference of self-efficacy in the use of Technology Tools in learning of computer science.

Table 12: Analysis on the influence of self-efficacy on the use of technology tools in learning of computer science

	Value	**df**	**Asymp. Sig..(2-sided)**
Pearson Chi-Square	141.691[a]	12	.000
Likelihood Ratio	143.906	12	.000
N of Valid Cases	1250		

Summary of Major Findings

1. There is significant difference in the computer science teachers' attitude towards the use of technology Tools.
2. There is significant difference in the computer science students' attitude towards the use of Technology Tools in learning.
3. There is no significant difference of self-efficacy in the use of Technology Tools in teaching of computer science.
4. There is significant difference of self-efficacy in the use of Technology Tools in learning of computer science.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

` The primary objective of this study was to investigate the influence of Technology Tools on teaching and learning of computer science in secondary schools. The result of this study has been presented in chapter four. In this chapter, the research findings are discussed, conclusions are drawn, recommendations and suggestions for further study were made.

5.1 Summary

The overall result of this study showed that three of the entire four tested hypothesis were rejected and the remaining one was accepted. The findings shows that influence of teachers' attitude towards the use of technology tools in teaching of computer science, influence of students' attitude towards the use of technology tools in learning of computer science, and the influence of students' self-efficacy in the use of technology tools in learning of computer science have a significant influence on computer science teachers and students in using Technology Tools while the influence of self-efficacy on teaching of computer science using technology tools have no significant influence on the students using Technology Tools.

The study also shows that technology tools in teaching of computer science influences teachers' positive attitude towards teaching of computer science. This finding, on the other hand, is in confirmation with Eugene (2006) who explored the effect of teachers' beliefs and attitudes towards the use of Technology Tools in classrooms. The study revealed that there was inconsistency between teachers' beliefs and their actual use of technology in classroom.

The findings also reveal that, influence of students' attitude towards the use of technology tools in learning of computer science has a positive influence on the students'

technology tools use to learn computer science. This finding agreed with Teo (2006) who explained that the success of students learning with computer depends largely on the attitude of the teachers, and their willingness to embrace the technology. This implies that students understood the value of using Technology Tools in teaching and learning of computer science. They were also aware that Technology tools such as TV, computer and radio are not only for entertainment but can also be useful in learning computer science. They were upbeat that indeed Technology Tools not only makes learning more enjoyable but also enhances understanding of concepts that are abstract

The findings from this study also shows that influence of self-efficacy on the teaching of computer science using technology tools have no significant influence on the teachers using Technology Tools to teach computer science.

5.2 Conclusion

The following conclusion was drawn out from the findings of the research questions and the testing of hypotheses:

1. There is significant difference in the computer science teachers' attitude towards the use of technology Tools.
2. There is significant difference in the computer science students' attitude towards the use of Technology Tools in learning.
3. There is no significant difference of self efficacy in the use of Technology Tools in teaching of computer science.
4. There is significant difference of self-efficacy in the use of Technology Tools in learning of computer science.

5.3 Recommendations

Just like other researches, a number of recommendations were made in this study. Some of the recommendations are for action by stakeholders in education while others are for further research.

1. Computer science teachers in the sample schools were found to be experienced and fairly competent in use of Technology Tools. Both the teachers and students had positive attitudes towards Technology Tools use in teaching and learning of computer science. As such, it is recommended that teachers should capitalize on the favorable attitude the learners have towards Technology Tools use in the teaching and learning of computer science. This could enhance learners understanding of concepts in the subject and this will motivate them to pursue computer science related courses to higher levels.
2. Since Technology Tools depends on power supply, the entire erratic power supply needs to be improved upon throughout the country. Also, school authority should improvise for alternative source of power supply such as generator set in case of power failure.
3. More time should be allocated to the teaching of computer science on the time-table in our secondary schools so that there will be enough time for the teaching of computer science. Also, computer science teachers should not be too overwhelmed with too many assignments so that they will have time to plan technology enhanced classes.
4. Teachers must be aware that for meaningful learning to take place, teacher-student interaction is an essential factor that must be strictly considered. It is therefore admonished that when integrating Technology Tools in computer science teaching, teachers should interact with the students while computer science teaching is going on.

5.4 Suggestions and Further Studies

1. Research could be carried out to determine how various Technology Tools software and hardware are made use of in the teaching and learning process. This study focused more on influence of Technology Tools on teaching and learning of computer science.
2. A similar study could also be carried out in other regions of the Federal Republic of Nigeria to determine whether findings established by this study also apply. This will serve to strengthen the findings of this study.
3. A study could be carried out to investigate Technology Tools use in other science subjects. This study focused on influence of Technology Tools in the teaching and learning of computer science.

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APPENDIX I

UNIVERSITY OF BENIN

FACULTY OF PHYSICAL SCIENCES

DEPARTMENT OF COMPUTER SCIENCE

THE IMPACT OF DIGITAL TECHNOLOGY IN TEACHING AND LEARNING COMPUTER SCIENCE IN SECONDARY SCHOOL

QUESTIONNAIRE (ITTLPQ)

Dear Respondent,

This questionnaire is designed to elicit information. It is geared towards assessing 'the impact of digital technology in teaching and learning computer science in secondary school'. Kindly assist in filling the questionnaire by responding as accurately as possible to each statement contained herein. Your responses will be used for research purpose only and will be treated with utmost confidentiality and used **ONLY** for this research.

Thank you for your cooperation,

GODFREY ERERE JULIET

Section A: Personal Information of the Respondent

Instruction: Kindly complete this section by ticking (√) in the space provided (and write in where necessary) in the option that is most applicable to you.

Name of School _____

Sex _____

Educational Qualification

(a) N.C.E ( ) (b) H.N.D ( ) (c) B.Sc.( )

(d) B.Sc. (Ed) ( ) (e) M.Sc. ( )

Teaching experience in terms of years

(a) 1-5yrs ( ) (b) 6-10yrs ( ) (c) 11-20yrs ( )

(d) Above 20yrs ( )

Section B: Influence of Technology Tools on Computer science Teaching

Direction: Kindly read carefully and answer by ticking (√) the appropriate column to indicate option most applicable to you, using the rating scale below;

SA - Strongly Agree A – Agree D – Disagree SD – Strongly Disagree

S/N	QUESTIONNAIRE ITEMS	SA	A	D	SD
	INFLUENCE OF TEACHERS' ATTITUDE TOWARDS THE USE OF TECHNOLOGY TOOLS IN COMPUTER SCIENCE TEACHING				
1	Integrating technology tools (e.g. Computers, Blogs, Word processor, projectors, Internet e.t.c) could improve my computer science teaching				
2	Teaching computer science using technology tools makes me feel comfortable				
3	Teaching computer science with technology tools makes me completely not in control				
4	The use of technology tools in teaching leads to greater student involvement in the teaching and learning process.				
5	Teaching computer science with technology tools makes me a better teacher				
	LEVEL OF USAGE OF TECHOLOGY TOOLS IN TEACHING OF COMPUTER SCIENCE				

1	Effective use of technology tools (e.g. projectors, computers Word processors, spread sheets, internet, Blogs etc.) in Teaching of computer science makes the lesson enjoyable				
2	Using of technology tools in computer science practical classes makes Teaching easier and simpler for the students to comprehend				
3	Many teachers lack the appropriate skills and knowledge regarding the effective use of technology tools in computer science teaching				
4	All aims and objectives of computer science are achieved using Technology tools				
5	Technology tools helps Computer science teachers to locate and develop better instructional materials				
6	Technology tools use in Computer science teaching is time consuming				
	INFLUENCE OF TECHNOLOGY TOOLS ON SELF-EFFICACY IN TEACHING OF COMPUTER SCIENCE				
1	The fear of making mistakes that teachers can't correct makes them avoid the use of technology tools				
2	Possession of the necessary skills to use the computer for instruction makes me feel confident.				
3	At times teacher find working with technology tools very confusing				
4	Teachers seems to have difficulties with most of the technology tools they have tried to use in the teaching of computer science				
5.	technology tools make me much more productive				

Section C: Availability of Resources Material (Technology Tools)

List the Technology Tools being used in your computer science class

1. _____

2. _____

3. _____

4. _____

5. _____

APPENDIX II

UNIVERSITY OF BENIN

FACULTY OF PHYSICAL SCIENCES

DEPARTMENT OF COMPUTER SCIENCE

THE IMPACT OF DIGITAL TECHNOLOGY IN TEACHING AND LEARNING COMPUTER SCIENCE IN SECONDARY SCHOOL

QUESTIONNAIRE (ITTLPQ)

Dear Respondent,

This questionnaire is designed to elicit information. It is geared towards assessing the influence of Technology Tools on computer science learning in secondary schools. Kindly assist in filling the questionnaire by responding as accurately as spossible to each statement contained therein. Your responses will be used for research purpose only and will be treated with utmost confidentiality and used **only** for this research.

Thank you for your cooperation,

GODFREY ERERE JULIET

Section A: Personal Information of the Respondent

Instruction: Kindly complete this section by ticking (√) in the space provided and (write in where necessary) in the option that is most applicable to you.

Name of School: - _____

Class: - _____ Sex: - _____

Section B: Influence of Technology Tools on Computer science learning

Direction: Kindly read carefully and answer by ticking (√) the appropriate column to indicate option most applicable to you, using the rating scale below;

SA - Strongly Agree A – Agree D – Disagree SD - Strongly Disagree.

S/N	QUESTIONNAIRE ITEM	SA	A	D	SD
	INFLUENCE OF STUDENTS' ATTITUDE TOWARDS THE USE OF TECHNOLOGY TOOLS IN COMPUTER SCIENCE LEARNING				
1	Technology tools make me feel comfortable in learning computer science.				
2	Technology tools make me nervous when used in computer science practical classes.				
3	Being taught with technology tools makes me a better learner.				
4	Technology tools are confusing when used to teach computer science				
5	Technology tools is not a priority for me				
	LEVEL OF USAGE OF TECHNOLOGY TOOLS IN COMPUTER SCIENCE LEARNING				
1	Effective use of technology tools (e.g. Spreadsheet, Word Processor, Computer, Internet etc.)makes computer science learning more comprehensive				
2	Using technology tools in computer science practical classes makes learning of computer science practical more easier				
3	Lack of sufficient access to use technology tools hinders the effective learning of computer science				
4	Technology tools use in computer science learning is time consuming				
5	Technology tools encourage student to work together collaboratively				
	INFLUENCE OF TECHNOLOGY TOOLS ON SELF-EFFICACY IN THE LEARNING OF COMPUTER SCIENCE				

1	Confidence in my computer understanding capabilities makes it well enough to maximize them in my computer science learning.				
2	Technology tools get in the way of my computer science learning				
3	Trying to learn how to use new technology tools in the learning of computer science often poses a lot of difficulties				
4	Technology tools make the students feel confident in their abilities when used in computer science learning				
5	Technology tools seems to motivates the students to learn computer science				