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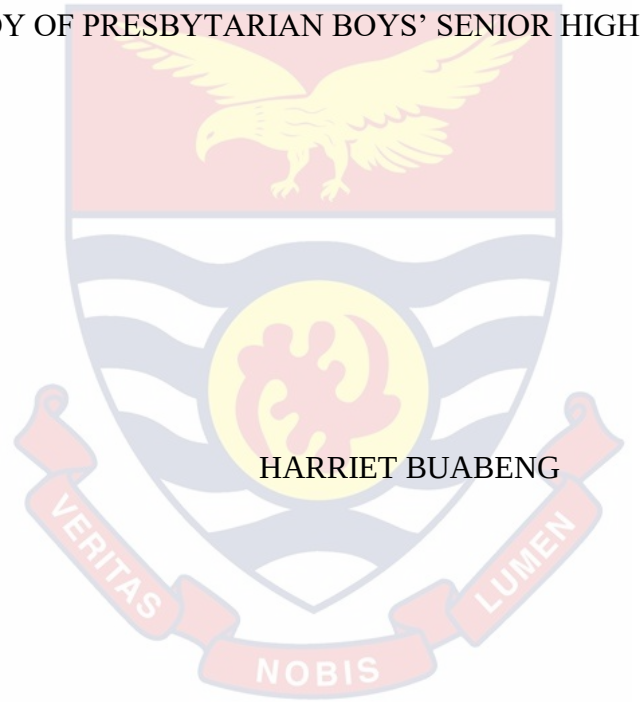
THE EFFECTS OF INFORMATION AND COMMUNICATION TECHNOLOGY TOOLS ON TEACHING AND LEARNING: A CASE STUDY OF PRESBYTARIAN BOYS' SENIOR HIGH SCHOOL, LEGON



HARRIET BUABENG

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THE EFFECTS OF INFORMATION AND COMMUNICATION TECHNOLOGY TOOLS ON TEACHING AND LEARNING: A CASE STUDY OF PRESBYTARIAN BOYS' SENIOR HIGH SCHOOL, LEGON

BY

HARRIET BUABENG

Dissertation submitted to the College of Distance Education, University of Cape Coast, in partial fulfilment of the requirements for the award of Master of Education degree in Information Technology

JULY 2019

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DECLARATION

Candidate's Declaration

I hereby declare that this dissertation is the result of my own original research and that no part of it has been presented for another degree in this University or elsewhere.

Candidate's Signature …….. Date ……

Name: Harriet Buabeng

Supervisor's Declaration

I hereby declare that the preparation and presentation were supervised in accordance with the guidelines on supervision of dissertation laid down by the University of Cape Coast.

Supervisor's Signature ……. Date …….

Name: Prof. Isaac Kojo Angnangsoore Galyoun

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ABSTRACT

The study examined the effects of information and communication technology (ICT) tools used in teaching and learning, which is a case study of Presbyterian Boys' Senior High School in Greater Accra Region. The study is underpinned by Valsiner's (1997) zone theory. A combination of qualitative and quantitative research designs were chosen for this study. Purposive sampling technique was used to select the senior high school teachers in Presbyterian Boys' Senior High School. In all, 50 teachers were selected for the study and 20 heads of department were interviewed. Self-administered questionnaire was used as an instrument for the study. SPSS version 21.0 was the software used for the data analysis. Specifically, the study revealed that majority of the teachers had positive attitudes towards teaching with ICT tools. The findings of the study revealed that the teachers were confident or very confident with the basics of operating PC (using keyboards, mouse), using word processors (such as MS Word) and using PowerPoint software. However, majority of the teachers are not confident using spreadsheets (such as MS Excel). It was recommended that authorities of senior high schools in Ghana should collaborate with the Ghana Education Service, education stakeholders and development partners to expand ICT infrastructure on various senior high schools. Furthermore, the Government of Ghana should build more computer laboratories; increase the number of computers as well as Internet bandwidth and speed, this would help increase the rate at which teachers use ICT tools for teaching.

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Finally, I wish to thank my family and friends for their support, especially, my husband, Maxwell Hayford Dwirah and my mother, Esther Asantewaa Ampadu. God bless you.

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DEDICATION

To my Husband, Mr. Maxwell Hayford Dwirah, my mother Esther Asantewaa Ampadu, my siblings Raymond Buabeng, Jessica Buabeng, Amofaa Buabeng, Asarewaa Buabeng and my spiritual father Yaw AmoTachie Pius.

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CHAPTER ONE

INTRODUCTION

Background to the Study

The call to integrate Information and Communication Technology (ICT) in classroom teaching and learning has become a major concern to many countries all over the world. This is so because the importance of integrating ICT in classroom instruction cannot be overemphasized and ignored. ICT plays an important role in the development of any country when we take into account the benefits it gives to teaching and learning. It is widely acknowledged that ICT can be used to improve the quality of teaching and learning in most situations (Barfi, Nyagorme & Duoddo, 2019; Ahiatrogah & Barfi, 2016; Andreas, 2015; Awudu, 2012).

ICT is defined as the use of technological tools to process, convert, manipulate, store, send and receive data. It encompasses the computer hardware, software, telecommunication and several other devices (audio, video, photography camera, etc.) that convert information (text images, sound, etc.) into digital form (Milken, 1999).

The ascendency and the fast development of ICT in most countries have made teaching and learning fun for students or learners. Zhang and Aikmain (2007) have argued that because of the usefulness of ICT, most academic institutions use it as part of their teaching delivery. Thus, ICT has become an indispensable tool in teaching and learning, since it allows students to learn more in less time and allows schools to focus on global learning if used appropriately. In addition, it could be an effective teaching tool when

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used to engage most students in the teaching learning process (Edumadze & Barfi, 2017; Almekhlafi, 2006).

The teaching and learning processes are aimed at enabling students to become part of the learning process. Hence, the application of ICT in education has the potential to transform teaching and learning. Lefebvre, Deaudelin and Loiselle (2006) indicated that ICT offers many means of improving teaching and learning in the classroom. The use of ICT has brought tremendous progress in the field of education in developed and developing countries and it has also brought revolution into teaching and learning process by changing the roles of teachers and learners (Kirschner & Woperies, 2013).

ICT is powerful in presenting or representing information in different ways. Robbins (2008) revealed that ICT can be used to present information through different forms (text and pictures or tables and graphs) or by enabling changes to be shown dynamically such as in mathematical modelling or by helping visualization of complex processes in science. ICT is becoming a natural part of man's daily life; thus their use in education by teachers is becoming a necessity for all educational institutions. Kozma (2015) and Leech (2014) have argued that ICT is a principal driver for effective teaching and learning delivery worldwide. Rosen and Well (2015) and Thierer (2014) also have reported that the role of technology in teaching and learning is rapidly becoming one of the most important and widely necessary in most education policies. Most experts in the field of education agree that when properly used, information and communication technology hold great promise to improve teaching and learning (Becker, Ravitz & Wang, 2009; Cohen, 2014; Laubsch, 2012).

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According to the Ghana Education Service (2002), integrating ICT in classroom instruction ensures greater motivation, increases self-esteem and confidence, enhances good questioning skills, promotes initiative and independent learning. They further added that it improves presentation of information or outputs, develops problem solving capabilities, promotes better information handling skills, increases focus time on task, improves social and communication skills for both teachers and students.

In Ghana, the use of ICT in teaching and learning is spreading very fast across all age barriers. It has been observed that ICT can boost education delivery; and teaching and learning has been made much easier with the use of ICT (Barfi, Nyagorme & Yeboah, 2018; Almekhlafi, 2006). ICT have nurtured students who are able to engage themselves productively and committed in their own learning and develop new ideas collaboratively with passion for learning of their own (Becker, Ravitz & Wang, 2009).

Currently, the use of ICT for teaching and learning is becoming more persuasive in Ghana and the number of computers for educational purposes in our institutions is growing. In the process, there is a proliferation of equipment standards for seemingly different goals. Government of Ghana has, therefore, developed a policy on ICT usage in education (Republic of Ghana, 2003). However, the success of this project has implications for attitudinal change and display of competence in the use of ICT by teachers and students.

Simply having computers in schools will not guarantee their effective use by teachers and students. 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 have the right

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attitude towards ICT use in teaching and learning. Tchombe (2008) posited that it is not just acquiring the knowledge of ICT that is important but also teachers need to understand how to use ICT pedagogically in their lesson delivery. Tchombe further asserted that ICT if used appropriately can stimulate the development of higher cognitive skills of students, deepen learning and contribute to the acquisition of skills needed for lifelong learning and for working in today's job market.

The implementation of ICT in teaching and learning is performed by teachers, since they are the integral part of the teaching and learning process. Therefore, teacher's lack of ICT knowledge and skills is a major obstacle to the usage of technology in teaching and learning. Kozma (2015) has argued that, there is the need for further training of teachers in the use of ICT in their delivery.

Ghana has developed a national framework on which the deployment of ICT in the education sector is to be based in teaching and learning at all levels of education. This framework is contained in the Information Communications Technology for Accelerated Development (ICT4AD) document (Republic of Ghana, 2003). The ICT4AD policy seeks to provide a framework in which information and communication technologies will be used to transform the education sector. This will also allow all Ghanaians to pursue quality lifelong learning opportunities regardless of their geographical location and the school they attend.

In view of this, education stakeholders and policymakers in Ghana have made a remarkable step towards the introduction of ICT in Ghanaian secondary schools. This will help to contribute to knowledge production, as

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well as communication and information sharing among students and teachers in the school system. Besides, the new educational reforms in Ghana have also placed high emphasis on the integration of ICT in all subject areas (MOESS, 2010).

The Government of Ghana has shown its commitment at the highest level of hierarchy to introduce ICT in all its operations and policies in the country. Conscious efforts are being made by Ghana Government to spread the use of ICT in teaching and learning. For instance, in relation to human resource development, Abdulai (2003) in a public forum at the University for Development Studies stated that ICT have been introduced in the nation's educational system from the basic level to the tertiary level. This idea was to facilitate creativity among individual students, encouraging students to build gadgets from their imagination based on local ideas and technologies that could be developed to benefit society at large.

Dankwa (1997) and Parthemore (2003) pointed out that many secondary schools in Ghana can boast of a computer laboratory through which students are gaining basic computer literacy to develop their mental abilities. They further argued that a number of these schools have Internet facilities, enabling students to deepen their connection to the outside world during classroom activities. Although, this is encouraging information, review of documents has revealed that some NGOs are spearheading ICT implementation in Ghanaian schools (Dankwa, 1997; Hawkins, 2002; Parthemore, 2003). However, most of these schools benefiting from these arrangements are either located in urban areas or are classified as premier senior secondary schools.

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Furthermore, Dakubu (2003), in a public forum at the University of Ghana stated that ICT should be introduced into all senior high schools, no matter their location. To him, education must start from the grass root level and ICT studies should be a pre-requisite for gaining admission to the university. He further asserted that computer literacy should be taught in all colleges of education, since most of the teachers at the basic schools are graduates of the colleges of education. By doing this, a sound human resource base would be developed with competence in ICT beginning from the primary to the senior high schools (SHSs). Though Dakubu's ideas are commendable, the big question is how realistic it will be in our part of the world.

The Ministry of Education has developed a curriculum for ICT training for students in senior high schools. ICT is an elective subject in the West Africa Senior Secondary School Certificate Examination. These developments at the policy levels show that by 2020 ICT will become a tool for assessing students' ability and determining their fitness for transition to post- secondary education (Mfum- Mensah, 2017). It is against this background that this study sought to examine the effects of the use of ICT tools in teaching and learning at the Presbyterian Boys' Senior High School in the Greater Accra Region.

Statement of the Problem

In Ghana, there has been a number of educational reforms. However, the said reforms have not brought the much-needed results in terms of the national objective of preparing its manpower potential to meet the growing demands. Considering the Ghanaian educational work force where generational differences prevail, one cannot overlook the effects of using ICT

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tools in teaching and learning. The use of ICT tools for enhancing teachers' instruction, and as a catalyst for improving access to quality education in formal and non-formal settings has become a necessity in most senior high schools in Ghana.

The presence of ICT tools in an interactive educational environment can help to develop students thinking skills and make classrooms an environment for educational growth. Teachers' usage of ICT tools also helps students to develop new thinking skills which may transfer to different situations which may require analysis and comprehension skills, and demand critical skill development (Al Hudhaifi & Al Dughaim, 2005). When you go visit Presbyterian Boys' senior high school, you will see some teachers having access to these ICT tools in their classrooms, but some teachers do not use in their teaching. Is it because they do not know how to use these ICT tools or they do not how to integrate them in their teaching. There is little research, which focuses on the role ICT plays in promoting interactive educational environment as part of teaching and learning in senior high schools (SHSs) in Ghana. Thus, there is the need to investigate the effects of ICT tools in promoting an interactive environment for effective teaching and learning.

Objectives of the Study

The major objective was to assess the effects of ICT tools on teaching and learning. Specifically, the research will investigate into:

1. the attitude of teachers towards ICT tools in the teaching process in Presbyterian Boys' senior high school.

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2. the confident levels of teachers in using ICT tools in teaching at Presbyterian Boys' senior high school.
3. the impact of using ICT tools in teaching at Presbyterian Boys' senior high school.
4. the barriers that manifest when using ICT tools in teaching if any at Presbyterian Boys' senior high school.

Research Questions

In order to address the specific objectives, the following questions were formulated to guide the study:

1. What is the attitude of Presbyterian Boys' senior high school teachers towards teaching with ICT tools?
2. How confident are Presbyterian Boys' senior high school teachers in using ICT tools in the teaching and learning process?
3. What are the impacts of using ICT tools in the teaching and learning process at Presbyterian Boys' senior high school?
4. What are the barriers hindering the integration of ICT tools in education at Presbyterian Boys' senior high school?

Significance of the Study

A study into ICT tools used in teaching and learning and their effects will make some contribution to the existing knowledge. At the end of the study, it is hoped that teachers' attitude towards the use of ICT in teaching will be improved and their entire performance gap in teaching with ICT tools will be addressed.

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The essence of any research is to address the void in our minds and add new knowledge to the existing ones. It is expected that the results of the study will be useful to policy makers in the Ministry of Education in Ghana and also teachers in developing ICT use within senior high schools. This study may also support educational administrators and policy makers in choosing the appropriate methods of managing changes associated with ICT use in the educational system.

Delimitation of the Study

It would have been best to interview all SHS school teachers in Ghana to examine the ICT tools used in teaching and learning and their effects, to arrive at the best result to make the needed recommendations. Though the study included all teachers in the school, non-permanent teachers were excluded. The study is delimited to only teachers who used ICT in teaching and learning at the Presbyterian Boys Senior High School.

Limitation of the Study

The findings of this study can only be generalized for teachers in Presbyterian Boys Senior High School sampled in Greater Accra. Therefore, it cannot be generalized for all senior high schools in Ghana because of the sampling procedure that was used for selecting the teachers.

Braginsky and Braginsky (1974) argued that generalization may distort and obscure the findings of any analyst, but quickly added that statistical procedures do not assure "truth". Citing the views of those authorities on the contention that, logical errors may occur when generalizing from a small

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sample to a large universe especially when the studies is about humans. Braginsky and Braginsky (1974) again stated that statistical procedures do not guarantee objective results and concluded that statistical generalization does not provide wisdom or foolishness; but both are a function of the intelligence and good sense from an investigator who uses this procedure.

Biases and the inherent flaws associated with the use of data collection instrument as a tool for data collection will be some of the setbacks of this study. In some cases, the uncooperative attitude of some of the respondents threatened the data collection efforts of the researcher. Also, the effects of extraneous variables such as ICT support from the Presbyterian Boys Senior High School and teachers' perception about ICT programme could affect the level of ICT use in the school. These variables could not be controlled; therefore, they could affect the final study. Measures were, however, taken to minimize the effects of these on the final results of the study.

Definition of Terms

ICT: Information and Communication Technology, which means computers, PDA, mobile or cellular phones, digital cameras, satellite navigations systems, electronic instruments and data recorders, radio, television, computer networks, and almost anything which handles and communicates information with the support of electronic device.

Learning: The acquisition of knowledge or skills through study, experience, or being taught through a mobile technological device.

Teaching: It is the ideas or principles taught by an authority through a mobile technological device.

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Organisation of the Study

This study is organised into five different chapters. The first chapter talks about the background to the study, the statement of the problem, the research objectives and questions. The chapter also deals with the significance of the study, the delimitations and limitations encountered in the study. The second chapter deals with the review of the related literature and the theoretical framework. The third chapter deals with the research methodology that was used in the study. The fourth chapter dealt with the presentation and analysis of the data collected. The last chapter, which is chapter five, gives the summary of findings, the conclusions that were drawn and the recommendations thereof.

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CHAPTER TWO

LITERATURE REVIEW

Introduction

The literature was reviewed based on the objectives and research questions in the study. The reviewed literature assisted in establishing the basis for the study. For easy referencing, this literature is reviewed under the following sub-headings:

ICT in education;

Attitude of teachers towards teaching with ICT tools;

Teachers' confidence level in using ICT;

Effects of ICT in teaching and learning;

Disadvantages of using ICT in the classroom;

Barriers hindering the integration of ICT tools in education; and

Theoretical framework. The chapter ends with the summary

Education and ICT

The best education is to be found in getting the best information from educative tools to support teaching and learning in various schools (Museveni, 2014). Educational technology provides aids for teaching and learning; however, they can never be substituted for learning itself (Ayo, 2011). In education, greater emphasis is put on the versatility, accessibility, availability and adaptability of learning materials or tools/aid that supports teaching (Almarzooqi, 2016). According to Almarzooqi (2016), ICT is a valuable teaching aid for accomplishing tasks that are logically distinct from the tool itself in education. ICT integration in the classroom is the use of technology to

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assist, enhance and extend users' knowledge using ICT tools (Omwenga, 2004). Using ICT tools or aids in education means more than simply teaching users how to use computers (Parthemore, 2003). According to Parthemore (2003), technology is a means for improving education and not an end in itself.

In fact, teaching using different learning styles with the support of ICT tools will help teachers to reach each student during classroom lessons. Teachers, who employ ICT in teaching and learning, use various teaching strategies in order to connect the learning style of each student in the classroom (Kozma, 2015). Pelgrum (2001) argued that students learn more and retain information longer, when they learn in a manner that is comfortable to them with the support of ICT tools or aids. Pelgrum (2001) further revealed that teachers use resource-centred approaches to help students gain knowledge by combining both visual and auditory senses with the support of ICT resources or tools. This makes learning attractive to students.

The use of ICT in teaching began some years or decades ago (Pelgrum & Law, 2000). The use of ICT became popular in the 1980's when personal computers became available to consumers for personal use (Teye, 2012). This has motivated government agencies across most countries to use these devices in teaching and learning. Kozma (2015) and Leech (2014) have pointed out that the use of ICT in teaching has encouraged global competition among nations to influence governmental policies in ensuring that they keep pace with these technological advancements.

The introduction of government policies has motivated the mass production of computers for schools. Towards the end of the 1980's, the term

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'information technology' began to replace the word 'computer' in most instances (Pelgrum & Law, 2003). The term information technology is explained as computer's processing ability, indicating a shift from computing technology to the ability or strength to store and retrieve information. Pelgrum and Law further argued that the enhancement of ICT signaled the introduction of email and electronic messaging with computer technology with the help of the various Internet service providers.

Technology use in education is becoming an increasing important part of the education system (Wernet, Olliges & Delicath, 2017; Almekhlafi, 2006). Through the use of ICT, teachers can have a look at the way they teach and modify the instructions with videos. Lam and Lawrence (2002) have observed that the use of ICT in teaching and learning not only gives students the opportunity to control their own learning process, but also gives them the opportunity to access vast amounts of information.

The acquisition of knowledge in ICT by students will help them in their research, assignment and learning. Teachers can also use the services of ICT to write lesson notes and prepare materials for teaching and learning. Thus, computers have become a routine tool for helping teachers and students accomplish their work successfully (Kwafoa, Barfi & Agyapong, 2019; Becker, Ravitz & Wang, 2009).

Attitude of Teachers towards Teaching with ICT Tools

Simply having ICT tools in the various schools will not guarantee their effective use in teaching and learning process (Ahiatrogah & Barfi, 2016). Regardless of the quantity and quality of technology placed in classrooms, the

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key to how those tools are used is the teacher; therefore, teachers must have the right attitude towards ICT tools (Kadel, 2015). Attitudes refer to one's positive or negative judgment about a concrete subject (Kadel, 2005). There is a common saying that attitude determines altitude. 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 (Ajzen & Fishbein, 2000).

Studies have established close links and affinities between teacher's attitude and their use of ICT tools for teaching (Leech, 2014; Teye, 2012; Ayo, 2011). High teacher's positive attitudes towards the ICT were associated with a higher level of computer experience (Dyck & Smither, 2005; Teo, 2008). Teachers' confidence in ICT tools can be explained through the attitude and behaviour of teachers. Teachers' behaviour is a critical influence on teachers' confidence and attitude towards ICT tools as they provide important role models to their students and themselves as instructors (Derbyshire, 2003).

Attitude of teachers towards computer and technology skills can be improved by integrating technology into teacher education (Zammit, 2012). Findings have revealed that a significant relationship exists between teachers' computer attitude and its use in classroom teaching (Beauchamp, 2012; Khine, 2011; Becker, Ravitz & Wang, 2009). Attitude is a major predictor of teachers' future ICT tools for classroom delivery. Sutherland (2015) and Lee's (2013) studies on attitude of teachers towards the integration of ICT indicated the importance of appropriate responses to teacher's feelings about using ICT tools as one of the factors critical to teacher's integration of ICT tools for teaching.

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Teachers who have positive attitude and are highly enthusiastic about interactive teaching aids or tools for teaching are motivated to practice using ICT tools for lesson delivery (Kennewell & Morgan, 2003). Teachers need to be skilled in the use of ICT and also to be able to critically evaluate strategies for the acquisition and the appropriate application of ICT tools in diverse curriculum area (Ittigson & Zewe, 2013; Robbins, 2008).

Many countries and agencies are developing and guiding professional development so that majority of teachers can be prepared to use ICT tools in their teaching. UNESCO has been working to produce guidance for less favoured countries at the request of their governments (UNESCO, 2008). A World Bank report on teachers' preparedness for technology adoption also identifies ICT tools in teacher education as a key issue, especially in the preparation of aspiring teachers (Hennessy, 2015). Many developed countries are also promoting initiatives for ICT tools in teacher education (Snyder, 2015) and in their report, they noted that ICT tools for teaching can prepare educators to use information and communication technologies effectively.

Davis and Tearle (2016) reviewed frameworks for ICT in teacher education to inform European Commission research objective of a 'Core Curriculum' for ICT in teacher education (then known as Telematics for Teacher Training, or T3). According to Davis and Tearle (2016), they noted that many countries around the world were taking action to ensure that their educational systems were updated to permit equality of access and to ensure that key ICT skills were developed in schools and other educational institutions to be used by teachers. They also noted that it was becoming abundantly clear that the training of teachers in ICT skills and appropriate

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pedagogical approaches was essential for teachers to integrate ICT tools in their teaching processes (Wernet, Olliges & Delicath, 2017).

Teachers' Confidence Level in Using ICT

The potential or the ability to use ICT tools in teaching depends on the skills of the teachers (Blurton, 2014). This implies the use of ICT in teaching rest heavily on personal experience and practical ability of the teacher (Ayo, 2011). At the end, the computer, as a technological apparatus, should become a means to an end and not an end in itself (Parthemore, 2003). It is not surprising that teachers who have had a kind of prior knowledge and skills in ICT, all things being equal, would optimise the use of it to the benefit of their students (Woodruff, 2015; Ivancevich, 2010).

Studies conducted by Flick (2011), Mullins (2007), Cole (2002) and Noe (2000) investigated the confidence levels of teachers in using ICT in their teaching or lesson delivery. They found that majority of the teachers were confident in using ICT tools in their lesson deliveries in the classroom. However, they also found that some of the teachers were not confident with the use of ICT tools in the teaching process.

Figg and Jaipal-Jamani (2011) found that ICT pedagogical skills of secondary teachers are important for them to use ICT in their delivery or not. Particular features of teacher actions were linked to the following:

1. the fact that teachers need to become confident in using ICT in their daily teaching,
2. knowledge of specific classroom management techniques for teaching with technology, and

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3. modeling ICT strategies in teaching with confidence in its delivery.

It is necessary that teachers need to feel confident in using ICT to assist students learning with technology. Students will likewise use technology when teachers are confident in incorporating technology into their delivery in the classrooms. Therefore, teachers need to become more confident in ICT usage to enhance students' usage (Ward & Parr, 2010). Mereku (2009) also found that many SHS teachers did not integrate technology in their teaching because most were not confident with its use. Teachers need know how to use ICT in relevant ways in order to help improve their lesson delivery in the classroom (Morrisa, 2011).

The availability of ICT has changed the nature of teaching and learning. Hence, to judge the extent and how ICT may enhance teaching and learning, it is necessary to examine the available research evidence. There are many positives that teachers can derive from the use of ICTs in the teaching and learning process (Laubsch 2012; Cohen, 2004; Katcher & Snyder, 2003; Kleiman, 2003).

ICT impacts on a large section of education users. Some educational institutions do not even require students to be physically present at classroom to benefit from classroom instructions. Virtual classroom activities have flourished with improved Internet accessibility to support teaching and learning process (Bishop, 2007).

Al-Balawi (2010) undertook a study in Kenya aimed at identifying the effects of ICT on learning during the teaching of statistics. The study sample comprised 66 selected students who were divided equally into two groups. An experimental group consisted of 33 selected students who studied relying on

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ICT-assisted methods, while the control group consisted of 33 students who studied by traditional methods. The findings of the study revealed that there were significant differences in the skills of understanding and application, and the overall post-test results were in favour of the experimental group who were taught using ICT.

Rendall (2001) also conducted a study in Canada to assess the effectiveness of ICT in teaching mathematics for rural public schools' students. The study sample consisted of two groups: experimental and control groups with a total number of 120 students. The eighty students of the control group studied over three semesters using traditional methods, while the experimental group comprised forty students who studied using ICT-assisted methods. The study indicated that ICT-assisted teaching was more effective in raising the arithmetical and logical skills in mathematics compared with the use of the traditional methods.

Similarly, Jabr (2007) investigated the effect of using ICT in Nigeria on students' achievement in mathematics compared with traditional methods in addition to identifying the teachers' attitudes towards using ICT. The study findings revealed that there were significant differences between the average achievements amongst students after both methods were applied (ICT and traditional) in favour of the ICT method. Likewise, a study by Su (2011) in Japan suggested that ICT integrated in learning can support students to achieve a greater understanding of a chemistry lesson and improves their attitude and approach to chemistry learning. However, these studies emphasised the importance of providing effectiveness of ICT use in the learning environment with the support of teachers.

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Kennewell (2005) reported that in Wales teachers who have evolved considerably and successfully in both course content and pedagogy through both individual and cooperative integration of ICT into their teaching methods experienced better results from their students. His findings further support the idea that the teacher is the leader of the learning process in the classroom.

Condie and Munro (2007) concluded that the use of ICT has had positive effects in a number of subjects, as well as being constructive in assisting students that are marginalized as a result of personal or familial problems. Studies conducted by Frear and Hirschbuhl (1999), Frost (2000), Nadler (2004), Ivancevich (2010) and Woodruff (2015) shown that many students benefit from the use of ICT. They claimed that students get immediate feedback or rewards when teachers use ICT in their delivery. Liao (2004) has argued that the use of ICT is positive over traditional instruction in Taiwan. This Taiwanese study was supported by a Chinese study (Zhou, Hu & Gao, 2010) from Shaanxi Normal University.

Hussein (2000) and Mawata (2008) studied the effect of using ICT on the achievement among high school students and their attitudes towards mathematics. The study sample consisted of 163 students from USA. The findings indicated that students' achievement was high according to the achievement test. Furthermore, the findings indicated the presence of students' positive attitudes towards mathematics from the study sample.

BECTA (2004) has asserted that the use of ICT in mathematics classrooms also allow students to focus on strategies and interpretation of answers rather than spending time on tedious computational calculations. The

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key benefits of using ICT in teaching instruction, according to BECTA are the following:

1. ICT promotes greater collaboration among students and encourages communication and the sharing of knowledge.
2. ICT gives rapid and accurate feedback to students and this contributes towards positive motivation.
3. The use of technology in mathematics also allows students to focus on strategies and interpretations of answers rather than spending time on tedious computational calculations.

ICT use in classroom also supports constructivist pedagogy, wherein students use technology to explore and reach an understanding of mathematical concepts. This approach promotes higher order thinking and better problem-solving strategies. ICT use in mathematics instruction assists students to visualize the process and concept role of symbols (Tall & Ramos, 2004).

Furthermore, the use of ICT in teaching and learning facilitates learning for teachers. Harrison (2012) has argued that the use of ICT in classroom activities has helped in the development of learning processes, such as gaining attention of students and helping to support response mechanism applications during learning. He further indicated that ICT use helps students to understand tasks in class well and facilitates knowledge understanding.

According to Wahyudi (2008), technology enabled students to learn from feedback. Technology often provides fast and reliable feedback to students. It enables students to produce many examples when exploring mathematical problems. Technology helps students to see patterns and

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connections. The computer enables formulae, tables of numbers and graphs to be linked readily for use to users. Li (2013) has observed that the use of technology allows students to work with dynamic images that cannot be done within traditional teaching. Students can use computers to draw graphs and manipulate diagrams for better understanding. Technology enables students to work with real data, which can be represented in a variety of ways or forms. This supports interpretation and analysis that lead students to higher order mathematical thinking skills and helps to analyse data first.

A study conducted by Roschelle, Pea, Hoadley, Gordin and Means (2000) in Germany also supported the use of technology in teaching and learning. Their finding indicates that ICT can help support learning and that it is especially useful in developing higher order skills of critical thinking, analysis, and scientific inquiry in class. ICT can also be used in various ways to improve how and what students learn in the classroom thereby helping students understand core concepts in mathematics. According to Roschelle et al., (2000), ICT use in classrooms build confidence of students and teachers and is a great tool for remediating slower learners. Hennessy (2007) argued that teachers will also benefit from the available tools technology gives in supporting students to build links between scientific theory and empirical evidence.

Effects of ICT in Teaching and Learning

The use of ICT in teaching and learning can lead to positive educational benefits in the classroom. Effective use of ICT by teachers can offer greater advantages in achieving various levels of interactivity at deep and

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surface level. Kozma and Anderson (2012) have argued that ICT usage in the classroom is transforming education. They further revealed that ICT use is introducing new curricula approaches based on real life problems, providing different tools to enhance learning, as well as providing students and teachers with more opportunities for feedback and reflection.

ICT use in teaching motivates teachers to complete tasks within shorter times (Ayo, 2011). Beauchamp (2012) and Sutherland (2005) have reported that the use of ICT in teaching offers a range of key features including completing lesson activities early and offers interactivity services with students and teachers. Ittigson and Zewe (2013) also argued that the use of ICT in teaching and learning improves the way subjects are taught and enhances students understanding of basic concepts.

The use of ICT in teaching and learning broadens horizons of students with more opportunities for creative expression, wider access to learning materials and increases motivation through learning that stimulate interest (DFES, 2003). They further suggest that ICT can make significant contribution to teaching and learning across all subjects' areas. Thus, ICT use can engage and motivate students to meet their individual needs in classroom situations (McGrail, 2015; DFES, 2003).

Students who do not enjoy learning can be encouraged through the use of ICT. Hennessy (2015) and Pelgrum (2001) argued that ICT tools for learning possesses the flexibility to meet the individual needs and abilities for every student. ICT presents information in ways that help students to understand concepts. As such, difficult ideas become easier to understand when ICT tools are used to support teaching (Beauchamp, 2012). Simulation

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offered by ICT encourages analytic and broader thinking as well as learning activation and stimulation. Wernet, Olliges and Delicath (2017) stressed that the use of ICT in teaching helps students with emotional difficulties to concentrate in class.

Denning's (2017) research findings involving nine secondary schools located in the West of Sussex, Sheffield and Birmingham on how ICT activities can stimulate students learning through positive experiences that involve the use of technology in group activities. Eighty percent (80.0%) of the teachers who used ICT regularly found that students were stimulated in a good manner. Indeed, ICT had a positive effect on student motivation and the use of ICT boosted students' motivation to learn, which led to a better performance for learning outcomes.

Korte and Husing (2007), as cited in Rodden (2010) also agreed that the use of ICT in teaching motivates students to concentrate in class and participate in class lessons. This is because modern educational software use animation with sounds, video and interactivity style to help students who are dull to concentrate in class (Armstrong & Baron, 2012). Bullock (2011) carried out a case study about the effect of ICT use on students' motivation and achievement in English and found a great improvement of students' performance. In particular, students were more enthusiastic to start the tasks, and this zeal continued over time.

Learning in an ICT environment entails more excitement and amusement regarding lessons. The use of ICT in learning is considered to have a number of positive effects on students. Students, who are taught using ICT have increasing self-confidence and self-esteem, reinforcing social skills,

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improving cooperative and collective work skills, and better achievement than students who were taught using traditional methods (Li, 2013; Harris & Kington 2002).

Another study was conducted by Hennessy (2010) in USA, to find out if the use of ICT has any effect on students learning. The research also studied the effects of different uses of ICT during lessons. The findings indicated that students who were taught using technology had their motivation and confidence level increased over three weeks. Similarly, a study conducted by Mereku (2009) indicated that ICT used in teaching was useful and had positive effects on students' learning. This was corroborated by Ittigson and Zewe (2013), who concluded that the use of ICT to support learning promotes students higher order thinking and better problem solving strategies.

Al-Balawi (2010) undertook a study in Kenya aimed at identifying the effect of ICT on learning during the teaching of a statistics. The study sample comprised of 66 selected students who were divided equally into two groups. An experimental group consisted of 33 selected students who studied relying on ICT-assisted method, while the control group consisted of students 33 who studied by traditional methods. The findings of the study revealed that there were significant differences in the skills of understanding and application and the overall post-test performance was in favour of the experimental group who were taught using ICT tools.

Rendall (2001) also conducted a study in Russia to find out the effectiveness of ICT in teaching mathematics for rural public schools' students. The study sample consisted of two groups: experimental and control groups with the total number of students amounts to one hundred and twenty.

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The eighty students of the control group studied over three semesters using traditional methods, while the experimental group comprised forty students who studied using ICT-assisted methods. The study indicated that ICT-assisted teaching was more effective in raising the arithmetical and logical skills in mathematics compared with the use of the traditional methods.

Jabr (2007) investigated the effect of using ICT on students' achievement in mathematics in India, compared with traditional methods in addition to identified the teachers' attitudes towards using ICT. The study findings revealed that there were significant differences between the average achievements amongst students after both methods were applied (ICT and traditional) in favour of the ICT method. A study by Su (2011) indicated that ICT integrated in learning supported students to achieve a greater understanding of a chemistry lesson and improved their attitude and approach to chemistry learning. Therefore, these studies emphasized the importance of providing effectiveness of ICT use in the learning environment with the support of teachers.

Condie and Munro (2007) concluded that the use of ICT has had positive effects in a number of subjects, as well as being constructive in assisting students that are marginalized as a result of personal or familial problems. Research on teachers' adoption to technology has shown that many students benefit from the use of ICT (Woodruff, 2015; Ivancevich, 2010; Nadler, 2004; Frost, 2000; Frear & Hirschbuhl, 1999). Wishart and Blease (2009) claimed that students get immediate feedback or rewards when teachers use ICT in their delivery. Liao (2004) stated that the use of ICT is positive over traditional instruction in Taiwan, which is corroborated by the results of a

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Chinese study from Shaanxi Normal University on teacher's attitudes towards the adoption of technology in classroom teaching (Zhou, Hu & Gao, 2010).

Li (2013) has observed that the use of technology allows students to work with dynamic images that cannot be done within traditional teaching. Students can use computers to draw graphs and manipulate diagrams for better understanding. Technology enables students to work with real data, which can be represented in a variety of ways or forms. This supports interpretation and analysis that lead students to higher order mathematical thinking skills and help to analyze data first.

A study conducted by Roschelle, Pea, Hoadley, Gordin and Means (2000) on ICT use in classroom supports the use of technology in teaching and learning. Their finding indicates that ICT can help support learning, and that it is especially useful in developing higher order skills of critical thinking, analysis, and scientific inquiry in class. Again, the study explored various ways ICT could be used to improve how and what students learn in the classroom by helping students understand core concepts in mathematics. They further report that ICT use in classroom builds confidence of students and teachers and is a great tool for remediating slower learners.

Disadvantages of Using ICT in the Classroom

Knowledge of and experience with computers in the delivery of lessons is not enough to enable teachers to make the best use of ICT in the classroom. Effective adoption of ICT in the classroom takes time and effort (Somekh & Davis, 2016). Teachers' adoption of technology in class sometimes takes time, even with the support of an experienced team or

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through collaborative working before it works (Sandholtz, 2015). In addition, teachers' skills, beliefs and practices about technology are related to its successes (Wild, 2006). This can affect the way teachers choose to use ICT and how effective they are at using it also matters (Higgins & Moseley, 2011).

Handal (2011) examined the usage of ICT with secondary school mathematics teachers in Australia. The study concluded that most teachers found ICT detrimental to learning. Hanson further argues that the use of ICT in teaching changed the nature of the curriculum by altering the content of what needs to be taught at different times and stages. The potential of new tools and opportunities can take a long time to have an impact on classroom practice. Despite the availability of ICT, teachers sometimes give up because of going back to learn the way of using that new approach in their delivery (Mumtaz & Hammond, 2014; Goldberg, Russell & Cook, 2013; Nadler, 2004).

Apparently, teachers' acceptance for new technologies in teaching and learning seems to be controversial (Barfi, Afful-Arthur & Agyapong, 2018; Becker, Ravitz & Wang, 2009). According to Becker, Ravitz and Wang (2009), this is because it takes time and effort to integrate ICT to the teaching and learning process. Whilst some have effectively integrated ICT tools into the classroom with ease, others have been cautious in their acceptance and some have simply rejected these technologies (Cascio, 2012; Noe, 2000).

Barriers Hindering the Integration of ICT Tools in Education

A barrier is anything that retards the progress or achievement of any set objective or aim (Hawkridge, 2014). ICT tools integration in the classroom

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is the application of technology to assist, enhance, and extend student knowledge (Barfi, Boohene & Afful-Arthur, 2017; Omwenga, 2004).

A study conducted by OECD in 2009 confirmed that there are a number of barriers or challenges that inhibit teachers' use of ICT tools in the teaching and learning process. These barriers included an inconsistent number of computers to students, a deficit in maintenance and technical assistance and finally, a lack of computer skills and or knowledge among teachers (OECD, 2009). Jenson (2012) classified these barriers as: limited equipment, inadequate skills, minimal support, time constraints and lack of interest or knowledge by teachers.

In a research report conducted by BECTA (2004), a number of other important barriers were identified as the reasons why teachers do not use ICT tools to support their teaching. These were: lack of confidence, accessibility, lack of time, fear of change, poor appreciation of the benefits of ICT and age. Ertmer (2009) concurred with Schoepp (2005), asserted that if teachers are aware of and understand such barriers; they can initiate strategies to overcome them within the shortest possible time. According to Annan (2012) although valuable lessons may be learned from best practices around the world, there is no one formula for determining the optimal level of ICT tools integration in the educational system. Significant challenges that policymakers and planners, educators, education administrators, and other stakeholders need to consider include: educational policy and planning, infrastructure, language and content, capacity building, and financing.

Research has classified these barriers in different ways. Several studies have divided the barriers into two categories: extrinsic and intrinsic. However,

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what was meant by extrinsic and intrinsic differed among studies. In one such study, Ertmer (2009) referred to extrinsic barriers as first order barriers citing as examples: lack of time, support, resources and training. She referred to intrinsic barriers as second order barriers, citing as examples: attitudes, beliefs, practices and resistance to change.

A full and complete integration in the use of ICT tools in education requires high quality frequent training and professional development. If this training is not provided, then attempts at integration will inevitably be unsuccessful. This is significant, as according to most researchers another barrier that is frequently cited is the lack of effective training. A study by Pelgrum in 2001 revealed that there were not enough training opportunities for teachers in the use of ICT tools in the classroom.

The training of teachers in the integration of ICT tools in the learning and teaching process is a difficult thing (Bigum, 2016). This is so because it involves a number of complex factors in order to render the training effective. These complex factors include finding time for the training, training in pedagogy, and skills training (Bingimlas, 2009).

Schoepp (2005) maintained that if new technology is going to be integrated into education, teachers should receive training on how to use the ICT tools, while Trotter (2009) concluded that training in ICT tools integration must be preceded by and supplemented with basic skills training. Research by Gomes (2015) also asserted that lack of training in digital literacy, lack of pedagogic and didactic training in how to use ICT tools in the classroom and lack of training concerning the use of technologies in specific subject areas, were obstacles to the use of new technologies in classroom practice.

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Cox (2009) again asserted that if teachers are to be convinced of the value in using ICT tools in their teaching, their training should focus on pedagogical issues. According to him, this is due to the fact that even after teachers had attended professional development courses in ICT tools, they still did not know how to effectively use ICT in their classrooms teaching. This was because too much emphasis was placed on acquiring technical ICT skills during training in schools, as opposed to skills in how to incorporate ICT tools into their teaching and learning.

It was also found that there were numerous problems within this application of ICT tools in the classroom, not least because of the fact that teachers were not always ready for its use and lacked training and confidence when using technology (Petrina, 2017). This lack of confidence and training meant that students suffered greatly from using ICT tools because the literature notes that it was simply used as an expensive way of projecting images, rather than allowing them to embrace technology tools and learn how to apply it in their own learning.

A study by Evertson and Weinstein (2016) indicated that "the problem of managing ICT tools in the classroom is one of the greatest challenges mentioned by teachers" (p. 543) while Morella (2017) stressed that teachers lacked training and were often less skilled in using ICT tools than their students, meaning that many were afraid to implement technology in the classroom and the learning suffered as a result.

Balanskat (2016) classified barriers as 'micro level' (teacher attitude) and 'meso level' (institutional). He added a third category called 'macro level', to account for the wider educational system. Meanwhile, Pelgrum

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(2011) identified material barriers as lack of physical equipment and non-material barriers as somewhat intangible entities such as lack of knowledge, confidence or time.

The work by Vrasidas and Glass (2005) specified that "a lack of technology training, resistance to, negative attitudes toward technology tools and instructional changes, as well as personal biases are important factors that certainly, teacher's beliefs and practices are instrumental in how ICT tools are used in the classroom" (p. 33). These viewpoints indicate the importance of teacher attitudes and this will be a central part of the focus for the primary research in this study. The attitude of the teacher, perhaps derived from the lack of training and other associated factors, therefore leads to either the successful inclusion of ICT tools into the curriculum, or rejects this implementation due to negative beliefs and a lack of confidence (Lloyd, 2000).

There also are problems associated with the hardware when using ICT tools in the classroom, rather than simply idealistic issues or problems involving the ability to use technology appropriately by teachers. A study by Pass (2008) on barriers on the use of ICT in teaching stated that there are hardware concerns with the use of ICT tools, with problems including glitches with the technology, the freezing of programs while attempting to run them, difficulties accessing files, students storing work on servers and forgetting passwords and downed equipment occurring for various reasons (Pass, 2008).

Pass (2008) noted that when using ICT tools for teaching and learning, reasons included "the failed attempt to access and use video and audio streaming because of too little bandwidth, electricity outages, programs

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freezing up and sometimes a lack of computer expertise resulting in lost data" (p. 83). In other words, from this statement the belief emerges that there are numerous obstacles relating solely to the hardware and software of technology tools systems rather than external factors such as the ability (or lack of) of the teacher in charge of classroom tools. The viewpoint that hardware issues are often serious problems in the classroom that has attempted to integrate ICT tools is supported by Cennamo (2012). According to Cennam (2012), most teachers do not know to install hardware or software devices.

Theoretical framework

This study is underpinned by Valsiner's (1997) zone theory. Valsiner's (1997) zone theory was originally designed as an explanatory structure in the field of students' development to apply technology into the teaching and learning setting. Valsiner's (1997) zone theory extends Vygotsky's (1978) concept of the Zone of Proximal Development (ZPD) which is often defined as the gap between student's present capabilities and the higher level of performance that could be achieved with appropriate assistance to incorporate the social setting and the goals and actions of participants using technology.

Valsiner (1997) added two zones: the Zone of Free Movement (ZFM) and Zone of Promoted Action (ZPA) to Vygotsky's Zone of Proximal Development. The ZFM structure takes into consideration an individual's access to different areas of the environment, the availability of different objects within an accessible area and the ways the individual is permitted or enabled to act with accessible objects in accessible areas using technology.

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The ZPA represents the efforts of a more experienced or knowledgeable person to promote the development of new skills using technology. The ZPA describes the set of activities, objects, or areas in the environment, in which the person's actions are promoted. Goos and Bennison (2008) argued that the ZFM can be interpreted as constraints within the school environment, such as participants' characteristics, access to resources and teaching materials and curriculum and assessment requirements. However, the ZPA represents opportunities for teachers to learn the skills involved in using ICT in their lesson deliveries. The details are provided in Table 1.

Table 1: Factors Affecting ICT Use in Teaching

Valsiner's Zones	Elements of the Zones
Zone of Proximal Development	Skill/experience in working with technology, pedagogical knowledge (technology integration). Pedagogical beliefs (technology).
Zone of Free Movement	Access to teaching materials, support from colleagues (including technical support), institutional culture, curriculum & assessment requirements.
Zone of Promoted Action	Pre-service education training for using ICT in teaching (university program), practicum and beginning teaching experience, professional development.

Source: Valsiner's (1997) zone theory themes

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Chapter Summary

Extensive discussion of studies on the effects of ICT tools on teaching and learning were captured. The literature research was based on the following headings: ICT in education, attitude of teachers towards teaching with ICT tools, teachers' confidence level in using ICT, effects of ICT in teaching and learning, disadvantages of using ICT in the classroom, barriers hindering the integration of ICT tools in education and theoretical framework. Several of the research done was carried on in different countries other than Ghana.

Some literature suggests that lack of adequate training and experience is one of the main factors why teachers do not integrate ICT tools in their teaching. This also results in teachers' negative attitude towards integrating ICT tools in their lesson delivery.

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CHAPTER THREE

RESEARCH METHODS

Introduction

This chapter describes the methods and procedures used to conduct the study and focuses on the research design, population, sample and sampling technique, research instrument, data collection procedure and analysis.

Research Design

The researcher adopted a descriptive research design which sought to investigate the effects of ICT tools on teaching and learning in Presbyterian Boy' Senior High School. Babbie (1992) described a research design as a plan or blueprint of how one proposes to do a research. The research design determines the research methods and procedures to be applied as determined by the nature of the research problem or objectives of the study. According to Cresswell (2014), a research design can be qualitative, quantitative or both. Research design relates to the general approach adopted in executing the study. The researcher has to specify the type of the design followed in the study (Oyedele, 2003). This study adopted both the qualitative and the quantitative research approaches.

The qualitative and quantitative research design was chosen as the design for this study. A case study, according to Baxter and Susan (2008), is a phenomenon of some sort occurring in a bounded context. This method was primarily selected because of the expected value that asking open-ended unstructured questions has in terms of gaining a thorough in-depth understanding of the issue in the context of studying multiple case study,

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which dilutes the overall analysis (Creswell, 2003; Stake, 2005). Again, the qualitative and quantitative was considered because the focus of the study was to answer questions on the effects of ICT tools used in teaching and learning at the Presbyterian Boys' Senior High School in the Greater Accra Region.

Creswell and Plano (2007) have indicated that mixed methods research is a research design with philosophical assumptions as well as methods of inquiry. They further argued that it involves a mixture of qualitative and quantitative approaches in many phases in the research process or stage. As a method, it focuses on collecting, analysing, and mixing both quantitative and qualitative data in a single study or series of studies (Ary, Jacobs & Razavieh, 1990). Also, according to Katundu (2008), the central premise is that the use of quantitative and qualitative approaches in combination provides a better understanding of research problems than either approach alone in any academic research.

A mixed research methodology is employed in this study, because it balances the strengths and weaknesses of both quantitative and qualitative research (Creswell & Plano, 2007). There are many advantages to using a mixed method approach for this particular research focus, which is the effectiveness of using ICT in teaching in secondary school classrooms. This mixed method approach provides the best opportunities for answering the important research questions of this study, the answers of which rely upon a variety of forms of data (Stake, 2005). According to Stake (2005), the quantitative section, which includes a questionnaire, addresses the research question related to how effective ICT is related to teaching method in the classroom. The qualitative section includes interviews.

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The researcher adopted both techniques in this study, in order to provide a complete and clear picture of the research study. Furthermore, this helped the researcher to critically answer the research questions to assess or identify the exact effects of ICT tools on teaching and learning. According to Strauss and Corbin (2010), the qualitative research method is the best method to employ when the research is not about measuring relationships.

In addition, qualitative research provides a holistic examination of research based on interviews, observations, or focus groups, which focuses primarily on life experiences, social processes, and organizational structures and settings (Strauss & Corbin, 1990). They further argue that, it is effective in obtaining culturally specific information about the values, opinions, behaviour and social contexts of a particular population that produces findings not arrived at by means of statistical procedures or other means of measurement.

The strength of qualitative research is its ability to provide complex textual descriptions of how people experience a given research issue (Katundu, 2008). Creswell (2003) has observed that this approach provides effective responses to researchers and it is flexible in nature to achieve the desired results. It provides information about the "human" side of an issue; that is, the often-contradictory behaviour, beliefs, opinions, emotions and relationships of individuals. Outcomes from qualitative research is usually extended to people with attributes like those in the target population in order to gain a better and complex understanding of a specific social issue (Leady, 2011).

Despite these strengths of qualitative research, it exhibits some weaknesses. Patton (1990) has argued that some sensitive and private

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information observed cannot be reported by the researcher who may be seen as being intrusive. Again, the researcher may not have good attending and observation skills, some respondents may present special problems to acquire rapport or favour from the researchers (Leady, 2011).

Interviews provide indirect information filtered through the views of interviewees and interviews provide information in a designated 'place' rather than the natural field setting (Stevens, 2012). Also, the researcher's presence may elicit bias responses from participants and they may report what interest them and people may equally not articulate and perceive the real issues.

In line with the differences associated with the quantitative, qualitative and mixed approach in research, the researcher found the mixed method suitable due to the nature of the objectives of the study and the research questions. In spite of these weaknesses, the rationale for this design chosen was to enable respondents to be questioned. Also, it allowed for greater degree of accuracy, reliability, standardizations of measurement and uniqueness of the study.

Population

According to Cohen, Manion and Morrison (2006), population describes the characteristics of object, people, humans, objects, groups, organization, cases or elements from which generalization can be made from its study. In a similar vein, Ary, Jacobs and Razavieh (1990) defined population as all members of a defined category of elements such as people, events or individual items of interest under consideration. Population is also referred to as the total number of subjects a research can conform to a clearly

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defined set of characteristics (Awanta & Asiedu-Addo, 2008). The population for the study was all senior high school's teachers in the Presbyterian Boys' Senior High School in Greater Accra Region.

The total population for the study comprised all seventy-eight (78) teachers in the school. These were individual teachers who played critical roles in using ICT in their teaching and learning processes. The reason for the selected school was that the researcher was very conversant with the school settings.

Sample and Sampling Procedure

Varkevisser (2003) explained sampling as the process of selecting a number of study units from a defined population. Similarly, Awanta and Asiedu-Addo (2008) defined sampling as a procedure of selecting a part of a population on which a research or study can be conducted. Also, Leady (2011) defined sampling as the process of choosing from a much larger population, so that selected parts represent the total group. Sampling is not a technique or procedure for getting information but it ensures that any technique used helps in getting information from a smaller group, which accurately represents the entire group (Teye, 2012). This establishes the fact that samples from the study population are taken when it is not feasible to carry out whole population studies.

These samples are normally supposed to be selected in such a way that conclusions drawn from the study can be generalized to the entire population. The sampling procedure employed for this study was purposive sampling. Purposive sampling, according to Teddie and Tashaskkori (2003), involves

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selecting certain units or cases based on specific purposes rather than randomly. Teddie and Tashaskkori (2003) further argued that purposive sampling is used in inductive studies to gather detail and in-depth information or data with small number of participants to represent the target population in order to yield detailed information about the issue.

The technique affords easy responses from the respondents. The researcher chose this sampling method because the cases were available and easy to study to get the expected responses (Gall, Borg & Gall, 2006). In all, 50 teachers were purposively selected for the study. Again, the head of each department was also selected to participate in the interview.

Research Instruments Used for Data Collection

The instruments used for collecting data were a questionnaire and interview guide. Some of the questions in the questionnaire were closed-ended and others open-ended types with Likert-type scale questions to elicit responses from the respondents. The questionnaire was made up of five sections: A, B, C, D and E.

Section A dealt with the respondents' demographic characteristics. Items considered were age, gender, highest level of education, teaching experiences and name of school. Section B contained items on teachers' attitude towards teaching with ICT tools. In this part, the respondents were asked to respond on their attitude towards ICT tools usage in lesson delivery. The scales were ranked from disagree, agree and completely agree in a four-point Likert-type scale.

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Section C contained items on teachers' confidence level in using ICT tools for teaching. In this part, the respondents were asked to rate their knowledge on ICT skills such as word processing, e-mailing, Internet, Excel and PowerPoint. Respondents were required to select from very unconfident, not confident, confident and very confident by ticking against the choice.

Section D contained items on teachers' perceived impacts on using ICT tools for teaching in the classroom. Respondents were required to indicate the usefulness of ICT for teaching and learning in the classroom. Finally, section E contained items on the barriers hindering the integration of ICT tools in teaching and learning processes.

An interview is a data collection method in which an interviewer poses questions to an interviewee (Johnson & Christensen, 2004; Shank, 2006). Interviews were conducted to find out the kind of ICT tools teachers use in the classroom. According to Gall, Borg and Gall (1996), semi-structured interviews involve asking a series of structured questions and then probing more deeply, using open-ended questions to obtain additional information. They further state that this interview approach has the advantage of providing reasonably standard data across respondents, but of greater depth than can be obtained from a structured interview.

The interview guide used also has some advantages. Patton (1990) listed the advantages of interview as: getting meaningful, knowable information from participants and gives opportunities to follow-up questions and more probing. He further explains that the use of interview encourages free and open responses; it captures respondents' perception in their own words.

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Regardless of these merits, the interview comes with some weaknesses such as being expensive and time consuming, need well-qualified, highly trained interviewers, interviewees may distort information through recall error, selective perceptions, desire to please interviewer (Patton, 1990). He further stated that flexibility can also result in inconsistencies across interviews, volume of information very large, may be difficult to transcribe and reduce data.

In all, 20 heads of department in Presbyterian Boys' Senior High School were interviewed. Each interviewee took an hour to respond to the items. The interview questions are in Appendix A. All the items in the interview guide were closed-ended types. This made it possible for the respondents to easily express themselves.

The questionnaire was self-designed. The instruments were checked for their validity and reliability before they were used in the field. The basis of the validity of a questionnaire is to ensure that the right questions are asked without creating any ambiguity. A drafted copy of the questionnaire was made available to my supervisor for face to face discussion and content validity. Also, the Cronbach's Alpha value was checked to see the strength or weakness of the questionnaire using Statistical Product and Service Solutions (SPSS) version 21.0 software. The thirty-nine items gave a value of 0.78 which was reliable. This ensured that the items in the questionnaire were related to the research questions and the objectives of the study. Statistical Product and Service Solutions version 21.0 software was also used to check for the validity and reliability values of the questionnaire questions.

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Data Collection Procedure

Before the administration of the final questionnaire, a pilot study was conducted to ascertain any challenges likely to hinder the smooth conduct of the study. The instrument was first given to technocrats with adequate expertise on the usage of ICT in teaching and learning and on research in general to peruse and critique the questionnaire and the interview guide.

The pilot study was carried out at St Aquinas Senior High School. Aquinas Senior High School was selected because the respondents had similar challenges to that of Presbyterian Boys' Senior High School. In all, 20 teachers were used for the pilot study which was based on simple random selection.

Before selecting the teachers, permission was sought from the District Education Office of the Ghana Education Service (GES) in Accra. This enabled planning to determine the suitable time and day to administer the final questionnaire. The Coordinator of the Master of Education (Information Technology) at College of Distance Education, University of Cape Coast was contacted for a written letter of permission to conduct the study in the selected school.

To ensure the anonymity of the teachers, no identification was required from the respondents in responding to the research items in the open-ended and close-ended questions. The instruments were hand delivered to all the participants of the study. The data collection was completed within three weeks in the month of July, 2018.

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Ethical Considerations

Ethics refers to doing what is morally and legally right in conducting research (Lerner 2010). Research ethical consideration is important and researchers should protect the dignity of their subjects and publish well the information that is researched (Fouka & Mantzorou, 2011). Some of the ethical issues requiring consideration were the length of time the interview took, statement indicating what would happen to the information collected and statement about confidentiality and anonymity. The participants were assured that the data would be used for academic purposes only.

Furthermore, participants had no obligation to take part in the study and that participants had the right to withdraw from the study or not to answer any particular question. The researcher got ethical clearance from University of Cape Coast to conduct the study and adhered to the ethical principles of the University of Cape Coast. The researcher also acknowledged all scholarly works and information consulted from journal articles, books, dissertation, theses and data from the field.

Data Analysis

Data analysis helps to manipulate the data obtained during the study in order to assess and evaluate the findings and arrive at valid, reasonable, and relevant conclusions. The analysis of qualitative data research transcripts was begun at the time of interviewing. According to Onwuegbuzie and Leech (2005), data analysis is a systematic search for meaning. Data analysis in qualitative research means organizing and interrogating data in ways that allow researchers to see patterns, identify themes, discover relationships,

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develop explanations, make interpretations, mount critiques, or generate theories (Hatch, 2002).

Also, SPSS version 21.0 was the software used for the analysis. The entire questionnaire was coded with the help of SPSS for the quantitative data. All respondents were given serial numbers to facilitate coding and analysis. Frequency tables, means, standard deviation, pie charts and bar chats were also used in presenting the data.

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CHAPTER FOUR

RESULTS AND DISCUSSION

Introduction

This chapter deals with the data presentation and analysis. All data gathered for the study are organised, analysed and followed by discussion of key issues relating to the findings of the study. Frequency tables are provided to give statistical reflections on key issues in terms of the research questions.

Demographic Characteristics of the Respondents

The demographic characteristics considered in the study were age, sex, highest educational level and years of teaching experience. Out of 50 teachers sampled for the study, 100% valid questionnaire was retrieved.

Age distribution of the respondents

It was necessary to determine the ages of the ICT teachers, since this information would help to know how young or mature the respondents are. Table 2 shows that 4.0% of the respondents fell under the 25 years' age bracket. Similarly, 14.0% and 20.0% fell in the 26 – 30 and 31 – 35 years' age brackets. Interestingly, 12.0% and 16.0% of them respectively fell in the age groups of 36 – 40 and 41 – 45 years. Another 10.0% of them fell in the 46 – 50 age brackets while 18.0% of them fell in 51 – 55 age brackets. The remaining 6.0% fell in the 56 – 60 age brackets. The details of their responses are provided in Table 2.

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Table 2: Age distribution of the respondents

Age	Frequency	Percent
Under 25 years	2	4.0
26 – 30 years	7	14.0
31 – 35 years	10	20.0
36 – 40 years	6	12.0
41 – 45 years	8	16.0
46 – 50 years	5	10.0
51 – 55 years	9	18.0
56 – 60 years	3	6.0
Total	**50**	**100**

Source: Field survey, Buabeng (2019).

The data presented in Table 2 indicates that the teachers used for the study spread across all the categories of age groups; that is young, middle aged and those preparing to retire from active teaching service. They, therefore, catered for all the age groups needed for this study.

Gender of respondents

Out of the 50 respondents selected, 54.0% were males and 46.0% were females. This suggests that most of the teachers used in the study were males. The details are provided in Figure 1.

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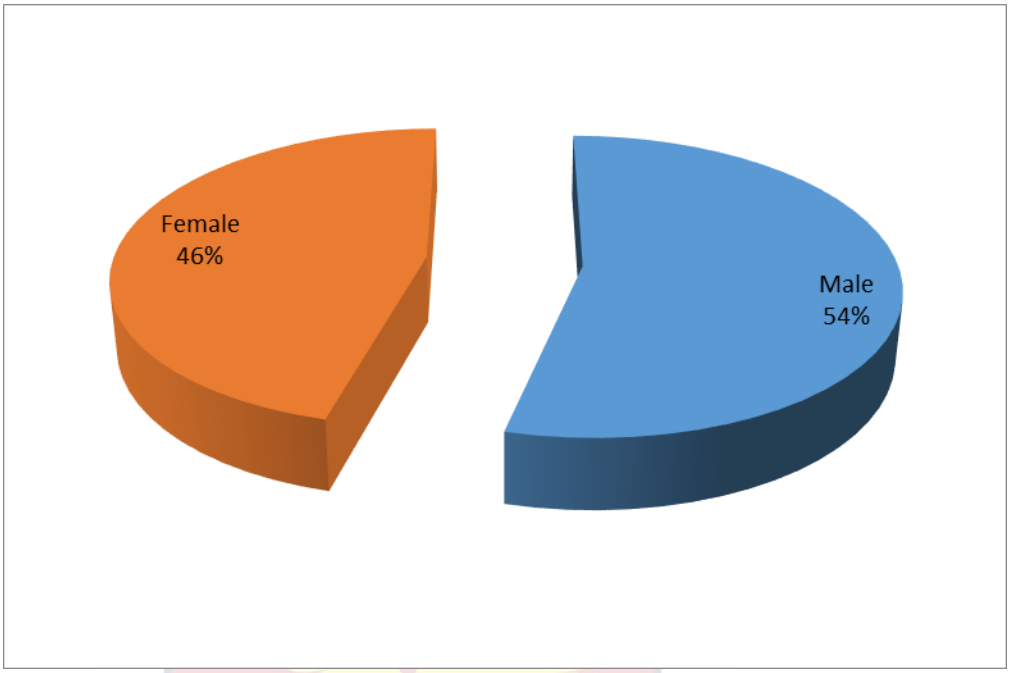

Figure 1: Respondents based on gender

Source: Field survey, Buabeng (2019).

Most studies allege that teaching in the senior high school is a male dominated area while others think otherwise. For instance, some research studies revealed that there are more male teachers teaching at the senior high schools than their female counterparts (Kay, 2006; Yusuf, 2012). However, in Western US schools Breisser (2006) found that female teachers were more than male teachers. Even though this was not the focus of the research, males were in a greater proportion compared to females at the schools.

Teaching experience of the respondents

As shown in Table 3, most of the teachers (34.0%) had only up to five years of teaching experience. Indeed, 60% of them had 10 or less years' experience in teaching with only 20% with more than 15 years of teaching experience. The details are represented in Table 3.

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Table 3: Distribution of teaching experience of the respondents

Age	Frequency	Percent
1 – 5 years	17	34.0
6 – 10 years	13	26.0
11 – 15 years	10	20.0
16 – 20 years	6	12.0
Above 30 years	4	8.0
Total	**50**	**100**

Source: Field survey, Buabeng (2019).

An inference from the above is that majority of the respondents have spent more than five years as teachers. The fact that more than 68% of the teachers had more than five years of working experience as teachers is encouraging. It can imply that the selected teachers might have experience in using different strategies in their teaching deliveries. Experience might not necessarily be the best, but it almost always results in the most enduring lessons.

Highest Educational level of Respondents

The data reveals that as many as 70.0% of the respondents possessed First Degree certificate as their highest level of education whilst 30.0% possessed a Master's degree. The details are provided in Table 4.

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Table 4: Educational level of the Teachers

Educational level	Frequency	Percent
First Degree	35	70.0
Master's degree	15	30.0
Total	**50**	**100**

Source: Field survey, Buabeng (2019).

A deduction from the above is that majority of the respondents are first degree holders. This indicates that for someone to teach as a teacher at the senior high school level, he/she should possess at least a first degree.

Research Question 1: What is the Attitude of Teachers towards Teaching with ICT Tools?

This question sought to establish the attitude of teachers towards teaching with ICT tools. Some indicators of attitudes were used to collect data. The analysis of the data is presented in Table 5.

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Table 5: Teachers' attitude towards use of ICT tools in teaching

	SA		A		D		SD	
Statement	Freq.	%	Freq.	%	Freq.	%	Freq.	%
ICT makes teaching more interesting	29	58.0	15	30.0	4	8.0	2	4.0
ICT makes teaching more difficult	7	14.0	3	6.0	29	58.0	11	22.0
ICT makes my lessons more diverse	24	48.0	12	24.0	10	20.0	4	8.0
ICT use decrease student motivation	2	4.0	1	2.0	18	36.0	29	58.0
ICT makes preparing lessons quicker	13	26.0	25	50.0	7	14.0	5	10.0
ICT use limits the content of lesson	6	12.0	3	6.0	11	22.0	30	60.0
ICT use make preparing lesson tedious	5	10.0	4	8.0	23	46.0	18	36.0
ICT use makes the lessons more fun	17	34.0	26	52.0	3	6.0	4	8.0
ICT use makes it hard to control class	3	6.0	2	4.0	20	40.0	25	50.0

Source: Field survey, Buabeng (2019).

As shown in Table 5, 88.0% of the teachers agreed that the usage of ICT makes teaching more interesting, whilst 12.0% of them disagreed that the usage of ICT makes teaching more interesting. Hence, majority of the teachers agreed that the usage of ICT makes teaching more interesting. The finding supports the work of Khine (2011) and Zammit (2012), who have reported that most teachers agree that the usage of ICT in teaching makes it interesting.

Similarly, 20.0% of the teachers agreed that the usage of ICT makes teaching more difficult whilst the majority (80.0%) of them also disagreed that the usage of ICT makes teaching more difficult (Table 5). This implies that majority of the teachers saw the use of ICT tools as important in their lesson delivery and they do not find it difficult using them whilst a few did. A survey

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by Ittigson and Zewe (2010) also found that majority of the teachers saw the use of ICT for teaching as not difficult.

However, this result also supports the findings of Beauchamp (2012), who concluded that the use of ICT makes teaching difficult for some teachers. This may result from differences in the exposure of teachers to the application of ICT tools in teaching; thus, experienced teachers may find it less difficult applying ICT in teaching compared to those less experienced.

Majority of the teachers (72.0%) agreed that the use of ICT makes their lessons more diverse, whilst 28.0% of them disagreed. These findings are consistent with Hennessy (2015) and Pelgrum (2001) who reported that the use ICT helps teachers to be diverse in their teaching to complete their task.

Majority (94.0%) of the teachers disagreed that the use of ICT decreases student motivation (Table 5). Indeed, 58% of the teachers strongly disagreed with this statement. The study supports the findings of Ivancevich (2010) and Woodruff (2015) that the use of ICT motivates students to learn in the classroom.

Furthermore, majority (76.0%) of the teachers agreed that ICT use makes preparation of lessons quicker, whilst (24.0%) of the teachers also disagreed. The outcome of this study agrees with the study done by Frost (2000) and Nadler (2004), who concluded that the use of ICT helps teachers to prepare their lessons quicker. This may result from the benefits these teachers have seen from using ICT tools in teaching and learning.

In the same vein, 18.0% of the teachers agreed that ICT use limits the content of their lessons, whereas majority (82.0%) of them disagreed. Indeed, as high as 60% disagreed that the use of ICT limits the content of their lessons.

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Similarly, 18.0% of the teachers agreed that ICT use make preparing lesson tedious and 82.0% of the teachers disagreed that ICT use make preparing lesson tedious. It can be concluded that majority of the teachers disagreed that ICT use make preparing lessons tedious. This finding confirms Blurton's (2014) findings that most teachers agree to the use of ICT for preparing lessons.

Majority (86.0%) of the teachers agree that ICT use makes the lessons more fun whilst 14.0% of the teachers disagreed with that statement. This implies that both the teachers and students enjoy the class when ICT tools are used in the lesson delivering. Wernet, Olliges and Delicath (2016) also stated that the use of ICT makes lessons more fun for students and teachers.

Finally, 10.0% of the teachers agreed that ICT use makes it hard to control class, and the majority (90.0%) of the teachers disagreed that ICT use makes it hard to control class. As indicated in Table 5, 50% of the teachers strongly disagreed that ICT use makes it hard to control class. This indicates that the use of ICT for teaching can make teaching delivery effective and easy for teachers to control their students.

Teachers' positive attitude towards the use of ICT tools are important and an added advantage to the implementation of their usage in teaching-learning activities. The current findings confirm those reported by Lau and Yeoh (2008) and Melor (2007) that teachers have positive attitude towards the use of ICT. Majority of respondents had a positive attitude towards the use of ICT in teaching and afforded the teachers to easily control their students with the support of ICT. This positive attitude motivated the teachers to use ICT tools in their teaching (Samuel & Zaitun, 2017). The effective use of ICT tools

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for teaching clearly depends on teachers' readiness and also positive attitudes towards ICT and those who perceive it to be useful in promoting learning will surely integrate ICT more easily (Papanastasious & Angeli, 2016).

Research Question 2: How confident are teachers in using ICT tools in the teaching and learning process?

In order to successfully impart knowledge to students, it is important that teachers are confident in using ICT tools in their lesson delivery. This question sought to ascertain the confidence level of the teachers in the usage of ICT tools for teaching and learning processes. The responses are represented in Table 6.

Table 6: Distribution of confidence levels of teachers using ICT tools for teaching-learning processes

Statement	Very unconfident		Not confident		Confident		Very confident	
	Freq.	%	Freq.	%	Freq.	%	Freq.	%
Basics of operating PC (using keyboards, mouse)	2	4.0	1	2.0	22	44.0	25	50.0
Managing files (delete, move to, etc)	1	2.0	-		26	52.0	23	46.0
Using word processors (such as MS Word)	-		-		21	42.0	29	58.0
Using spreadsheets (such as MS Excel)	9	18.0	19	38.0	10	20.0	12	24.0
Using PowerPoint software	8	16.0	12	24.0	14	28.0	16	32.0

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Source: Field survey, Buabeng (2019).

It is clear from Table 6 that, out of the 50 teachers who participated in the study, a majority (50.0%) of teachers stated that they were very confident with basics of operating PC (using keyboards, mouse etc.) while 44.0% of the teachers stated that they were confident with this activity. This makes a total of 94% of the teachers who were confident with the basics of operating a PC. Thus, only 6.0% were not confident or very unconfident with the basics of operating PC. Therefore, majority of the teachers were confident with basics of operating PC. This finding agrees with the findings of Rosnaini and Mohd Arif (2010) that minority group of teachers are less knowledgeable in basic operating PC, as well as the findings of Ayo (2011) and Moganashwari and Parilah (2013) that most teachers are confident in using operating PC (using keyboards, mouse, etc.) in their classroom. The high level of confidence observed in this study could be due to availability of ICT tools, better awareness of ICT usage or frequent usage of ICT tools for teaching or a combination of these factors. Only one respondent was very unconfident in managing files (delete, move to, etc.). The rest of the teachers were either confident (52.0%) or very confident (46.0%) as shown in Table 6. Therefore, majority (98%) of the teachers were very confident in managing files using PC. The outcome of this study agrees with the findings of a study by Blankson (2015) that teachers are confident in managing files, such as deleting and moving files for teaching purposes.

As shown in Table 6, most of the respondents were confident (42.0%) or very confident (58.0%) in using word processors (such as MS Word). The ability of the teachers to use word processors corroborates Danner and Pessu's

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(2013) finding that most teachers are confident in using MS Word as a tool for teaching.

Again, 18.0% of the respondents were very unconfident using spreadsheets (such as MS Excel), 38.0% of them were not confident using spreadsheets. That is, more than half of the teachers (56%) were not conversant in the use of spreadsheets. The remaining teachers were either confident (20.0%) or very confident (24.0%) using spreadsheets (Table 6). This indicates that majority of the teachers were not confident using spreadsheets (such as MS Excel). This high level of lack of confidence among the teachers, obviously, could reflect in poor use of spreadsheets in teaching and learning in the Presbyterian Boys' Senior High School in Greater Accra Region or any senior high school where a similar situation occurs. Somekh and Davis (2016) argued that adoption of ICT in the classroom takes time and effort. It might also be that those teachers did not make any effort in using spreadsheets in their teaching or were not trained adequately in the use of spreadsheets in teaching. In consonance with this, Weinberger (2011) suggested that most teachers are not conversant in the use of MS Excel in their lesson delivery. However, in Australia, Meiers, Knight and White (2009) have reported that teachers had capability in using ICT tools including spreadsheet in their lesson delivery. It is obvious that the level of development for these teachers will give them the needed confidence to use ICT tools in teaching and it might be readily available to use.

As shown in Table 6, 24% of the respondents were not confident or very unconfident (16.0%) in using PowerPoint software. Thus, 28.0% were confident in using PowerPoint software while 32.0% were very confident in

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using it. This implies that the majority (60%) of the teachers were confident in using PowerPoint software. Teachers' adoption of technology in class sometimes takes time, even with the support of an experienced team or through collaborative working before it works (Sandholtz, 2015). This implies that training and practice in the use of PowerPoint for teaching-learning activities can improve the confidence of teachers to use PowerPoint software in their lesson delivery.

Research Question 3: What are the Impacts of using ICT Tools in the Teaching and Learning Processes?

Respondents were interviewed to solicit their responses on the impacts of using ICT tools in the teaching and learning processes. The respondent heads of department and their subject specializations are shown in Table 7.

Table 7: Subject specialties of the heads of department interviewed on the impacts of using ICT tools in teaching-learning processes

Head of Department	Code of Participants
Mathematics	M
ICT	ICT
English	E
Chemistry	C
Biology	B
Physics	P
Accounting	A
Management	M

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Economics	Ec
Business Management	BM
Social Studies	SS
Horticulture	H
General Agriculture	GA
Sculpture	S
Picture Making	PM
General Knowledge in Arts	GKA
Literature	L
Government	G
History	HI
Government	HOD

The respondents were asked to state the kind of ICT tools they used in their classroom for teaching and learning processes. From the responses given, majority of the heads of department indicated that they used Personal Digital Assistants (PDA), pagers, laptops, projectors and digital cameras as teaching tools. Their responses are quoted below:

"It depends; I sometimes used them when all the ICT tools are available. Usually, I use the projector, laptop and pager (B, ICT, GA and L).

Well, I like using the school projector and the Personal Digital Assistant as teaching tools in my lesson delivery (M, C, H, H1, BM, E, GA and A).

To know the impact of using ICT tools in the teaching and learning process, the teachers were asked to describe the standard of attainment in their subjects when ICT tools are used. Majority of heads of department admitted

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that incorporating ICT tools in their teaching had significantly improved students learning outcomes as compared to the past years. This was evident from some teachers' response:

"Attainment goals are measured by the student performance, and I can proudly say that last year, if I go by my results, we had one of the best results as a government school where we improved from 67% to 84%, so the results alone tell you that there is a lot of improvement" - (C and A).

Another head of department indicated that teaching using ICT tools had considerably improved the attainment or understanding level of her students as she explains:

"With teaching with ICT tools in my classroom, the standard of attainment of understanding is high, and the class is livelier, the students learn much better, especially when this method of teaching is used." (GKA), (S), (H), (SS) and (L). These were similar responses coming from the five teachers.

The head of mathematics department, who just started using ICT tools a few years ago, gave his testimony of the impact ICT had in his subject area:

"Since I started using ICT tools in this school, added to using my phones, laptop and modem at home, I realise that there are significant changes in my teaching and also the students. From the year 2014 that I started using ICT tools in the teaching and learning processes, I realise that the first batch of students I started using these ICT tools with had 98.6 % pass in my subject area; in the Mathematics examination. Last year we had 100%, to be honest, I cannot do without ICT tools in my profession".

Another head of department, who had been actively using ICT software and video lectures in his lessons explained thus:

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"My students' performance has improved a lot because now they can relate what is being taught with the real life scenarios in Chemistry as we tend to use some excellent Chemistry software and also play CDs making the teaching and learning process more enjoyable. For example, when we look at what I did last year with my students, the students who performed well were those who had been attending and being attentive to lessons taught using ICT tools" (C),

In as much as heads of department were excited about the positive impact of the use of ICT tools in pedagogy, repeatedly, it was interesting to note from some of the teachers that they were afraid ICT tools also distracted the students, making many of the students not able to concentrate on the lessons taught. Also, considering their economic background, the heads of department unanimously agreed that students were so excited when they saw these ICT tools were displayed in the classroom. This was typical of a response of one of the heads of department. This idea supports Jabr (2007) and Su (2011) findings that most teachers use ICT in their teaching and that the use of ICT have improved the performance of the students.

Using these tools in my classroom, I have realised that ICT tools tend to act as distracting devices to some of my students. Some students are more interested to see how the instruments are functioning and usually become excited instead of following the lesson. (B) and (P).

Most of the heads of department accepted that they had observed for the past years that students were excited when it came to teaching with ICT tools, which made them use it for scholarly purposes. To create a clear and unbiased picture during the study, additional data were collected from some

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other teachers other than their heads of department, to find out the impact of using ICT tools in their teaching and learning process.

Furthermore, the teachers were asked to indicate the impact of using ICT tools in their teaching methods. The details of their responses are represented in Table 8.

Table 8: Impacts of using ICT tools in teaching

Impacts	Frequency	Percent
Using ICT tools enhances my role as a teacher	17	34.0
Using ICT tools makes me feel more professional	4	8.0
Using ICT tools positively changes the learning climate in my classroom	10	20.0
Using ICT tools have positively changed the relationship between my students and me	12	24.0
The usage of ICT tools has positively changed the usual relationship among students in my classroom	7	14.0
Total	**50**	**100**

Source: Field survey, Buabeng (2019).

As shown in Table 8, 34.0% of the teachers indicated that the use of ICT tools in their teaching enhanced their role as teachers, while 8.0% of them indicated using ICT tools made them feel more as professional teachers. Ten (20%) indicated that the use of ICT tools had positively changed the learning climate in their classroom and 24.0% disclosed that the usage of ICT tools had positively changed the usual relationship between the students and their teachers during classes. The remaining 14.0% of the teachers also indicated

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that the use of ICT tools had positively changed the usual relationship among students in their classroom. This may result in more effective collaboration learning among students compared to the traditional way of teaching without using ICT tools.

The results in Table 8 indicates that the three major impacts of using ICT tools for teaching are the (i) enhancement of the teacher's role, (ii) positive change in the relationships among students in classroom and (iii) positive changes in the learning climate in the classrooms. This corroborates the assertion by Li (2013) and Quarshie's (2012) that the use of ICT tools in school allows students to work together, encourages the sharing of ideas and cooperative learning which may lead to gains in cognitive abilities, such as logical problem-solving, critical thinking and abstraction. Hence, when teachers use ICT tools well in the classroom, both the teachers and students will enjoy the benefits. However, the findings of this study are contrary to the findings of Valentine and Pattie (2005), who reported that the use of ICT tools for teaching makes some teachers inactive.

Research Question 4: What are the Barriers Hindering the Integration of ICT Tools in Education?

In trying to answer this question, respondents were asked what was preventing them from using ICT tools for teaching. Their responses are represented in Table 9.

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Table 9: Barriers preventing teachers from using ICT tools in the classroom

Responses	Frequency	Percent
Lack of time to use ICT tools	13	10.8
Fear	5	4.2
Lack of knowledge on ICT tool usage	7	5.8
Age	3	2.5
Lack of confidence	14	11.7
Lack of training	11	9.2
Computers are not accessible	8	6.7
Little experience	4	3.3
Computers are not reliable on campus	2	1.7
Insufficient Internet bandwidth or speed	22	18.3
Too difficult to integrate ICT tools use into the curricular	15	12.5
Lack of pedagogical models on how to use ICT tools for teaching	16	13.3
Total	**120**	**100**

Source: Field survey, Buabeng (2019).

As shown in Table 9, the most outstanding hindrance to the use of ICT tools in teaching was insufficient Internet bandwidth (18.3%). This was followed by lack of pedagogical models on how to use ICT tools for teaching (13.3%), difficulty in the integration of ICT tools into the curricular (12.5%), lack of teacher confidence (11.7%) and inadequate time for the use of ICT

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tools (10.8%). Other hindrances were lack of training in the use of ICT tools (9.2%), inaccessibility of computers (6.7%), lack of knowledge on ICT tools use for teaching (5.8%), and fear of the use of ICT tools (4.2%). Other reasons advanced as hindrances were little experience in the use of ICT tools (3.3%), age of the teacher (2.5%) and that computers are not reliable (1.7%). It can be that those teachers who did not have time to use ICT tools for teaching had more classes to handle compared to their colleagues. This will make it difficult for such teachers to use these tools in their teaching delivery. The teachers who revealed that they are unable to use ICT tools in their delivery because of fear had no ideas to use them. Also, such teachers may even think that when they make mistakes, students will make fun of them.

The barriers may be as a result of differences in the exposure of teachers to the use of ICT tools in teaching, thus, experienced and confident teachers may find it less difficult using these tools in teaching. Majority of the reasons given by the teachers are technical barriers which prevent them from using ICT tools in their teaching. If these barriers are not removed, these teachers will not use ICT tools in their teaching.

This study identified three major hindrances to teachers' use of ICT tools in teaching – (i) insufficient Internet bandwidth or speed, (ii) lack of pedagogical models on how to use ICT tools for teaching and (iii) difficulty of integrating ICT tools use into the curricular. These barriers have been reported by Schoepp (2005) as the major barriers teachers face when it comes to the use of ICT tools for teaching and learning. Similarly, Oguoma (2013) and Osakwe (2012), and Boateng (2012) have argued that the major constraints faced by teachers in using ICT tools for lesson delivery in Nigeria and Ghana,

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respectively; include poor electricity supply, lack of pedagogical skills by teachers to use ICT tools and lack of Internet connectivity.

Research by Gomes (2015) also asserted that lack of pedagogical models on how to use ICT tools for teaching, insufficient Internet bandwidth or speed and didactic training in how to use ICT tools in the classroom and lack of training concerning the use of technologies in specific subject areas were obstacles to the use of new technologies in classroom practice. OECD (2009) also indicates that little number of computers for teachers to use for teaching, difficulty in integrating ICT tools use into their curricular and lack of computer skills and/or lack of knowledge among teachers to integrate ICT tools in teaching. These reasons are quite similar to the reasons given by the respondents in this study. Ironically, the reasons given by the respondents are different from or contrary to what Ertmer (2009) referred to as intrinsic barriers. She referred to intrinsic barriers as attitudes, beliefs, practices and resistance to change as their major barriers for teachers' use of ICT tools. In the current study, the teachers demonstrated positive attitudes towards the use of ICT tools in teaching-learning processes.

The current findings are in line with the findings of a study by Moganashwari and Parilah (2013), who found that teachers had an issue with the lack of time in the school to use ICT tools as they are burdened with other responsibilities and insufficient Internet bandwidth or speed. Lack of pedagogical models on how to use ICT tools for teaching and knowledge on how to make full use of ICT tools were also barriers or challenges faced by teachers.

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Chapter Summary

This chapter examined the effects of the use of ICT tools in teaching and learning: a case study of Presbyterian Boys' Senior High School in the Greater Accra Region. Specifically, the study revealed that majority of the teachers had positive attitudes towards teaching with ICT Tools. The findings of the study revealed that the teachers were confident or very confident with the basics of operating PC (using keyboards, mouse), using word processors (such as MS Word) and using PowerPoint software. However, majority of the teachers were not confident using spreadsheets (such as MS Excel). The three major impacts of using ICT tools for teaching identified were that ICT tools enhanced the roles of teachers, ICT tools positively changed the relationship between teachers and their students in their classroom and the use of ICT tools had positive effects on students learning climate in their classrooms.

The major barriers that prevented teachers from using ICT tools in their teaching were insufficient Internet bandwidth or speed, lack of pedagogical models on how to use ICT tools for teaching and high difficulty teachers had in integrating the use of ICT tools into their curricular.

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CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Introduction

This chapter provides a summary of the entire study. It gives a brief description of the methodology that was used to arrive at the findings of this study. Based on the findings, conclusions and recommendations were made. This chapter also provides suggestions for further studies.

Summary

The study examined the effects of ICT tools used in teaching and learning, as a case study of Presbyterian Boys' Senior High School in the Greater Accra Region. A combination of qualitative and quantitative research designs was chosen for this study. Purposive sampling technique was used to select the teachers in Presbyterian Boys' Senior High School. In all, fifty teachers were selected for the study and twenty heads of department were interviewed. Self-administered questionnaire was used as an instrument for the study. SPSS version 21.0 was the software used for the data analysis of frequencies and percentages. Four main research questions were formulated to guide the study. The research questions were:

1. What is the attitude of teachers towards teaching with ICT tools?
2. How confident are teachers in using ICT tools in the teaching and learning processes?
3. What are the impacts of using ICT tools in the teaching and learning processes?

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4. What are the barriers hindering the integration of ICT tools in teaching and learning?

These research questions were answered with the help of a questionnaire made up of six sections. Section A captured the bio-data while the rest of the sections were based on the research questions formulated for the study. The questionnaire was made up of 39 items. In all, 50 questionnaires were completed and returned for analysis.

Key findings

The key findings of the study were the following:

1. Majority of the teachers had positive attitudes towards using ICT tools for teaching.
2. Most of the teachers were either confident or very confident with the basics of operating PC (using keyboards, mouse), using word processors (such as MS Word), managing files (delete, move to etc.) and using PowerPoint software's. However, majority of the teachers were not confident using spreadsheets (such as MS Excel).
3. Three major impacts of using ICT tools for teaching were revealed. These were (i) ICT tools enhanced their role as teachers, (ii) ICT tools had positively changed the relationship among students in their classrooms and the usage of ICT tools had positively changed the learning climate in their classrooms.
4. Insufficient Internet bandwidth or speed, lack of pedagogical models on how to use ICT tools for teaching and high level of difficulty in

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integrating the use of ICT tools into their curricular were also major hindrances to the application of ICT tools in their teaching.

Conclusions

The conclusions were drawn based on the research questions which were set.

It can be concluded that majority of the teachers had positive or good attitude towards teaching with ICT tools for teaching. The results revealed that that the teachers were very confident using basics of operating PC (using keyboards, mouse), using word processors (such as MS Word), managing files (delete, move to etc.) and using PowerPoint software's. This implies that the teachers saw the use of ICT tools as important in their lesson delivery and they did not find it difficult using them. However, majority of the teachers are not confident using spreadsheets (such as MS Excel). This high level of lack of confidence among the teachers, obviously, could reflect in poor use of spreadsheets in teaching and learning process. This study revealed that the three major impacts of using ICT tools for teaching are that ICT tools enhance their role as teachers, ICT tools had positively changed the usual relationship among students in their classroom and the usage of ICT tools have positively changed the learning climate in their classrooms. This implies that, when teachers use ICT tools well in the classroom, both the teachers and students will enjoy the benefits. The barriers hindering the integration of the use of ICT tools in teaching are insufficient Internet bandwidth or speed, lack of pedagogical models on how to use ICT tools for teaching and too difficult to integrate ICT tools use into their curricular. The barriers may be as a result of

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differences in the exposure of teachers to the use of ICT tools in teaching, thus, experienced and confident teachers may find it less difficult using these tools in teaching.

Recommendations

From the summary of the major findings of this study, it is recommended that:

1. Authorities of Senior High Schools in Ghana should collaborate with the Ghana Education Service (GES), education stakeholders and development partners to expand ICT infrastructure on their campuses (Build more computer laboratories, increase the number of computers as well as Internet bandwidth and speed) in schools. This would help increase the rate at which teachers use ICT tools for teaching.
2. ICT training through workshops and seminars should be organised for senior high school teachers to train them on the appropriate skills required for using ICT tools effectively to enhance teaching and learning.
3. The findings reveal that teachers still had difficulty in using certain applications, such as MS Excel. It is recommended that, to remain confident in their knowledge of technology applications, the teachers need to enhance their skills regularly and stay up to date through continual professional development.
4. All professional development initiatives for teachers should be based on learning strategies that make a difference in daily practice. Specific skills training in the use of ICT tools for teaching should be part of any

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ICT training workshop or teacher education programme to equip teachers to use them for teaching and learning processes. If teachers are well trained and equipped in how to use ICT tools for effective teaching this will enhance learning opportunities, and are more likely to improve their attitudes towards teaching with ICT tools.

5. The GES in collaboration with the Ministry of Education should set up an independent ICT task force to take charge of schools' ICT infrastructure and equipment to ensure their sustainability and continuous utilization of ICT tools in Ghanaian senior high schools.

Suggestions for Further Research

It may be necessary for further research to be conducted on the impact of computer-based tests, Microsoft digital literacy programme etc. on teacher's attitude and ICT tools competency levels. Also, the role of school administration in the integration of ICT tools in senior high schools could be investigated.

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APPENDIX A

UNIVERSITY OF CAPE COAST

COLLEGE OF DISTANCE EDUCATION

QUESTIONNAIRE FOR TEACHERS

The researcher is a postgraduate student in University of Cape Coast who is writing her dissertation on the topic "Examining the effects of ICT tools used in teaching and learning: A Case Study of Presbyterian Boys Senior High School in Greater Accra Region. Answer the following questions by ticking or writing the appropriate responses. All responses will be treated confidential.

Thank You.

Section A: Demographic characteristics

Age : Under 25 [ ] 26 – 30 [ ] 31 – 35 [ ]

36 – 40 [ ] 41 – 45 [ ] 46 – 50 [ ]

51 – 55 [ ] 55 – 60 [ ]

Sex: Male [ ] Female [ ]

Highest educational level attained:

1st Degree [ ] Masters [ ]

How long have you been teaching?

1 – 5 years [ ] 6 – 10 years [ ] 11 – 15 years [ ] Above 16 years [ ]

What subject do you teach? …….

Section B: Level of ICT Usage

Have you attended any ICT training courses?

Yes [ ] No [ ]

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What motivated you to undertake the training? (Tick all that apply)

To use ICT in class [ ] Personal interest [ ]

Required to do so [ ] Increase career prospects [ ]

Other (please specify) ……..

How will you rate your ability of handing ICT tools for teaching

High [ ] Medium [ ] Low [ ]

How would you rate your confidence level in terms of the following ICT skills or applications?

SN	ITEM	Very unconfident	Not confident	Confident	Very confident
9.	Basics of operating PC (using keyboards, mouse etc)	[ ]	[ ]	[ ]	[ ]
10.	Managing files (delete, move to, etc)	[ ]	[ ]	[ ]	[ ]
11.	Using word processors (such as MS Word)	[ ]	[ ]	[ ]	[ ]
12.	Using spreadsheets (such as MS Excel)	[ ]	[ ]	[ ]	[ ]
13.	Using PowerPoint software	[ ]	[ ]	[ ]	[ ]

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Section C: ICT usage during Teaching

SN ITEM	Never	Occasionally	Monthly	Weekly	Daily
14. Use the Internet to obtain teaching resources.	[ ]	[ ]	[ ]	[ ]	[ ]
15. Create lessons that incorporate simulation software.	[ ]	[ ]	[ ]	[ ]	[ ]
16. Create lessons that use presentation software.	[ ]	[ ]	[ ]	[ ]	[ ]
17. Set computer-based homework.	[ ]	[ ]	[ ]	[ ]	[ ]
18. Create lessons that incorporate student's use of digital video graphics or sound editors.	[ ]	[ ]	[ ]	[ ]	[ ]
19. Use software to monitor students' scores.	[ ]	[ ]	[ ]	[ ]	[ ]
20. Use emails to communicate with other teachers.	[ ]	[ ]	[ ]	[ ]	[ ]
21. Use emails to communicate with students.	[ ]	[ ]	[ ]	[ ]	[ ]
22. Use emails to communicate with students' parents.	[ ]	[ ]	[ ]	[ ]	[ ]

23. To what extent has the usage of ICT in teaching change your teaching methods? (Please tick the appropriate response)

No change [ ] A little [ ] Somewhat high [ ] High [ ]

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Section D: Teachers' opinion or attitude about using ICT in the teaching process

SN ITEM	Strongly Agree	Agree	Strongly Disagree	Disagree
24. ICT makes teaching more interesting for me.	[ ]	[ ]	[ ]	[ ]
25. ICT makes teaching more difficult.	[ ]	[ ]	[ ]	[ ]
26. ICT makes my lessons more diverse.	[ ]	[ ]	[ ]	[ ]
27. ICT use decreases students' motivation.	[ ]	[ ]	[ ]	[ ]
28. ICT makes preparing lessons quicker.	[ ]	[ ]	[ ]	[ ]
29. ICT use in class limits the contents of my lessons.	[ ]	[ ]	[ ]	[ ]
30. ICT use makes preparing lessons more tedious.	[ ]	[ ]	[ ]	[ ]
31. ICT use makes the lessons more fun for students.	[ ]	[ ]	[ ]	[ ]
32. ICT makes it more hard to control the class.	[ ]	[ ]	[ ]	[ ]

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Section E: The Impact of Using ICT Tools in teaching, in what ways does this affect you as a teacher?

SN	ITEM	Strongly Disagree	Disagree	Strongly Agree	Agree
33.	ICT tools enhance my role as a teacher.	[ ]	[ ]	[ ]	[ ]
34.	ICT makes me feel more professional.	[ ]	[ ]	[ ]	[ ]
35.	ICT positively changes the learning climate in my classroom.	[ ]	[ ]	[ ]	[ ]
36.	ICT positively changes the relationship between me and my students.	[ ]	[ ]	[ ]	[ ]
38.	ICT positively changes the usual relationship among students in my classroom.	[ ]	[ ]	[ ]	[ ]

Section F: Barriers Hindering the Integration of ICT Tools in Education

39. Is your use of ICT tools in teaching and learning adversely affected by the following? (Tick all that apply).

Lack of time to use ICT tools [ ]

Fear [ ]

Lack of knowledge about computers [ ]

My age [ ]

Lack of confidence [ ]

Lack of training [ ]

Computers not accessible [ ]

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Little experience [ ]

Computers are not reliable [ ]

Insufficient Internet bandwidth or speed [ ]

Too difficult to integrate ICT tools use into the curriculum [ ]

Lack of pedagogical model on how to use ICT tools for teaching [ ]

Thank you for your participating in this survey

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APPENDIX B

UNIVERSITY OF CAPE COAST

COLLEGE OF DISTANCE EDUCATION

Interview Guide for Teachers

Are you capable of using ICT tools during classes?

What kind of ICT tools do you use in the classroom?

What are the teaching methods that you use to integrate ICT tools in the teaching-learning processes in the classroom?

What are the objectives that you want to achieve through the integration of ICT tools in the teaching-learning processes?

Have you noticed a change in the ability to understand lessons among the students or impacts while using ICT tools in the educational process?

Do you have any comments, concerns or suggestions for policy-makers in the Ministry of Education, or other teachers, about the usage of ICT tools in the teaching-learning processes?

Thank you for participating.

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