

**UNIVERSITY OF GHANA, LEGON**

**DEPARTMENT OF INFORMATION STUDIES**

**ICT APPLICATION IN TEACHING AND LEARNING IN TERTIARY  
INSTITUTIONS: A CASE OF UNIVERSITY FOR DEVELOPMENT STUDIES  
AND TAMALE TECHNICAL UNIVERSITY**

**REJOICE AKUSIKA OFORI**

**(10550250)**

**THIS THESIS IS SUBMITTED TO THE UNIVERSITY OF GHANA, LEGON,  
IN PARTIAL FULFILMENT OF THE REQUIREMENT FOR THE AWARD OF  
MASTER OF PHILOSOPHY (MPHIL) DEGREE IN INFORMATION STUDIES.**

**JULY 2019**

**DECLARATION**

**I hereby declare that except for reference to other people's work which have been duly acknowledged, this thesis was done by me.**

**Signature.....**

**Date.....**

**Rejoice Akusika Ofori**

**(Student)**

**Signature.....**

**Date.....**

**Prof. Harry Akussah**

**(Supervisor)**

**Signature.....**

**Date.....**

**Dr. Musah Adams**

**(Co-Supervisor)**

**DEDICATION**

**This work is dedicated to the Almighty God, my Family and to my beloved son Ray**

## ACKNOWLEDGEMENT

I am very grateful to the Almighty God for His infinite Love and Grace that saw me through this work.

I am also very grateful to my supervisors Prof. Harry Akussah and Dr. Musah Adams for their Patience, time, knowledge and expertise in guiding me to come out with the content and presentation of this work. May God replenish your every effort.

I am so grateful to Alhaji I.K. Antwi, former University Librarian of the University for Development Studies for his encouragement. I am also grateful to the current University Librarian, Mr. Edwin Thompson for the support and encouragement. To Dr. Florence Plockey and all staff of the UDS library, I say God bless you so much for your support and your words of encouragement.

I am particularly grateful to the UDS and TaTU staff, lecturers and students for their support throughout this study.

My appreciation also goes to Head Pastor Foster Edem Edenam and his wife Pastor Dr. Mrs. Esinam Edenam and all members of Fountain Gate Chapel Philadelphia Pastures, Tamale and Pastor Francis Agbenyeke and his wife Mrs. Grace Agbenyeke of Anointed Chapel Assemblies of God, Buipe for the prayers, support and encouragement.

My final thanks go to my wonderful family, friends and loved ones. God bless you all.

## TABLE OF CONTENTS

DECLARATION .....	i
DEDICATION .....	ii
ACKNOWLEDGEMENT .....	iii
LIST OF TABLES .....	vii
LIST OF FIGURES.....	ix
LIST OF ACRONYMS AND ABBREVIATIONS .....	xi
ABSTRACT.....	xii
CHAPTER ONE .....	1
INTRODUCTION .....	1
1.1 Background to the Study .....	1
1.2 Problem Statement .....	5
1.3 Purpose of the Study .....	7
1.4 Objectives of the Study .....	7
1.5 Scope and Limitations of the Study .....	7
1.6 Theoretical Framework .....	8
1.6.1 Technological, Pedagogic, Content, Knowledge Theory (TPCK) .....	9
1.6.2 Elements of TPCK .....	9
1.6.3 Application of TPCK to the Study .....	14
1.7 Significance of the Study .....	15
1.8 Organization of Chapters .....	15
CHAPTER TWO .....	17
LITERATURE REVIEW.....	17
2.1 Introduction.....	17
2.2 Concept of ICT.....	18
2.3 The Concept of Teaching and Learning .....	22
2.4 Teaching and Learning Technologies .....	26
2.5 Integration of ICT into Teaching and Learning .....	32
2.6 Role of Management in ICT Integration in Teaching and Learning .....	35
2.7 Challenges to ICT Integration in Teaching and Learning .....	39
CHAPTER THREE.....	43
METHODOLOGY.....	43
3.1 Introduction.....	43
3.2 Research Design.....	43
3.3 Selection of Cases .....	44
3.4 Research Settings .....	44
3.5 Study Population .....	47
3.6 Sample Size.....	49
3.7 Sampling Techniques .....	51
3.8 Instrumentation .....	51
3.8.1 The Questionnaire.....	52
3.8.2 Interview Guide.....	53

3.9 Pilot Study.....	53
3.10 Data Collection Procedure .....	54
3.11 Method of Data Analysis .....	55
3.12 Ethical Consideration .....	56
CHAPTER FOUR.....	58
ANALYSES AND FINDINGS.....	58
4.1 Introduction.....	58
4.2 Quantitative Analyses of the Study .....	58
4.2.1 Response Rate .....	58
4.2.2 Demographic Data of Respondents.....	59
4.2.3 Availability of Teaching and Learning Technologies .....	65
4.2.4 Lecturers’ and Students’ Use of ICT for Teaching and Learning .....	78
4.2.5 Challenges to ICT Integration .....	92
4.3 Qualitative Analyses .....	99
4.3.1 Provision of ICT Infrastructure and Services .....	100
4.3.2 ICT Training .....	102
4.3.3 System Maintenance .....	103
4.3.4 Challenges of Management and ICT directorate .....	104
CHAPTER FIVE.....	107
DISCUSSION OF FINDINGS .....	107
5.1 Introduction.....	107
5.2 Availability of Teaching and Learning Technologies .....	107
5.3 Lecturers’ and Students’ Use of ICT for Teaching and Learning .....	109
5.3.1 Use of ICT Facilities .....	110
5.3.2 Use of ICT Software by Lecturers and Students .....	112
5.3.3 Use of ICT Services by Lecturers and Students.....	115
5.3.4 Use of Learning Management System (LMS).....	116
5.4 Role of Management and ICT Directorate in ICT integration in Teaching and Learning .....	117
5.5 Challenges to ICT Integration .....	118
CHAPTER SIX.....	121
SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS.....	121
6.1 Introduction.....	121
6.2 Summary of Findings .....	121
6.2.1 Availability of Teaching and Learning Technologies .....	121
6.2.2 Lecturers and Students Use of ICT for Teaching and Learning.....	122
6.2.3 Role of Management and ICT Directorate in the integration of ICT in Teaching and Learning .....	124
6.2.4 Challenges to ICT integration in Teaching and Learning .....	124
6.3 Conclusion .....	125
6.4 Recommendations .....	126
6.4.1 Training of Lecturers.....	126
6.4.2 Training of Students.....	127

6.4.3 Provision of Learning Management System .....	128
6.4.4 Provision of ICT Infrastructure .....	128
6.4.5 Regular System Maintenance .....	129
6.4.6 Regular Electricity Supply .....	129
6.4.7 Sensitisation of Management .....	129
6.5 Areas for Further Studies .....	130
REFERENCES.....	131
APPENDICES .....	150
APPENDIX I: QUESTIONNAIRE FOR LECTURERS .....	150
APPENDIX II: QUESTIONNAIRE FOR STUDENTS .....	158
APPENDIX III: INTERVIEW GUIDE .....	166
APPENDIX IV: LETTER OF INTRODUCTION.....	167

## LIST OF TABLES

Table 3.1: Study Population.....	45
Table 3.2: Population of selected Personnel.....	47
Table 3.3: Sample Size.....	47
Table 4.1: Gender of Lecturers.....	57
Table 4.2: Gender of Students.....	58
Table 4.3: Age of Lecturers.....	59
Table 4.4: Age of Students.....	59
Table 4.5: Institutional Division of Respondents.....	60
Table 4.6: Teaching Experience of Lecturers.....	61
Table 4.7: Lecturers Level of ICT Knowledge at appointment.....	63
Table 4.8: Lecturers Current Level of ICT Knowledge.....	63
Table 4.9: Lecturers Level of Participation in ICT Trainings.....	64
Table 4.10: Students Level of ICT Knowledge at Admission.....	65
Table 4.11: Students Current Level of ICT knowledge.....	66
Table 4.12: Students Level of Participation in ICT Trainings.....	67

Table 4.13: Ownership of Computer by Lecturers.....	68
Table 4.14: Ownership of Computer by Students.....	68
Table 4.15: Mode of Acquisition of Lecturers Computer.....	69
Table 4.16: Mode of Acquisition of Students Computer.....	69
Table 4.17: Access to Computer by Lecturers.....	70
Table 4.18: Access to Computer by Students.....	71
Table 4.19: Access to the Internet by Lecturers.....	72
Table 4.20: Access to the Internet by Students.....	73
Table 4.21: Lecturers in ICT Software.....	82
Table 4.22: Lecturers View on Challenges to ICT integration in Teaching and Learning.....	91
Table 4.23: Students View on Challenges to ICT integration in teaching and learning	94

## LIST OF FIGURES

Figure 1.1: Illustration of Technological, Pedagogic, Content Knowledge.....	13
Figure 4.1: A Histogram Showing Lecturer’s Response on the Availability of ICT Facilities in Lecture Halls.....	74
Figure 4.2: A Histogram Showing Students Response on the Availability of ICT Facilities in Lecture Halls.....	75
Figure 4.3: A Pie Chart Showing Lecturers’ Ability to Use ICT Facilities.....	78
Figure 4.4: A Pie Chart Showing Students’ Ability to Use ICT Facilities.....	79
Figure 4.5: A pie chart showing Lecturers’ Frequency of use of ICT/computers.....	80
Figure 4.6: A pie chart showing Students’ Frequency of use of ICT/computers.....	81
Figure 4.7: A Histogram Showing Students Skills in ICT Software.....	83
Figure 4.8: A histogram illustrating Lecturers’ Use of the Internet.....	84
Figure 4.9: A Bar Graph Illustrating Students’ Use of the Internet.....	85
Figure 4.10: A bar graph showing Lecturers use of learning management systems.....	87
Figure 4.11: A bar graph showing Students Awareness and Use of learning management systems.....	88
Figure 4.12: A pie chart showing Lecturers’ view on the Challenges of ICT integration in teaching and learning.....	90

Figure 4.13: A bar graph showing students view on the Challenges of ICT integration in teaching and learning..... 92

## **LIST OF ACRONYMS AND ABBREVIATIONS**

<b>ICT</b>	-	Information and Communication Technology
<b>LMN</b>	-	Learning Management System
<b>KNUST</b>	-	Kwame Nkrumah University of Science and Technology
<b>PCK</b>	-	Pedagogical Content Knowledge
<b>OBE</b>	-	Outcome Based Education
<b>TaTU</b>	-	Tamale Technical University
<b>TPACK</b>	-	Technological, Pedagogical Content Knowledge
<b>UDS</b>	-	University for Development Studies
<b>UNESCO</b>	-	United Nations Educational, Scientific and Cultural Organization
<b>WIS</b>	-	Web Information System

## ABSTRACT

It is an undisputable fact that ICT play a very significant role in the development of every nation these days. This is because growth is stimulated by the flow of information and this consciousness has led most learning institutions into knowledge based ones. Hence, leading to easy access, quality teaching and learning, infrastructure provision as well as management efficiency. In spite of these, the potentials of ICT in teaching and learning has not been fully realized by many academic institutions. A Mixed method approach was used to carry out the study. Questionnaire was used to collect data from 570 respondents, comprising 62 Lecturers and 508 Students of UDS and TaTU. Interviews were also conducted for four management and ICT personnel of UDS and TaTU. The findings of the study indicated that ICT have not been widely integrated into the teaching and learning activities in UDS and TaTU. Some challenges identified were frequent Power fluctuation, lack of maintenance, low internet bandwidth, lack of pedagogical models on how to use ICT in teaching and learning and limited ICT skills of lecturers and students to fully integrate ICT. The study recommended that ICT trainings for lecturers and students should go beyond basics to advance and professional levels to aid practical integration of ICT in teaching and learning. ICT infrastructure provision and maintenance, and ICT service delivery should also be given priority in UDS and TaTU. The vigorous implementation and use of ICT facilities and services to its full potential will not only revolutionize teaching and learning in UDS and TaTU, but will also facilitate the development of lecturers and students' innate scientific inquiry mind and their critical thinking abilities.

## **CHAPTER ONE**

### **INTRODUCTION**

#### **1.1 Background to the Study**

The sudden rise in Information and Communication Technology has introduced a phenomenal change in contemporary society which has affected the demands of present-day civilization. The importance of technology to modern concepts such as e-commerce, teleconferencing, e-governance, and telecommunication have all risen as a result of the application of technology in almost every aspect of human life (Amoaful, 2011).

Turner (2009) defined Information and Communication Technology (ICT) as any device or system that allows the storage, retrieval, manipulation, transmission and receipt of digital information. For example, personal computers, digital television, email, robots.

Information and Communication Technology thus relates to those technologies that are used for accessing, gathering, manipulating and presenting or communicating information. The technologies could include hardware (e.g. computers and other devices), and software applications and connectivity (e.g. access to the Internet, local networking infrastructure, and video conferencing) (Tommey, 2001). The hardware equipment like mobile phones, computers, laptops, television and projectors are mostly used in educational environment to process, send and retrieve information for academic purposes.

Technological advancement has made it possible for most universities worldwide to create and maintain electronic libraries together with electronic teaching models in order to make teaching and learning conceivable. This advancement has made creation, collection, organizing, storage, retrieval and dissemination of information simpler than before.

With Information and Communication Technology being applied to every facet and discipline of human endeavor, its full impacts should be seen in the process of teaching and learning.

In the context of this study, ICT refers to any electronic equipment that can be used to enhanced teaching and learning: systems that enable easy communication between the teacher and the students beyond the physical barrier (either by space, time or both) of the classroom. (Lim and Chai, 2004). According to Kirschner & Selinger (2003), ICT offers the potential to meet the learning needs of individual students; to promote equality of opportunity; to offer high-quality learning materials; and to increase self-efficacy and independence of learning amongst students. To the teacher, ICT is not only an essential tool for teachers in their daily work, but it also offers them opportunities for their own professional development. It can be used to encourage new ways of working as part of professional learning teams and it offers academic institutions the possibility of a faster route to establishing a meaningful role in the wider community, embracing learners of all ages, linking and networking to other educational establishments and bringing professionals together across a range of areas.

It is an undisputable fact that ICT plays a very significant role in the growth of every nation in recent times. This is because growth is stimulated by the flow of information and this consciousness has led many learning institutions into knowledge based ones. Many countries now regard understanding and mastering the basic skills and concepts of ICT as part of the core of education, alongside reading, writing and numeracy. A report by the United Nation, Educational, Science and Cultural Organisation (UNESCO, (2015) stated that “Information and communication technologies (ICTs) must be harnessed to strengthen educational systems, knowledge dissemination, information access, quality and effective learning, and more effective service provision”.

According to Amega-Selorm (2006), the current educational landscape in Ghana is as a result of key policy initiatives embraced by the Ghana government. Some of these policy initiatives and reports, which have supported in making the educational needs and desires of the people a reality include the following; The Education Act of 1961; The Dzobo Report of 1973 which recommended the JSS Concept; The New Structure and Content of Education 1974; The Education Commission Report on Basic and Secondary Education 1987/88; The Education Reform Programme 1987/88; The University Renationalization Committee Report 1988; The Free Compulsory Universal Basic Education Programme, 1996, 1992 Constitution; The FCUBE Policy Document and Programme of Operations, 1996; The Ghana Education Trust Fund - GET Fund Act 2000 (Act 581) and the New Educational Reform that took off since 2007 (Amega-Selorm, 2006).

These initiatives have facilitated the structural transformation of the educational system and have also significantly improved, access, quality teaching and learning, infrastructure provision and management efficiency.

According to Appiah-Kubi (2002), information communication technologies (ICT) integration in education is part of the approaches to ensure growth and efficiency in all educational sectors. Though other sectors of the society have also used technology to increase productivity by augmenting human labour with it, teaching in Ghana has rather become more labour-intensive due to the lack of required resources. In view of this, A Teacher Laptop Initiative (TLI) policy has been initiated to bring innovation into teaching and learning by improving the pedagogical and content knowledge of teachers.

Agbovi (2003) stated that as ICT is now the backbone of academia there is the need for every student to know how to input, process, store and output data and information which has become more and more relevant in academic environment. Therefore, there is the need to lay a very firm foundation in ICT in all tertiary institutions in the country.

According to Osei-Akoto (2010), success in the information superhighway required computer literacy, as the concept also has changed along with the changes in the curriculum contents. The computer exercise has an important and wide spread influence on the academic environment today, every student needs to understand something about it.

Chisholm (2003) argued that the use of technology, content and pedagogy can aid both teachers and students to structure and organize in a way that will enhance teaching and

learning activities that support outcome-based education (OBE). The outcome-based education philosophy place emphasis on results and not just content and subject areas.

ICT has got its own challenges in spite of all its actual and potential benefits. Some of these challenges related to the use of ICT in the academic environment include lack of required skills of lecturers and students needed to operate their devices to the benefit of their academic pursuits and inadequacy of network/wireless capabilities to enhance learning among others.

Fathima (2013) indicated that, several studies have realized that teachers and students' abilities to integrate ICT into learning programmes is dependent on sufficient preparation. Therefore, it is essential that teaching and learning programmes are planned effectively to integrate ICT in the classroom.

## **1.2 Problem Statement**

The rapid growth in information communication technologies (ICT) have brought incredible changes in the twenty-first century, and has also affected the demands of modern societies (Jamieson-Proctor et al., 2006). The manner people teach and learn is affected by ICT (Bayindir and Inan, 2009). Many educational institutions in the world today are using ICT to teach the knowledge and skills their students need in the twenty- first century (UNESCO, 2002).

Global investment in ICT to provide schools with ICT infrastructure and equipment has been implemented by many governments. In Ghana for instance, the government has invested millions of dollars to equip secondary and tertiary schools with ICT facilities. A remarkable amount of money has been spent on hardware, software and infrastructure such as computer laboratories, internet and science resource centers to facilitate teaching and learning in science (Ministry of Education, 2009).

In spite of all these investments on ICT infrastructure, equipment and professional development to advance education in Ghana, it is clear that the potential for ICT to support students' learning and teachers' delivery has not been realized (Ministry of Education, 2009).

A lot of research strides including state policies have been made towards ICT integration in teaching and learning around the world. Kennah (2016) in Cameroon, Buza & Mula (2017) in Prishtina, Moya et al. (2011) in Uganda among others. In Ghana, a number of researches have been conducted on ICT integration in teaching and learning. Sey (2013) conducted a study among selected Junior High Schools in Ga South Municipality, Ofosu-Appiah (2017) at Wisconsin International University College and Amoafu (2011) at the University of Ghana among others, touching on the relevance of ICT in teaching and learning and the perceptions of students and lecturers on the integration of ICT in teaching and learning. This study however sought to examine lecturers and students use of ICT in teaching and learning in tertiary institutions for an effective and efficient integration of ICT in teaching and learning to improve tertiary education in Ghana.

### **1.3 Purpose of the Study**

The purpose of this study was to examine the use of ICT in teaching and learning at the University for Development Studies and the Tamale Technical University.

### **1.4 Objectives of the Study**

The specific objectives of the study are:

1. To determine the availability of teaching and learning technologies in UDS and TaTU.
2. To examine lecturers and students use of ICT for teaching and learning in UDS and TaTU.
3. To find out the role of Management and ICT directorate in the integration of ICT for teaching and learning in UDS and TaTU.
4. To identify challenges to ICT integration in teaching and learning in UDS and TaTU.

### **1.5 Scope and Limitations of the Study**

The study focused on Lecturers and final year undergraduate students of University for Development Studies – Tamale Campus and Tamale Technical University. The Management and the ICT directorate of both institutions were also included. The research could have covered all the students and lecturers of the Universities and even all tertiary

institutions but time allocated for this study will not allow for larger population to be covered. Also, final year students were considered for the study due to their length of stay and experience in the University environment. This is because they might have seen several technological advancements and changes the institution has undergone over a specified period of time and due to their experience, they are able to give a clear account of some of the difficulties encountered pertaining to ICT integration in teaching and learning. University for Development Studies-Tamale Campus and Tamale Technical University were used for the study since the researcher could easily have access to information relating to ICT in teaching and learning. Also, most researches conducted in this research area focused on institutions in the southern part of Ghana. Hence the researcher decided to focus on these two only public universities in the Northern Region of Ghana

## **1.6 Theoretical Framework**

Theories are very important in research since they serve as guides to the research. Swanson (2013) define theoretical framework as a structure that support a theory of a research study. Theories give explanations or reasons to the way specific group of people behave, do things, understand things and perceive things in relation to their beliefs and practices about a particular phenomenon. The theoretical framework introduces and defines the theory that explains why the research problem under study exists. The theoretical framework for this study is Technological, Pedagogic Content Knowledge theory (TPCK) by Mishra & Koehler (2006)

### **1.6.1 Technological, Pedagogic, Content, Knowledge Theory (TPCK)**

The Technological, Pedagogic Content Knowledge theory (TPCK) by Mishra & Koehler (2006) was built on Schuman (1986) idea of Pedagogic Content Knowledge (PCK). According to Schuman (1986) in order for a teacher to ensure effective teaching in the classroom, the teacher is mandated to have in-depth knowledge of the content of his/her domain (content knowledge) and in-depth knowledge of the various approaches he/she will be using to deliver his/her lessons (pedagogic knowledge). This notion of Schuman (1986) was developed by Mishra & Koehler (2006) who added that, knowledge and use of ICT can be used to support the content and pedagogic knowledge of the teacher for an effective teaching and learning outcome. The essence of the TPCK model is to equip the 21<sup>st</sup> century teacher and student with all the skills needed to use ICT to function in the classroom for the best teaching and learning outcome.

### **1.6.2 Elements of TPCK**

The Technological, Pedagogic Content Knowledge (TPCK) theory acknowledge the complex interrelationship of diverse elements, which are contextually bound in a fruitful integration of ICT in teaching and learning. These core elements constitute the different components of the theory and they are; technological knowledge, pedagogical knowledge and content knowledge (Mishra and Koehler, 2006). These elements interact for an effective integration of ICT in teaching and learning (Mishra and Koehler, 2006)

### ***1.6.2.1 Content Knowledge***

Content Knowledge (CK) deals with individual's knowledge about the contents of the subject area they are reading or teaching. This element of knowledge underlines disciplinary differentials, which results in the application of different methodologies in teaching and learning (Mishra and Koehler, 2008). Every subject or discipline have unique nature and characteristics and these informs how the content of these subject can be disseminated from one person to the other for teaching and learning goals to be attained. Knowing what entails in a subject or discipline is key to knowing the right approaches to knowledge dissemination in that discipline or subject area and this is what Schuman (1986) as well as Mishra and Koehler (2006) described as Content Knowledge.

### ***1.6.2.2 Pedagogic Knowledge***

The Pedagogical Knowledge (PK) represents the methods and processes of teaching and learning purposes, values and aims (Mishra and Koehler, 2006). This component deals with the planning and implementation techniques of teaching and learning. An enriched pedagogical knowledge of student enable them to know and understand how to construct knowledge and build skills from what they are taught and from what they learn. Similarly, an enriched pedagogical knowledge of teachers enable them to effectively transmit acquired knowledge and skills to students for a better educational outcome. This talks about the manner in which knowledge is transmitted to a recipient and the manner the recipient also receives and process that knowledge in a way that the objectives of that

transmission is obtained. This is what Schuman (1986) as well as Mishra and Koehler (2006) meant by Pedagogic knowledge.

### ***1.6.2.3 Technological Knowledge***

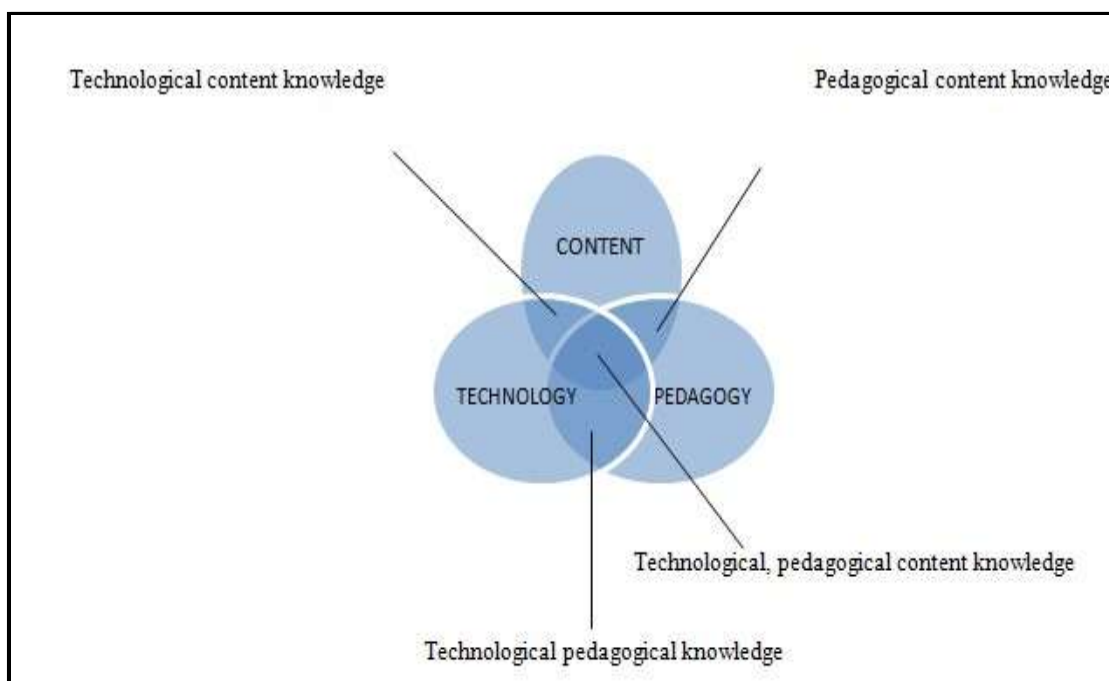
Technology Knowledge (TK) concerns the knowledge of the potentials of basic teaching and learning technologies such as books and chalkboard as well as modern and advanced teaching and learning technologies such as computers, projectors, and internet. According to Mishra and Koehler (2006), both teachers and students are required to possess the skills needed to apply these technologies productively in their teaching and learning activities. It is about incorporating technology into content and pedagogic knowledge. That is technology becomes the platform for the application of the Content Knowledge (CK) and the Pedagogic Knowledge (PK). However, before technology can serve as the platform for the effective application of CK and PK, teachers and students need to know the potentials and functions of the technology as well as how to apply them in specific approaches for the delivery of specific contents in a particular discipline or subject area.

### ***1.6.2.4 Interrelationship of TPCK Elements***

In view of what Content Knowledge, Pedagogic knowledge and Technological knowledge is all about, Mishra & Koehler (2006) stated that, these three are interrelated and are represented with three overlapping circles to aid understanding as shown in figure

1.1. As shown in figure 1.1, each circle represent Content, Pedagogy and Technological knowledge. Content and pedagogy overlap to create Pedagogical Content Knowledge (PCK), technology and content overlap to create Technological Content Knowledge (TCK) and technology and pedagogy overlap to create Technological Pedagogical Knowledge (TPK)

**Figure 1.1: Technological, Pedagogic Content Knowledge**



**Source: Mishra & Koehler (2006)**

These three components overlap each other thereby creating three different intersections as can be seen in Figure1.1. Mishra and Koehler (2008) contend that: It is the interactions, between and among these elements, playing out differently across several contexts that account for the wide variations realized in educational technology integration.

The first intersection forms Pedagogical Content Knowledge (PCK) and it shows the strong relationship between content and pedagogy. It indicates that each subject area (discipline) is different and should be taught and presented with different instructional approaches or strategies for utmost outcome. The second intersection is Technological Content Knowledge (TCK), which comes from the overlap of technology and content. This demonstrates the importance of understanding the impact of technology on specific content or subject, and vice versa. In essence, certain contents can limit or enhance the type of technology to use, and some technologies can limit or enhance the content and subject for easy understanding (Mishra & Koehler, 2006).

The third intersection from the overlap of Technology and Pedagogy forms Technological Pedagogical Knowledge (TPK). This intersection depicts how teaching and learning can change when certain technologies are used (Mishra and Koehler, 2006, 2008). Different forms of technologies can enable the application and development of different forms of pedagogy. On the other hand, different pedagogical methods will require different forms of technology.

The simultaneous integration of content, pedagogy and technology makes a vast difference in realizing the goals of investment in educational technology. This is graphically presented in Figure 1.1.

### **1.6.3 Application of TPACK to the Study**

The model puts forward two basic opinions:

1. Thoughtful interweaving of content, pedagogy and technological knowledge is needed by lecturers and students to ensure a productive application of ICT in teaching and learning;
2. There is no single technological solution applicable to every teaching, every subject, or every view of learning (Mishra & Koehler, 2006).

Therefore, it is crucial for lecturers and students to have basic ICT competencies and skills that is applicable in their teaching and learning activities. The interest and frequency of use of ICT facilities of lecturers and students is therefore crucial to attain competence. The more a particular skill is frequently practiced, the more the competence gained in using that skill and more areas to apply the skill is discovered.

Fathima (2013) explained that good teaching is not simply adding technology to the existing approach and content domain rather it should cause the demonstration of new concepts and developing of sensitivity to the dynamic nature, and the transactional relationship between the content, the approach and the technology to use. It is therefore important for teachers and students to know the content of their field of study, the appropriate approaches to use in teaching or learning the content of that field of study and the application of the right technology in their teaching and learning activities for the utmost outcome. This study through the application of this theory was able to determine the availability of teaching and learning technologies in the universities and to examine lecturers and students use of these technologies in teaching and learning.

### **1.7 Significance of the Study**

The findings of the study are of significance to Policy makers for tertiary education in the formulation of policies at every level of national development. Also, the significance of the study lies in the fact that the outcome of the study adds to existing knowledge on the use of ICT in teaching and learning.

The findings of the study are of much importance to lecturers and students as well as to all academicians and researchers to serve as a guide and source of reference to their research. The findings of the study also provide in-depth knowledge and serve as an informing tool to the university authorities and decision makers for implementation of vigorous ICT into teaching and learning. The findings of this study will also be of significance to scholars and researchers since it will contribute to knowledge on ICT application in teaching and learning in tertiary institutions.

### **1.8 Organization of Chapters**

This study was organized into six chapters as follows:

Chapter one is the introductory chapter comprising the background to the study, statement of the problem, the purpose of the study, objectives of the study, scope of the study, theoretical framework, significance of the study and organization of chapters.

Chapter two covers the literature review.

Chapter three covers the methodology, comprising the research design, selection of cases, population, sample size, data collection instruments and data collection procedures.

Chapter four covers the results of the study, comprising analysis of data and presentation of findings

Chapter five covers discussion of major findings.

Chapter six covers summary of findings, conclusion and recommendations.

## **CHAPTER TWO**

### **LITERATURE REVIEW**

#### **2.1 Introduction**

Literature review according to Lamb (2016) is a text of a scholarly paper, which includes substantive findings, current knowledge as well as methodological and theoretical contributions to a particular topic. Literature reviews are secondary sources, and do not report original or new experimental work. Taylor (2015) also defines literature review as an account of what accredited scholars and researchers have published on a topic.

Education and ICT integration is one area that has been researched by other scholars in different countries all over the world. In this study, literature was reviewed to show research progress made concerning the application of ICT for teaching and learning under the following themes:

1. The Concept of ICT
2. The Concept of Teaching and Learning
3. Teaching and Learning Technologies
4. Integration of ICT into Teaching and Learning
5. Role of Management in ICT Integration in Teaching and Learning
6. Challenges to ICT Integration in Teaching and Learning

## **2.2 Concept of ICT**

ICT is an interdisciplinary science mainly concerned with the collection, manipulation, classification, storage, retrieval and dissemination of information. According to Ezekoka (2007), ICT is a means of receiving or accessing, transforming, processing, storing and sending ideas, perception or information through computer and their telecommunication facilities. Abimbade (1996) also viewed ICT as a concept, method, function, process or system of collecting, analyzing, processing and sharing of information using electronic equipment. ICT includes all that is involved in modern communication satellites, television, radio, video, tape recorders, floppy diskettes, compact discs, personal computers and other related equipment so that, the output generated can get to the user in good time and at reasonable cost to the overall benefit of mankind.

Developments in ICT such as the World Wide Web, electronic mail and Electronic data interchange can be seen as facilitators to cross organizational boundaries when dealing with information intensive processes (Hengst and Sol, 2001). Liverpool (2002) points out some of the uses of ICT in teaching and learning to include; ICT as objects, ICT as an assisting tool, ICT as a medium of teaching and learning, and ICT as a tool for organization and management in schools. ICTs allow learners to explore and discover rather than just listen and remember (Tinio, 2003).

Several reports and studies in recent years have placed emphasis on the potentials and opportunities of ICT for improving the quality of education. ICT is perceived as a “major tool for the construction of knowledge societies” (UNESCO, 2003) and significantly as

an instrument at the educational level that can offer a way to restructure the educational systems and processes, resulting in quality education for all.

Additionally, in Europe, appropriate use of ICT is seen as a main factor in attaining quality education. In view of this, the European Commission is encouraging the use of ICT in learning through its eLearning Action Plan. One of the specific objectives of the action plan is “to improve the quality of learning by facilitating access to services and resources as well as remote collaboration and exchange (CEC, 2001).

A study by Bakar et al., (2010) examining secondary school student’s motivation in using technology in teaching and learning mathematics, found out that technology could be used to motivate students in their teaching and learning activities.

To prepare the students for the challenges of the 21st century workplace and community leadership, the integration of information communication technology into teaching and learning process becomes inevitable. Also lecturers must be supported in the preparation of students’ classroom use of technological tools and applications so that they can create learning environments that enable students to become responsible for their own learning and also focus on process and outcomes specifically for their individual learning states and needs. Adekunle (1997) stated that students’ ability to speak, write and analyze information can be enhanced as part of their individual and personal growth through ICT. Furthermore, Adekunle (1997) added that teachers should emphasize the many benefits they derive from the use of ICT as productive tool in developing their own instructional materials and managing classroom and student information, in order to motivate their colleague teachers and students as well.

The application of ICT in teaching and learning makes learning more productive and efficient as it facilitates pedagogical activities of teachers and academic performance of students. For instance, e-learning has become one of the most common means of using ICT to offer learning opportunities to students, both on campus and off campus through online teaching via web-based system (Yusufu, 2005). Also, ICT allows teachers and students to contribute, control and manipulate information in teaching and learning environments with the use of interactive books, journals among other resources that are usually available on the Internet (Oxfarm Educational Report, 2008).

Researchers are also able to lay their hands on varied and counter opinion information of other researchers in other parts of the world to aid their work through the use of ICT. Colwell (2000) briefly pointed out the potential of ICT in research when she noted that: No field of research will be left untouched by the current explosion of information and communication technologies. Science for instance, used to consist of theory and experiment. But today it has computer simulation as a third element which links the other two. ICT can lead lecturers into new frontiers in basic and fundamental research. ICT is relevant to lecturers and students in many areas of research.

According to Colwell (2000), ICT facilitates dissemination of information and communication from one person to another through e-mail, mail lists, newsgroups and chat rooms. These ICT resources facilitate communication between scholars as they can post research, books, journals, assignments, lists of references to on-line materials among others. Problems and solutions can be discussed among researchers, and scholars can respond to the work of others in an electronic manuscript through the use of ICT. ICT offer greater chances for research collaboration and networking among scholars across

the globe, thus national and international aspect of research issues can be studied since they can allow for communication with experts and peers around the world. Through collaborative knowledge building, studies can highlight transnational trend analysis through human and instrumentation collaboration.

Colwell (2000) again added that, ICTs can support research in any discipline as they offer faster and easier access to extensive and up-to-date information through digital libraries that provide digitized full-text resources to learners and researchers. Others are the electronic list, thus a directory of professional and scholarly e-conferences containing topics and articles relevant to researchers, and virtual libraries or electronic reference desks. Others include electronic books, journals, catalogues and image database. Other Internet resources, like CD-ROM and gopher can provide a researcher with current and in depth information.

Colwell (2000) asserted that, ICT can be used for data manipulation and analysis and can also be used to do complex statistical and mathematical calculations which are important in research. ICT enhance the completion of data on time and enhance the swift performance of statistical analysis. In fact, complex statistical analyses are not only performed instantaneously but also more accurately than possible manually. ICT offer researchers ready means for the dissemination of research findings and reports. ICT also offer ready avenue for the production of research reports. Publication outlets include e- journals, e-books or through personal web-sites. Furthermore, digital video, audio, interactive software, asynchronous and synchronous chats, software simulation, social media among others, bring dynamism in describing a method or reporting result (Middleton et al, 2001).

### **2.3 The Concept of Teaching and Learning**

Teaching is to cause people to learn and acquire the desired skills, knowledge and also required ways of living in a society. It is the process in which the learner, the teacher, the curriculum and other variables are systematically and psychologically organized in a way so as to achieve some pre-determined goals. According to Lewis (2003), teaching is the set of activities involved in educating and instructing in order to impart knowledge or skill.

Learning on the other hand is the acquisition of knowledge or skills through study, experience, or being taught (WWD, 2019). Learning is mostly interpreted as the process of acquiring knowledge, theories and values that relates to sustainable development but it also prioritizes the changing of minds and active engagement of the learner in matters relating to more sustainable future (Tibury, 2011). Lewis (2003) again defined learning as the cognitive process of acquiring knowledge or skills.

Teaching and learning is a process that consist of many variables and these variables interact as learners pursue their goals and incorporate new skills, knowledge and behaviors that add to their learning experiences.

Despite the variance between the two concepts in terms of meaning, they are interrelated in practice. Even though there can be learning without the practical art of teaching, teaching on the other hand can hardly take place without a learner. In view of this, the two concepts have been treated concurrently to aid discussion.

Brophy (2013) in his book advised that, before beginning any lesson or activity, the teacher should ensure that students know what they will be learning and why it is important for them to learn it. The teacher is mandated to give students a general knowledge or an overview of the content of the activity, and a structure or method within which they can understand and connect the details of what will be presented by the teacher. Such knowledge of the nature of the activity and the structure of its content helps students to focus on the main ideas and order their thoughts effectively.

According to Mishra and Koehler (2006) and Schuman (1986), knowing the general content of the activity is termed Content Knowledge and the structure or method within which the student can understand the activity is also known as pedagogic knowledge. They are also of the notion that, a teacher needs to be abreast with the nature and content of what he/she is to deliver, and the structure or method within which he/she will deliver, in order to be able to present it well to the understanding of the students. Meaning, for a complete cycle of teaching and learning to take place, theory must be accompanied by practice.

Brophy (2013) in his book established that, there are three main ways in which teachers help their students to learn:

1. They present the content, explain concepts and model skills.
2. They asked questions and lead their students in discussion and other forms of dialogue surrounding the content.
3. They engage students in activities or assignments that provide them with opportunities to apply or practice what they have learnt.

Therefore, the provision of teaching and learning materials and other resources to aid both theory and practice must be given utmost attention.

In teaching and learning, the learner discovers, draws in from the outside, and make that which is drawn a real part of him/her (Rogers, 1983 as quoted by smith, 1998). They are of the notion that while trying to pass on knowledge to the learner, it is necessary to make sure the leaner is able to understand what is being taught in its practical sense, thus making what is learnt a real part of the learner, as it reflect in the daily life and activities of the learner.

Research shows that skills practiced extensively tend to be retained indefinitely, whereas skills that are mastered only partially tend to deteriorate. Most skills included in school curricula are learned best when practice is dispersed across time and rooted within variety of tasks. Thus, it is important to follow up through initial teaching with occasional review activities and with opportunities for students to use what they are learning in a variety of application contexts (Brophy, 2013).

It is important for the development goals of any country to direct its education towards skill acquisition than just the theoretical orientation of concepts. AAAS (1990) maintains that, for teachers to be able to bring all students to the level of understanding and skill acquisition, they will need a new generation of books and other instructional tools. In other words, reaching demanding goals in education requires having access to appropriate technologies that can help in reaching those goals.

For effective teaching and learning to take place, Walberg and Paik (2000), suggest that it is necessary to enlighten student of learning strategies. They suggested three possible phases of teaching:

1. Exhibit the desired behavior; in this phase students are taught.
2. Guided practice; in this phase students perform with the help of the teacher.
3. Application; in this phase students act independently of the teacher.

This is because many students do not develop effective learning and problem solving strategies on their own but can acquire them through modelling and explicit instruction from their teachers (Brophy, 2013).

Tutoring has been an effective means of teaching and learning in most Ghanaian learning institutions and across the world. It is therefore in the right direction that Universities in Ghana have made it a policy to reduce the large class sizes into smaller ones in order to balance the lecturer/student ratio. Also, the use of teaching assistants to support teaching and learning has greatly been encouraged. Walben and Paik (2000) added that, tutoring directs learning to student's needs, hence teaching one student or a small number with the same abilities and instructional needs can be very effective and yields great teaching and learning outcome. Lecturers are therefore admonished to help students to learn by seeking the active participation of students. The background of the student must also be considered throughout the learning process. This is because students' background turn to shape the understanding and truth the student creates, and the knowledge and skills the student acquires through the learning process.

Assessment is one of the means by which learning is established, and it gives the teacher opportunity to measure the absorption rate or otherwise of the learner. Brophy (2013) again suggests that, besides tests and quizzes, students' assessment should address the full range of objectives or intended outcomes of not only their knowledge but also the thinking and practical skills of students, content-related values and dispositions. It should also be directed towards planning curriculum improvement. Laurillard (2013) added that the learner develops their conceptual understanding through repeated attempts to achieve a particular goal, and then reflecting on how well they succeeded in achieving that goal. By so doing, they gain more insight and understanding of a particular knowledge or skill acquired, making the application of acquired knowledge or skill easier for them. In this way, it becomes easier to also develop appropriate structure or method to transmit these acquired knowledge to another person.

#### **2.4 Teaching and Learning Technologies**

Technological aids not only break the monotony to grab students' attention, foster inquiry and increase interest but also improve comprehension and stimulate retention. Classes become more interactive, engaging and collaborative as students move from passive reception to active discovery and learning.

Effective teaching is strongly influenced by the manner in which teachers use ICT tools or technologies in the teaching and learning process and not only how the various ICT tools function (Mishra and Koelher, 2006). By implication, the teachers' knowledge in the functions of the various ICT tools is not enough for the effective teaching and

learning outcome, but the ability of the teacher to practically use the ICT tools is very crucial for effective teaching.

Technology is the application of human or scientific knowledge to practical problems (Lewis, 2003). In the context of this work, teaching and learning technologies refer to all ICT hardware and software tools that can be used to enhance teaching and learning. ICT consists of the software, hardware, media and networks for the collection, processing, transmission, storage and presentation of information (data, voice, text, and image) and its related services (APF, 2008). They include the use of computers, DVD/CD-ROM, projectors, web based multimedia training, interactive media, modems, satellites, teleconferencing, webcast (live video streamed over the web), interactive whiteboards and other technological means (Fuglestad, 2011).

Hajara & Bukari (2017) study on students perception of ICT in teaching and learning at Wurishei community Al-Badah Junior High School in Tamale identified computer, Phone, CD/DVD player, Television, Printer and Modem as the common ICT facilities available for use by students for learning. But limited duration of ICT lessons as well as teachers inability to cater for individual students ICT needs was a challenge. Therefore the study recommended that, more time and more ICT related activities should be incorporated in their teaching and learning because ICT benefits both the weak and strong students and also have positive effects on behavior, communication and skills of students.

DVD/CD-ROM technology enhances learning mobility. A computer and a source of electricity allow learners to carry volume of information on DVD/CD-ROM with them. It

gives the learner, access to quality information at locations where they may not gain access to the library and the internet.

From the analysis of Sutherland et al., (2004), the use of interactive whiteboard and software plays a potential role in conjoining the teacher's „personal curriculum“ to the knowledge of students in the classroom settings. According to Sutherland et al., (2004), the use of some music software package (for example, Fruity Loops, Acids Xpress and Dance eject) enables students to compose within various contemporary styles of music that are clearly important in young peoples' social and cultural lives. The results of the music design initiatives indicate that this can lead to increase motivation and engagement in school activities.

Gleeson (2001) said in his submission that the internet provides the platform for teaching to take place across boundaries. Using such resources as teleconferencing, webcasting, and web based multimedia has aid teachers to provide teaching to learners from a distance. The University of Texas for instance runs an online program known as „Tele campus“ for distance students. The system offers both in-campus and off-campus access to students and gives students the opportunity to interact with each other and with their lecturers through webcasting (UT, 2007). Videoconferencing systems uses a regulated band of frequencies and allows remote participants to be connected live by telephone lines (Encarta, 2009). Video conferencing systems can support distant collaborative learning. Students can have group discussions and tutorial sections through video conferencing. Skype is another internet facility that can be utilized by educators to enhance teaching and learning activities. Skype is a software application that also allow students to make voice and video calls and chats over the internet (Wikipedia, 2011).

Now Imo, Whatsapp and Facebook video calls are also available to support online interaction between lecturers and students and amongst students thereby bridging the limitations of time and space on teaching and learning.

Even though digital tools are rarely developed with the needs of formal teaching and learning in mind (Laurillard, 2007), with the internet now available in most University Campuses in Africa, educators can take advantage of the vast resources and potentials of the internet to support teaching and learning in so many ways. Aside discussion groups, lecturers can conduct assessments and evaluations via the internet. Students watch videos of what they have learnt on YouTube thereby enhancing their understanding of what they have learnt.

Sutherland et al., (2004) in their study admonished that technological tools can be used for teaching almost any subject, thus from a complicated scientific classification system, history of a country or a complicated mathematical problem to simply narrating a story to children with pictures, graphics and pieces of text.

Computers have changed the traditional classroom experience from perceptive learning to a visual, web-based and virtual learning experience. Moreover, different visual formats facilitate ease of learning and an enhanced retention period for the learners.” The different pedagogies available for teachers enable them to improve not only teaching but also create personalized learning plans since all students don't learn the same way.

There is a wide variety of audio/visual/technological tools that can be utilized in different ways to help teachers teach and students learn. The simplest visual representation is with an overhead projector and transparencies to present text, graphs,

illustrations, photographs, cartoons etc. Video documentaries and audio- tapes are used so that students can actually view and better understand theoretical concepts like human anatomy or the eclipse phenomena.

Teachers can effectively use ICT tools such as the computer, internet and mobile phones, the array of teaching aids and online services including email, online chat, facebook, twitter, forums, blogs, slideshows, search engines, interactive whiteboards, videoconferencing, etc. to communicate with students, ask questions, solve doubts, answer queries, give assignments, send reminders, coordinate group activities or even have a group discussion out of the class. Such virtual interactions encourage a running dialogue of thoughts, comments, reflection and feedback overcoming limitations of time, distance and even students' shyness.

Teachers can post course material, a lesson presentation or other important information on the internet, enabling students to quickly access them anytime they want. This can be replete with providing links to relevant definitions, background information, audio, images, animation, etc. (something that is missing in traditional books/lectures). This will help arouse students' curiosity and invite them to explore. Teachers can go a step ahead and use an e-group to organize interactive quizzes or even conduct polls that help students understand how their opinions relate to the lessons.

Different computer programs like word processors, PowerPoint, databases and spreadsheets help teachers organize, evaluate and present information in a quick and interesting way. Another use of these computer programs is keeping track of students' grades/progress. Teachers can use software products and multimedia components to

design and deliver rich, engaging and visually stunning presentations. Students can even view real phenomena and processes with simulations that help them to easily relate to the principles and concepts.

Educators can also run websites with Learning Management Software (like Moodle, Edmodo, Canvas etc) to not only deliver content but also build collaborative communities of learning. These sophisticated tools also support self-paced learning. Options like CD-ROMs, e-books, podcasts, smart boards, Skype, YouTube videos are also open.

The web offers a variety of options for students. They can easily conduct research with Google or Wikipedia, use Microsoft Office for creating a project, air different perspectives for solving a problem on Blogger and share ideas with other students through MSN Messenger/Facebook/Twitter, sometimes even to the extent of collaborating in real-time with another class across the globe. This enhances their thinking, problem-solving and creative skills.

Buzzard et al., (2011) also conducted a study of the use of digital technologies by students and faculty members. Findings showed that instructors and students are eager to teach and learn with variety of digital technologies. The research highlighted major concerns to the use of technology as disciplinary differences, Meta teaching demands and tool sophistication.

## **2.5 Integration of ICT into Teaching and Learning**

Integrating ICT into teaching and learning is the process of determining the kind of products and processes of ICT appropriate for a given teaching and learning situations and problems (Ifegbo, 2005). With regard to the use of ICT for teaching purposes, the lecturer is expected to acquire competencies and expertise on how to utilize ICT for effective lesson delivery. In the teaching and learning process, the student, the teacher, the curricular contents, the methods and the specified objectives all interact in the teaching and learning process to achieve the expected result

According to Ukwungwu (2004), the integration of ICT into the curriculum demands the availability of teachers who are knowledgeable in ICT tools and its application and these teachers are trained teachers with expertise in computer operations and developing of suitable software. The ability of the teacher to set up the ICT tools correctly influences how the teacher uses these ICT tools in the teaching process. When a teacher is able to blend the selection of appropriate tools with the appropriate strategies and activities to teach ICT enhanced lessons, learning also becomes easy to be achieved as explained by Graham (2011); Mishra and Koelher (2006) and Shuman (1986).

Ukwungwu (2004) further asserted that most developing countries of the world are lagging behind in science education delivery due to their inability to utilize ICT resource in their teaching and learning. However, effective utilization of ICT resources in teaching and learning cannot be successful without the training of both teachers and students to acquire technological knowledge on the functions and application of ICT tools in their teaching and learning activities. Within a very short time, ICT has become one of the

basic building blocks of modern society. Understanding and mastering the basic skills and concepts of ICT has become part of the fundamentals of education, alongside writing, reading and numeracy (UNESCO, 2002). In view of these, Agyei and Voogt (2012) suggested some guidelines for teachers to develop a more competent approach to integrating ICT in the classrooms. These guidelines include;

1. Creating collaborative teams where teachers can work in a team to formulate ICT related lessons and solve ICT related problems.
2. Creating ICT curriculum materials that will inspire teachers to learn;
3. Organizing orientation programs in the form of in-service training and other professional development program to enable teachers to acquire both theoretical, pedagogical and technological knowledge in their subject area.
4. Putting in place a user-friendly technology for easy adaptation for both teachers and students to easily integrate ICT into their teaching and learning activities (Agyei & Voogt, 2012)

Kennewell, Parkinson and Tanner (2000) also in their review, added that for a school to successfully develop ICT capabilities, the various aspects have to be observed;

1. Students must be trained to use ICT to develop an attitude of planning, describing, applying and evaluating their tasks.

2. A healthy school ICT culture in teaching and learning has to be cultivated with dominant use of ICT in the school to enable teachers and students to develop skills in applying ICT in their teaching and learning activities.
3. Teachers should develop their students ICT skills by purposefully assigning them with ICT related assignments.

Kennewell, Parkinson, and Tanner (2000) concluded that the more the level of ICT capability of teachers and students are developed, the more potential for the application of ICT in teaching and learning. This implies that increase in training will increase the ability of teachers and students to use ICT in their teaching and learning activities which will in turn increase frequency of use of ICT for teaching and learning.

Carlson and Gaido (2002) concluded that ICT and teacher professional development is the best address in a context where the educational reform embraces a shift from a teacher-centered, lecture-based instruction towards interactive, students-centered and constructivist learning. More concretely, teachers' professional training in the use of ICT needs to combine presentations as well as small-group discussion, individual as well as collaborative activities, and creating opportunities for teachers to reflect on their actual use of ICT in the teaching process (Carlson & Gaido, 2002). Voogt (2010) added that additional motivation and incentives to participate in professional development practices especially in the incorporation of ICT in the teaching and learning process should act as a major requirement especially for teachers who are reluctant to change their teaching styles.

Saret (2001) describes this present era and a revolution in which the computer is the agent which transforms the way we do business, communicate with each other, and live. According to her the rapid changing of the world is a result of computers, and the computers are making a considerable impact on how we work. With regard to the use of computer for teaching and learning, it is sometimes seen as a teacher and as a tool in teaching, appropriately computer in teaching is classified as a teaching device because computer cannot replace a teacher but rather it can serve as a device or platform through which the teachers' prepared lessons are delivered. Computer as a device for teaching is used to aid teaching in the form of drills and practice, tutorials and dialogue, simulation and games and as subject of instruction while as a learning resource, it is used in information processing, data collection and analysis, data retrieval resources and computer mediated communication.

## **2.6 Role of Management in ICT Integration in Teaching and Learning**

According to Higgins (2003), though it is a proven fact that ICT brings improvement in the teaching and learning process, there is always a challenge when it comes to the provision of the necessary infrastructure from management who are the decision makers and financial controllers of any organization.

Egoeze (2014) study on the evaluation of ICT infrastructure and its application in Nigerian universities identified ICT facilities often used in universities as computer, internet, telephone, email services. She found underutilization due to limited supply of

this facilities. And concluded that the benefits of ICT infrastructure are enormous and the extents to which it is provided and utilized define the status of the institution

Emans (2002) pointed that for many teachers and academic institutions, the use of ICT for educational purposes might be a threatening step due to the fact that there is often little expertise, and teachers as well as management are reluctant to take the first step.

Jaway (2003) observed that, several governments are facing challenges pertaining to adapting their higher education system to the demands of a rapidly changing economic, social and technological order.

The impact of ICT, the large volume of student intake, the need to deliver timely and accurate learning, delivering student support services, and providing accurate information require the use of ICT (Kirschner and Woperies, 2003) and similar studies with Dean (2013); (Davis and Tearle, 1999; Lemke and Coughlin, 1998). Ghana is not in isolation on large student intake at both secondary and tertiary education which has exponentially increased and this increase in student intake greatly require a greater increase in the supply of ICT equipment to meet the increasing demands of students.

Jaway (2003) observed that when developing nations are reaping the fruits of state of the art ICT in their educational system, educational delivery in poorest countries of Africa in particular Ethiopia is solely based on student-teacher face-to-face contact. In Ghana, many sectors like Education are still heavily relying on traditional systems and severely lagging behind as far as new technologies are concerned (Kaweesa, 2002). There is the need for management and policy makers to wake up and help bridge the digital divide

between developed and the developing world by providing and encouraging the use of ICT to boost the effectiveness of the educational sector.

The successful integration of any technology into teaching and learning needs careful planning and largely depends on how well the dynamics of such integration is understood and appreciated by policy makers (Dean, 2013). This require sensitization of management and policy makers on the role ICT play in our educational system, in our daily operations and the development of the country as a whole.

More studies on management attitude were done by Muwonge (2005); Becta (2003); Becta (2002); Passey (2002) and Christensen (2002). This is relevant to the study as it is important that management attitude towards ICT is changed in order to enable the provision of quality services. Change in managerial attitude will also foster a quicker response of management to every ICT needs.

Turban et al (2005) observed that there is the need for real time operations given the fast rate at which the economy is evolving. The support given by management is vital for the enhancement of ICT in the teaching and learning process as Hawkins (2002) noted that lecturers need support in good practice and leadership from management to become more effective in their work. This justifies the inclusion of management support as one of the study variables.

In a study by Obiri-Yeboah et al., (2013) on the factors affecting ICT adoptions in tertiary institutions in Ghana at the Kwame Nkrumah University of Science and Technology. The findings of the study showed that ICT was not fully integrated into research, teaching and learning and the major obstacles pointed out were inadequate

infrastructure and the required skills to use ICT. The study therefore recommended that management must have a clear model for ICT integration that will foster adoption and use.

According to Emans (2002), the key factor that contributed in the success of ICT in education is the availability of good and updated equipment. It is therefore essential for both students and lecturers to have regular access to up-to-date ICT equipment.

Other researchers like Tsubira (2005); Mudasiru (2005); Turban et al (2004); Christensen (2002); Hassan (2002); Becta (2002); Walsh (2000); Wilmore and Betz (2000) indicated that other ICT integration challenges may come up apart from financial resources to acquire computers and software, and to set up and operate international and internal connectivity on a sustainable basis, however, this should not hinder management in the provision of ICT infrastructure but strategies should rather be put in place to handle some of this problems anytime they come up.

Cuban (2001) asserted that to actively implement ICT in the classrooms, the policy makers have a very important role to play and these role include the following;

1. Decision makers and management must first understand the strength and weaknesses of lecturers and involve them in designing, providing and implementing ICT plans in the institution.
2. There is the need to change the structural arrangement of the daily lecture schedules, so that more time will be given to lecturers to plan their lecture activities.

3. Professional development and technical support should be made available for lecturers to support them in integrating ICT in their teaching activities.

## **2.7 Challenges to ICT Integration in Teaching and Learning**

In spite of the accompanying benefits and clarion call for full introduction and utilization of ICT facilities and services in our educational system, there are still serious challenges hindering the implementation of ICT at the institutional and classroom level. Such factors include;

**Absence of trained teachers in ICT** to teach students practical aspects of computer skills coupled with non-availability of computer and associated tools in school all put together militate against actual utilization of ICT in our tertiary institutions. Most of the teachers and lecturers play avoidance techniques in the utilization of ICT. They distance themselves from computer related activities and training. They also rely on traditional methods of teaching. Such distance may be due to fears, ignorance, negative perception or inferiority complex. This factor presupposes an urgent need for all employed and practice teachers to brace up with the challenges of ICT and use ICT tools and skills to their advantage.

Onuma (2006) remarked that, as important as ICT devices are, they should be seen as tools teachers can use to support students to be more productive and successful in learning. The successful implementation of any curriculum is dependent on the informed

and rationale choice the instructor makes about curriculum programmes and materials required for use.

**Inadequate funding:** inadequate funding is directly on the part of the government. Low level funding in school is due to inadequate budgetary allocation. ICT is capital intensive and require huge investments. ICT equipment or accessories, soft and hardware are very costly as well as its maintenance and repair. Investment in ICT educational services is also at a low level, coupled with low level of budgetary allocation and poverty among Ghanaians to procure ICT tools for private use. Few available computers in most tertiary institutions cannot serve all the students.

Adu-Manu et al (2013) study on the opportunities and challenges in the implementation of social network technologies in four private universities in the Greater Accra Region of Ghana revealed some of the challenges as higher cost of purchasing of sophisticated devices, safety and privacy issues, and incompetence with the use of multimedia tools. It also revealed that change in teaching methodology brings about frustration and the issue of uncertainty because of the lack of exposure to technological devices. The study recommended the training of lecturers on how to use the technology and that management should consider making laptops available to all the lectures so that they will be stimulated to have strong affiliation with the technology in order to overcome the problem of lack of exposure.

**Management attitude:** the attitude of various management in and outside institutions towards the development of ICT related facilities such as the internet and the procurement of computers is rather slow. In some instances and in others there are no

aids or support by the government to provide these facilities (Kwache, 2007). These leads to frustrations in the use of ICT by students, lecturers and management.

Addy and Ofori-Boateng (2015) in their study analyzed the level of ICT readiness as a tool for effective university education. In their study they identified problem of infrastructural development as key challenge for student and lecturers to close the digital divide with those of the developing world. According to them the high cost of setting up ICT in the universities in Ghana including high cost of hardware and software, high cost of setting up of telecommunication networks, high cost of maintenance and repair of infrastructure looks impossible for developing countries.

**Inadequate Internet Connectivity:** again there is also low of internet connectivity in Ghana. Low bandwidth makes teaching and learning with ICT very boring and unattractive.

**Power Supply:** power supply all over the country appears erratic. All ICT tools depend heavily on steady supply of electricity if they are to function effectively. In urban cities, where there are power supplies, it is irregular and regularly interrupted. Interrupted power supply disrupts actual utilization of ICT services. The negative effect of erratic power supply in Ghana makes ICT dysfunctional and sometimes causes regular breakdown of ICT equipment.

**Low Tele Density:** low tele density is another major problem of ICT utilization in Ghana. access to telecommunication tools such as telephone, computer, and internet among others is still at lower rate despite the infusion of global system for mobile telecommunications.

**Digital Divide among University Staff:** digital divide is described as discrimination against the ICT usage between countries, cultural, religion, family, urban and rural dwellers, rich and poor. Geographical spread, race, gender and vulnerable groups. Yet, leveraging modern technology and integrating it into teaching is quite a daunting challenge. Not to mention the problem of high costs and access to computers. Faculty resistance/lack of training is another barrier as lecturers are not only willing to incorporate technology but also be up-to-date with the latest tools. To overcome these problems educators are encouraged to attend short workshops or join online teacher support sites/chat rooms/newsgroups. Many websites also provide valuable information on various technological teaching aids/assistance and their use.

## **CHAPTER THREE**

### **METHODOLOGY**

#### **3.1 Introduction**

Research methodology is a set of tools, techniques and procedures used during research. According to Howell (2013), a methodology is the strategy that shows the form of a research and the methods that will be used in order to arrive at the results. These methods comprise processes and techniques that was employed in a research to arrive at the results of the research. Methods employed for this study are discussed here under the following headings: research design, selection of subject, study population, sample size, sampling techniques, sources of data, data collection instruments, data collection procedure, data analysis and ethics of researching.

#### **3.2 Research Design**

Research design is the complete plan used to obtain answers to the questions being investigated and for managing some of the challenges encountered during a research process.

A mixed method approach was adopted for this study under a descriptive research design. In order to ensure that the weaknesses of both quantitative and qualitative research approaches are taken care of, mixed methods are mostly adopted to complement the findings of the two approaches thereby enriching the findings of the study.

### **3.3 Selection of Cases**

The study focused on Lecturers and final year undergraduate students of University for Development Studies – Tamale Campus and Tamale Technical University. The Management and the ICT directorate of both institutions were also included. Final year students were considered for the study due to their length of stay and experience in the University environment. This is because they might have seen several technological advancements and changes the institution has undergone over a specified period of time and due to their experience, they are able to give a clear account of some of the difficulties encountered pertaining to ICT integration in teaching and learning. University for Development Studies-Tamale Campus and Tamale Technical University were used for the study since the researcher could easily have access to information relating to ICT in teaching and learning.

### **3.4 Research Settings**

The University for Development Studies (UDS) was established in May 1992 by PNDC Law 279 in order to provide productive and meaningful interaction between the academic world and the community by blending the academic world with that of the community for the total Development of Northern Ghana, in particular, and Ghana as a whole. It commenced academic work in September 1993 with the first batch of thirty-nine (39) students admitted into the Faculty of Agriculture (FOA), Nyankpala. The University's main objective was to address and find solutions to the socio-economic deprivations and

environmental problems that had characterized Northern Ghana in particular and some rural areas throughout the rest of the country. The UDS was borne out of the new thinking in higher education which emphasizes the need for universities to play a more active role in addressing problems of society, particularly in the rural areas (Effah, 1998). The University by its mandate and capacity has a pro-poor focus. This is revealed in its approach in research, teaching and outreach services. The specific emphasis on research, practically-oriented and field-based training is targeted at contributing towards poverty reduction in order to hasten national development. Accordingly, UDS purposely and systematically offer courses that are targeted at preparing individuals to institute their own careers in desired areas. Further, it provides these practitioners with necessary knowledge to enable them to live and function in any deprived community in the country. Although the University is still in need of teaching aids and physical infrastructure, it has progressively grown over the years, and now have four (4) satellite campuses spread out in the three (3) Northern Regions of Ghana. That is Nyankpala and Tamale Campuses in the Northern Region, Wa Campus in the Upper West Region and Navrongo campus in the Upper East Region. (Source: <http://www.uds.edu.gh>).

The Tamale Technical University on the other hand envisions to become an information Technology driven tertiary institution with a cohesive workforce for the running of professional, certificate, Higher National Diploma (HND), and degree programmes relevant to national development. The University trains students up to the Post Graduate level with the needs of the University socio- economic environment centre. The mission of the University includes the following;

(a) To offer tertiary education in the fields of technology, commerce, manufacturing,

science, applied arts, applied social science and any other field approved of by the sector minister;

(b) To offer opportunities for training, development of skills and competencies in the relevant fields, applied research and publication of research findings;

(c) To Link development and training to the requirements of world of work and industry.

The Tamale Technical University commenced as a Training Centre for Trades in 1951 and then became the Government Training School in 1954. The School was converted to a Junior Technical Institute in 1960. It was upgraded to the Polytechnic in August 23, 1992 and now to the status of a Technical University, in 2016 together with Accra, Cape Coast, Kumasi, Takoradi and Ho, Polytechnics as a result of the Educational Reform Programme and the enactment of the PNDC Law 321 in 1992. (Source: <http://www.tatu.edu.gh>).

The University for Development Studies and The Tamale Technical University are both pro-poor focused and targeted at preparing individuals to establish their own careers in specialized areas by providing opportunities for skills development, training and competencies in the relevant fields. In order to achieve this goal in this 21<sup>st</sup> century, there is the need for vigorous implementation of ICT based teaching and learning in order to raise the kind of competitive people needed for this current world of work and industry. Saret (2001) stressed that industry is becoming more computerized and businesses has become more dependent on computers for routine task such as billing, payroll and

communications as well as for decision making. It is therefore necessary that graduates possess the requisite ICT skills in readiness for industry and job creation.

### **3.5 Study Population**

Neuman (2006) defined a population is a large group of many cases from which a researcher draws a sample and generalizes the results of that sample. Alvi (2016) also referred to population as all members of a particular group who meet certain criteria for a research study. This means, population is about human beings and certain attributes they possess such as their locations, dwellings and environments. It may also include age of people, their ethnicity, and their type of housing, birthplace or location.

The target population for this research study was 2854 comprising Lecturers and Final year undergraduate students and management and ICT directorate of University for Development Studies and Tamale Technical University. The total of 2854 comprised 1450 from UDS and 1400 from TaTU. 1450 from UDS also comprised 120 Lecturers and 1330 Students likewise the 1400 from TaTU also comprised 190 Lecturers and 1210 Students. The total of Lecturers was about 310 and that of final year students were about 2540 as illustrated in Table 3.1. it also comprised 2 Management personnel (one from UDS and One from TaTU) and 2 personnel from the ICT directorate (one from UDS and One from TaTU) as shown in Table 3.2.

**Table 3.1: Study Population**

INSTITUTION	POPULATION		
	Lecturers	Students	Total
UDS	120	1330	1450
TaTU	190	1210	1400
<b>TOTAL</b>	<b>310</b>	<b>2540</b>	<b>2850</b>

Source: Field Data 2019

**Table 3.2: Population of selected Personnel**

Name of Institution	Management Personnel	ICT Personnel	Total
UDS	1	1	2
TaTU	1	1	2
<b>TOTAL</b>	<b>2</b>	<b>2</b>	<b>4</b>

Source: Field Data 2019

### 3.6 Sample Size

According to Neuman (2006), a sample size is a smaller set of cases a researcher selects from a larger pool and generalizes to the population. In this study, the researcher selected the sample size with reference to the sampling ratios proposed by Alreck and Settle (cited in Ankrah, 2014, p. 121). They proposed that for different population sizes; sampling ratio of 30% is adequate for a population of less than 1,000; sampling ratio of 20% is adequate for a population between 1,000 and 10,000; and a sampling ratio of 10% is adequate for a population greater than 10,000.

According to Alreck and Settle (1985) “only a small fraction of the entire population ordinarily provides sufficient representation of the group as a whole and enough accuracy for decisions to be based on the results with confidence”. The researcher therefore, selected a sample size of 570 which is 20% of the 2,850 Lecturers and Final year undergraduate students of UDS and TaTU. However two people from management (1 from UDS and 1 from TaTU) and Two ICT personnel (1 from UDS and 1 from TaTU) were also considered for the study as shown in Table 3.3. Giving an overall sample size of **574** for the study.

Thus;

$$\text{Sample Size (N)} = 20/100 \times 2854 = \mathbf{570}$$

The proportionate sample size for each strata in the population was calculated using 20%.

The following proportionate sample size (P.S) formula was used:

Thus;

$$P.S = \frac{\text{Population of Strata}}{\text{Total Population}} \times \text{Sample Size (N)}$$

The breakdown is as follows; UDS Final year undergraduate students (266), TaTU Final year undergraduate students (242), UDS Lecturers (24) and TaTU Lecturers (38), Total number of students sampled is 508 and total number of Lecturers sampled is 62 as shown in Table 3.2.

**Table 3.3: Sample Size Determination**

INSTITUTION	Study Population			Number Sampled (20%)		
	Lecturers	Students	Total	Lecturers	Students	Total
UDS	120	1330	1450	24	266	290
TaTU	190	1210	1400	38	242	280
<b>TOTAL</b>	<b>310</b>	<b>2540</b>	<b>2850</b>	<b>62</b>	<b>508</b>	<b>570</b>

Source: Field Data 2019

### **3.7 Sampling Techniques**

“Sampling is the process or technique of selecting a suitable sample, or a representative of a population for the purpose of determining characteristics or parameters of the whole population” (Mugo, 2002). The sampling was done to select elements that accurately represent the population size from which the elements were drawn. The researcher carefully selected the sample so that it would properly represent the whole using sampling techniques.

Convenience sampling technique was employed in this study for the distribution of copies of questionnaire to lecturers and students. Convenient sampling is a type of non-probability sampling that involves the sample being drawn from that part of the population that is close to hand or readily available.

### **3.8 Instrumentation**

Different types of data collection tools are used in research for different purposes depending on what the researcher seeks to achieve and how the researcher intends to achieve it. According to Bradley et al (2009) a researcher’s choice of data collection tool is normally determined by the research aims and objectives.

For the purpose of this study, questionnaire and interview guide were used as data collection instruments.

### 3.8.1 The Questionnaire

The questionnaire for this study was partly structured and partly unstructured. A categorical scale such as (“yes” or “no”) was used to measure some items of the questionnaire. The questionnaire comprised six parts and data was solicited on the following;

1. Part I: Demographic Data

Comprised questions on gender, age, institution and number of years as lecturers.

2. Part II: Computer Knowledge

Comprised various questions asked about students and lecturers' level of ICT knowledge and level of improvement and whether they participate in ICT training sections.

3. Part III: Availability of Teaching and Learning Technologies

Comprised questions on the availability of ICT tools for teaching and learning and frequency of use of the available tools.

4. Part IV: ICT Integration in Teaching and Learning

Comprised questions on the usability of ICT for teaching and learning purposes by students and lecturers.

5. Part V: Challenges to ICT Integration in Teaching and Learning

Comprised questions on the challenges to ICT integration in the teaching and learning activities of lecturers and students.

6. Part VI: Respondents' Recommendations

This part is to solicit the views and recommendation of respondents for an effective integration of ICT for teaching and learning.

### **3.8.2 Interview Guide**

The Interview Guide was used as a guide to conduct interviews for the management and ICT personnel selected for the study in order to solicit their views on the role of management and the ICT directorate of the two universities in the integration of ICT for teaching and learning.

### **3.9 Pilot Study**

Questionnaire assist in gathering responses in a standardized way. Collecting data using questionnaire is generally faster, and can also be used to gather data from a large group. Its limitations include the fact that returns may be low if they are not delivered and responded to by the researcher himself. Also, it is not possible to explain any point in the questions that respondents might misinterpret. Hence, it is appropriate to pilot the questions on a small group of students or at least friends and colleagues to partially solve some of the issues of misinterpretation and misunderstanding of questions. For this reason a pilot study was conducted at the UDS Clinical campus, Tamale with ten students and two lecturers to know respondents level of understanding of the questionnaire so that necessary corrections was done based on the feedback to enrich the questionnaire

### **3.10 Data Collection Procedure**

According to Burns and Grove (1999), “data collection is the precise systematic collection of information relevant to the research purpose or specific objectives, questions, or hypotheses of a study”. Data collection is about the methods and approaches the researcher employs to obtain relevant data regarding the major ideas or variables of the study.

Data was collected via the distribution of copies of semi structured questionnaire by the researcher, supported by course representatives from the various departments in the various campuses. For the purpose of this study the questionnaire was in two categories; Questionnaire for Lecturers and Questionnaire for Students. Copies of the questionnaire were distributed by the researcher to lecturers and students of the two universities within a time span of two weeks. They were collected immediately after they had been answered by respondents. This helped to reduce the non-response rate of this study. A sample of the questionnaire for both lecturers and students are appended to this report.

A face-to-face interview was conducted using the interview guide designed by the researcher to serve as a guide to the researcher in order to solicit the views of the two management personnel and the two ICT personnel in their offices. Before the interview, the researcher made a phone call to the four respondents in order to schedule time for the interview and to seek their approval for the interview. The interview was recorded by writing and mobile phone recorder. The interview was conducted at respondents’ convenience. Before the interview the researcher made a call to each of the four

respondents to make a schedule for the interview. The interview was scheduled at respondents convenience. At the meeting, the purpose and objective of the study was made clear to respondents and respondents were also assured of confidentiality of their identity and their responses, and the fact that any information given was strictly for academic purposes. For this reason respondents identity was represented as Mr. A for the management personnel from UDS, Mr. B for the ICT personnel from UDS, Mr. C for the management personnel from TaTU and Mr. D for the ICT personnel from TaTU.

### **3.11 Method of Data Analysis**

Data present raw facts which convey very little meaning to most people. The data collected was processed to make them meaningful and useful thus turning them into information. According to Burns and Grove (1999) “data analysis is the process of extracting from a given data, relevant information from which a summarized and comprehensible numerical description can be formulated”. Data analysis is “conducted to reduce, organize and give meaning to the data” (Burns and Grove, 1999).

Data that are collected can be analyzed in different ways, but for the purpose of this study, the researcher analyzed the data collected using the Statistical Package for Social Sciences (SPSS) version 22.

SPSS software was used in statistical analysis of data which may include figures, tables, bar graphs, histogram, pie charts etc. Data that were gathered for this study was analyzed using descriptive and inferential analyses. The analyses are more statistical. Descriptive

statistics is concerned with the description, presentation and summarization of a set of data to properly describe the various features of that set of data. In effect, descriptive statistics describe numerical data. The inferential aspect of data analysis is concerned with drawing conclusions from all information of interest on the basis of a small part of that information. Information about the number of returns and non-returns of copies of the questionnaire was reported. In this study, descriptive analytical methods involving tabular representation of data and the use of frequencies, four-point likert scale, pie charts, bar graphs and histogram was used. Content analysis was also used to analyze the qualitative data collected for this study in which interviews recorded were transcribed and interpreted.

### **3.12 Ethical Consideration**

According to Ghauri and Gronhaug (2005) the moral values and principles influencing the conduct of research by a researcher is referred to as ethics. In view of the above some ethical issues were considered for this study. These ethical issues include the following:

A letter of introduction was issued from the University of Ghana (Department of Information studies) to University for Development Studies and Tamale Technical University to permit the researcher to gather data from the students and lecturers.

Participants were fully informed about the procedures and the risks involved in the research including the aim and objectives of the research and the kind of questions to be answered before giving their consent to participate.

Confidentiality of the information provided by participants was guaranteed. Respondents who were interviewed were allowed to ask questions to clear doubts in their minds. The study adhered to the University of Ghana code of ethics. All sources used were duly acknowledged

## **CHAPTER FOUR**

### **ANALYSES AND FINDINGS**

#### **4.1 Introduction**

This chapter reports the findings of the study. The findings of the study were presented in two sections. The first section comprised the quantitative analyses of the study and the second section also comprised the qualitative analyses of the study.

#### **4.2 Quantitative Analyses of the Study**

This section consist of the quantitative analyses of the study based on the objectives of the study. It includes the descriptive statistics of the demographic data of respondents, descriptive analysis of the availability of teaching and learning technologies, the descriptive analysis of lecturers and students use of ICT in teaching and learning, and the responses of lectures and students on the challenges to ICT integration in their teaching and learning activities.

##### **4.2.1 Response Rate**

A total of 570 copies of questionnaire were distributed to lecturers and students. 62 to lecturers and 508 to students. All 570 questionnaire was returned indicating 100% response rate.

#### 4.2.2 Demographic Data of Respondents

To support analysis and interpretations of findings, the demographic data of respondents were taken such as gender, age, institutional division of Lecturers and students and the years of service of lecturers.

##### 4.2.2.1 Gender of Respondents

Gender relates to the number of males and females used in the study. Gender was analysed in this study to aid a better understanding of the category of respondents.

**Table 4.1: Gender of Lecturers**

Gender	UDS		TaTU		Total	
	Frequency	Percentage %	Frequency	Percentage %	Frequency	Percentage %
Male	20	32.3	23	37.1	43	69.4
Female	4	6.4	15	24.2	19	30.6
Total	24	38.7	38	61.3	62	100

**Source:** Fieldwork (2019)

Out of the 62 Lecturers, 43 (69.4%) were males and 19 (30.6%) were females. 20 (32.3%) of the males are from UDS and 23(37.1) of the males are from TaTU. 4 (6.4) of the females are from UDS and the remaining 15(24.2) of the females are from TaTU as shown in Table 4.1

**Table 4.2: Gender of Students**

Gender	UDS		TaTU		Total	
	Frequency	Percentage%	Frequency	Percentage%	Frequency	Percentage%
Male	199	39.2	76	14.9	275	54.1
Female	67	13.2	166	32.7	233	45.9
Total	266	52.4	242	47.6	508	100

**Source:** Fieldwork (2019)

Out of the 508 students 275 (54.1%) were males and 233 (45.9%) were females. 199 (72.4%) of the males are from UDS and 76 (27.6%) of the males are from TaTU. 67 (28.7%) of the females are from UDS and the remaining 166 (71.3%) of the females are from TaTU as shown in Table 4.2

#### ***4.2.2.2 Age of Respondents***

Age relates to a distinct period of a persons existence. In a study about technology, a persons age becomes relevant since age can influence a persons approach to the

understanding and use of technology. According to Colley and Comber (2003), young people are optimistic and use computers more than older people.

**Table 4.3: Age of Lecturers**

Age	UDS		TaTU		Total	
	Frequency	Percentage%	Frequency	Percentage%	Frequency	Percentage%
20-29			1	1.6	1	1.6
30-39	4	6.5			4	6.5
40-49	12	19.3	30	48.4	42	67.7
50+	8	12.9	7	11.3	15	24.2

**Source:** Fieldwork (2019)

Findings from lecturers survey revealed that out of 62 lecturers, 42 (67.7%) were between the ages of 40-49 and 15(24.2%) were above 50 years, 4 (6.5%) were between the ages of 30-39, and only 1 (1.6) between the ages of 20 – 29. An indication that majority of lecturers are middle aged and some are quite elderly as shown in Table 4.3

**Table 4.4: Age of Students**

Age	UDS		TaTU		Total	
	Frequency	Percentage%	Frequency	Percentage%	Frequency	Percentage%
20-29	234	46.1	242	47.6	476	93.7
30-39	32	6.3			32	6.3
40-49						
50+						

**Source:** Fieldwork (2019)

From the students survey, it was revealed that out of 508 students, 476 (93.7%) were between the ages of 20-29 and 32 (6.3%) were between the ages of 30-39. An indication that majority of students are of youthful age and very few are of middle age as shown in Table 4.4

#### ***4.2.2.3 Institutional Division of Respondents***

This presents the part of respondents from UDS and that of TaTU in every aspect of the study.

**Table 4.5: Institutional Division of Respondents**

Institution	Lecturers		Students		Total	
	Frequency	Percentage %	Frequency	Percentage %	Frequency	Percentage %
UDS	24	38.7	266	52.4	290	50.9
TaTU	38	61.3	242	47.6	280	49.1
Total	62	100	508	100	570	100

**Source:** Fieldwork (2019)

The findings from the lecturers survey showed that out of the 62 lecturers, 24 (20 males and 4 females) representing 38.7% of the total respondents were from UDS and 38 (23 males and 15 females) representing 61.3% of the total respondents were from TaTu as shown in Table 4.5

Findings showed that out of 508 students, 266 (199 males and 67 females) representing 52.4% of the total respondents were from UDS and 242 (76 males and 166 females) representing 47.6% of the total student respondents were from TaTu as shown in Table 4.5

**4.2.2.4 Teaching Experience of Lecturers**

This aspect of the study presents the length of stay of lecturers in their capacity as lecturers in their respective institution under study.

**Table 4.6: Teaching Experience of Lecturers**

No. of Years	UDS		TaTU		Total	
	Frequency	Percentage%	Frequency	Percentage%	Frequency	Percentage%
1-5	7	11.3	9	14.5	16	25.8
6-10	13	21.0	29	46.7	42	67.7
11-15	4	6.5			4	6.5

**Source:** Fieldwork (2019)

From the lecturers survey, Majority of the respondents 42 (67.7%) had 6-10 years of working experience. 16 (25.8%) had 1-5 years working experience and 4 (6.5%) had 11-15 years working experience as Lecturers. An indication that majority 68% have 6-10 years working experience in their institutions as shown in Table 4.6.

### 4.2.3 Availability of Teaching and Learning Technologies

The first research objective of the study was to examine the availability of teaching and learning technologies in UDS and TaTU. Issues considered with regard to this were; students and lecturers level of ICT knowledge, ownership of computers by students and lecturers, access to computer, access to the internet, and ICT facilities available for use in the lecture halls.

#### 4.2.3.1 Level of ICT knowledge

A persons level of ICT knowledge relates to the extent to which the person knows, understand and uses various ICT tools and services. This helps to determine the extent to which lecturers and students identify, understand and use available ICT tools and services in their teaching and learning activities.

**Table 4.7: Lecturers level of ICT knowledge at appointment**

Rating	UDS		TaTU		Total	
	Frequency	Percentage%	Frequency	Percentage%	Frequency	Percentage%
Basic	4	6.4	14	22.6	18	29
Average	4	6.4	14	22.6	18	29
Good	16	25.8	10	16.1	26	41.9
Very good						

**Source:** Fieldwork (2019)

From the lecturers’ survey, lecturers were asked if they had any computer knowledge before being appointed as a lecturer and how they will rate their knowledge in computer. All 62 lecturer respondents said Yes to having computer knowledge before coming to the university. None of them was very good with ICT, 26 (49.9%) were good, 18 (29%) were average and 18 (29%) had a basic knowledge in ICT as shown in Table 4.7

**Table 4.8: Lecturers Current Level of ICT knowledge**

Rating	UDS		TaTU		Total	
	Frequency	Percentage%	Frequency	Percentage%	Frequency	Percentage%
Extremely improved			7	11.3	7	11.3
Improved	15	24.2	16	25.8	31	50
Improved a bit	9	14.5	15	24.2	24	38.7
Still the same						

**Source:** Fieldwork (2019)

With the corresponding number of years served by lecturers as shown in Table 4.6 (67.7%) have 6-10 years working experience 16 (25.8%) 1-5 years working experience and 4 (6.5%) 11-15 years working experience, they were further probed to know the progress or otherwise of their computer knowledge. 7 (11.3%) said they have extremely

improved in their knowledge in ICT, 31 (50%) have Improved, and 24 (38.7%) have Improved a bit in their knowledge in ICT as shown in Table 4.8.

**Table 4.9: Lecturers Level of Participation in ICT Trainings**

Rating	UDS		TaTU		Total	
	Frequency	Percentage%	Frequency	Percentage%	Frequency	Percentage%
In all modules						
Few of the modules	24	38.7	30	48.1	54	87.1
Never	8	12.9			8	12.9

**Source:** Fieldwork (2019)

To know their level of participation in ICT trainings that took place in the institutions, lecturers were asked to indicate the number of modules they participated in. Out of the 62 lecturer respondents, majority 54 (87%) have attended few ICT training modules organized in their institution either by the ICT directorate, the Library department or any other department and 8 (13%) said they have never attended any of such trainings. These are illustrated in Table 4.9. The findings of the study indicates low patronage of ICT trainings by lecturers.

**Table 4.10: Students Level of ICT Knowledge at Admission**

Rating	UDS		TaTU		Total	
	Frequency	Percentage%	Frequency	Percentage%	Frequency	Percentage%
Basic	41	8.1	44	8.6	85	16.7
Average	91	17.9	55	10.8	146	28.7
Good	90	17.7	58	11.4	148	29.1
Very good	37	7.3	62	12.2	99	19.5

**Source:** Fieldwork (2019)

From the students' survey, students were asked if they had any computer knowledge before being admitted into the university and how they will rate their knowledge in computer. Out of 508 student respondents, 480 (94.5%) responded Yes to having computer knowledge before coming to the university while the remaining 28 (5.5%) said No. Out of the 480 who responded Yes, 99 (19.5%) were very good with ICT, 148 (29.1%) were good, 146 (28.7%) were average and 85 (16.7%) had a basic knowledge in ICT as shown in Table 4.10

**Table 4.11: Students Current Level of ICT knowledge**

Rating	UDS		TaTU		Total	
	Frequency	Percentage%	Frequency	Percentage%	Frequency	Percentage%
Extremely improved	18	3.5	30	5.9	48	9.4
Improved	76	15.0	89	17.5	165	32.5
Improved a bit	139	27.4	94	18.5	233	45.9
Still the same	33	6.5	23	4.5	56	11.0

**Source:** Fieldwork (2019)

Throughout their stay in the university till final year 48 (9.4%) said they have extremely improved, 165 (32.5%) have Improved, 233 (45.9%) have Improved a bit and 56 (11%) said their knowledge in ICT is still the same as the time they came as shown in Table 4.11

**Table 4.12: Students Level of Participation in ICT Trainings**

Rating	UDS		TaTU		Total	
	Frequency	Percentage%	Frequency	Percentage%	Frequency	Percentage%
In all modules	3	0.6	19	4.0	22	4.5
Few of the modules	33	6.8	114	23.5	147	30.3
Never	230	30.7	224	29.9	490	65.5

**Source:** Fieldwork (2019)

To know the level of participation of students in ICT trainings that took place in the institutions, students were asked to indicate the number of modules they participated in. Out of 508 student respondents, majority 490 (65.5%) have never attended any ICT training organized in their institution either by the ICT directorate, the Library department or any other department. 147 (30%) attended few modules and 22 (4.5%) said they attended all. This explains the low rate of improvement in their knowledge of ICT since majority of them have never attended any ICT training in their institutions as shown in Table 4.12

#### *4.2.3.2 Ownership of Computers*

The study enquired to know lecturers and students preparedness to use ICT in their teaching and learning activities by finding out their ownership of computers and the mode of acquisition in order to know the institutional and individual efforts towards the use of computers.

**Table 4.13: Ownership of Computer by Lecturers**

Rating	UDS		TaTU		Total	
	Frequency	Percentage%	Frequency	Percentage%	Frequency	Percentage%
Yes	24	38.7	38	61.3	62	100
No						

**Source:** Fieldwork (2019)

**Table 4.14: Ownership of Computer by Students**

Rating	UDS		TaTU		Total	
	Frequency	Percentage%	Frequency	Percentage%	Frequency	Percentage%
Yes	258	50.8	98	19.3	356	70.1
No	8	1.6	144	28.3	152	29.9

**Source:** Fieldwork (2019)

Out of 508 student respondents, 356 (70%) said they have their own computer and the remaining 152 (30%) said they don't have their own computer as shown in Table 4.14. 193(54.2%) of those who have their own computer said they acquired it themselves, 163(45.8%) had it through other means such as through parents, relatives, as gift etc and None of them got it from their institution as shown in Table 4.16

**Table 4.15: Mode of Acquisition of Lecturers Computer**

Rating	UDS		TaTU		Total	
	Frequency	Percentage%	Frequency	Percentage%	Frequency	Percentage%
Self	19	27.1	30	42.9	49	70
Institution	5	11.5	8	18.5	13	30
Others						

**Source:** Fieldwork (2019)

**Table 4.16: Mode of Acquisition of Students Computer**

Rating	UDS		TaTU		Total	
	Frequency	Percentage%	Frequency	Percentage%	Frequency	Percentage%
Self	254	38.8	101	15.4	355	54.2
Institution						
Others	12	3.4	141	39.6	163	45.8

**Source:** Fieldwork (2019)

#### *4.2.3.3 Access to computer*

**Table 4.17: Access to Computer by Lecturers**

Rating	UDS		TaTU		Total	
	Frequency	Percentage%	Frequency	Percentage%	Frequency	Percentage%
Very Often	16	25.8	2	3.2	18	29
Often	4	6.5	8	12.9	12	19.4
Not Often	4	6.5	28	45.2	32	51.6
Not at all						

**Source:** Fieldwork (2019)

**Table 4.18: Access to Computer by Students**

Rating	UDS		TaTU		Total	
	Frequency	Percentage%	Frequency	Percentage%	Frequency	Percentage%
Very Often	81	15.9	36	7.1	117	23.0
Often	134	26.1	79	15.5	213	41.9
Not Often	51	10.1	56	11.0	107	21.1
Not at all			71	14.0	71	14.0

**Source:** Fieldwork (2019)

Student respondents were also asked if there are enough computers in their institutions for all students and how often they get access, out of 508 student respondents, majority 331(65.2%) said No and 177 (34.8%) said Yes. This was clear when students were further asked how often they get access to a computer, the study results showed that majority 213(41.9%) often get access to a computer, 117(23%) get access to a computer very often, 107 (21.1%) does not often get access and 71(14%) does not get access at all as shown in Table 4.18

4.2.3.4 Access to Internet

**Table 4.19: Access to the Internet by Lecturers**

Rating	UDS		TaTU		Total	
	Frequency	Percentage%	Frequency	Percentage%	Frequency	Percentage%
Daily	16	25.8	4	6.5	20	32.3
Twice a week	4	6.4	7	11.3	11	17.7
Monthly						
Never						

**Source:** Fieldwork (2019)

Pertaining to the use of the internet services provided by the institutions, lecturers were asked how they get access to the internet. All 62 lecturers affirmed that they have computer laboratory or e-resource center and wifi services in their institution to aid access to the internet.

They were further probed to know how often they get access to the internet. Majority 20 (32.3%) said daily and 4(17.7) said twice in a week as shown in Table 4.19

**Table 4.20: Access to the Internet by Students**

Rating	UDS		TaTU		Total	
	Frequency	Percentage%	Frequency	Percentage%	Frequency	Percentage%
Daily	198	39.0	91	17.9	289	56.9
Twice a week	64	12.6	107	21.1	171	33.7
Monthly	4	0.8	16	3.1	20	3.9
Never			28	5.5	28	5.5

**Source:** Fieldwork (2019)

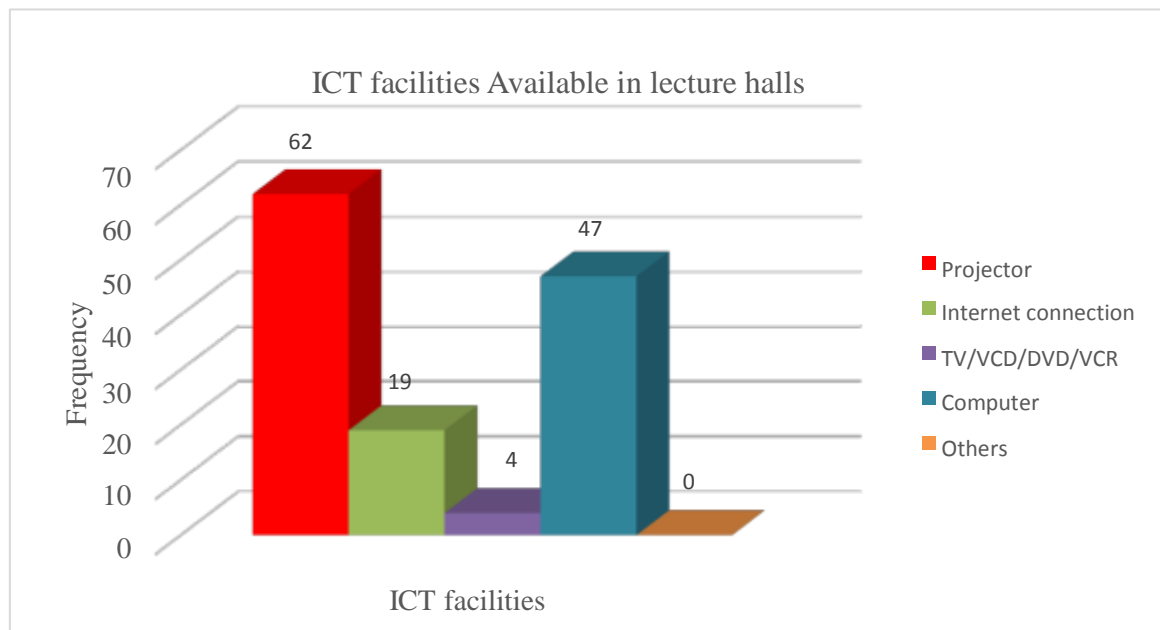
Pertaining to the use of the internet services provided by the institutions, students were also asked how they get access to the internet. Out of the 508 student respondents majority 462(90.9%) confirmed that they have computer laboratory or e-resource center and wifi services in their institutions to aid access to the internet.

They were further probed to know how often they get access to the internet. 289(56.9%) said daily, 171(33.7) said twice in a week, 20(3.9%) said monthly and the remaining 28(5.5%) said they never get access to the internet as shown in Table 4.20

#### 4.2.3.5 ICT Facilities Available in Lecture Halls

This relates to the ICT tools and services that are available for lecturers and students to use in the lecture halls for their teaching and learning activities

**Figure 4.1 A Histogram Showing Lecturer’s Response on the Availability of ICT Facilities in Lecture Halls**

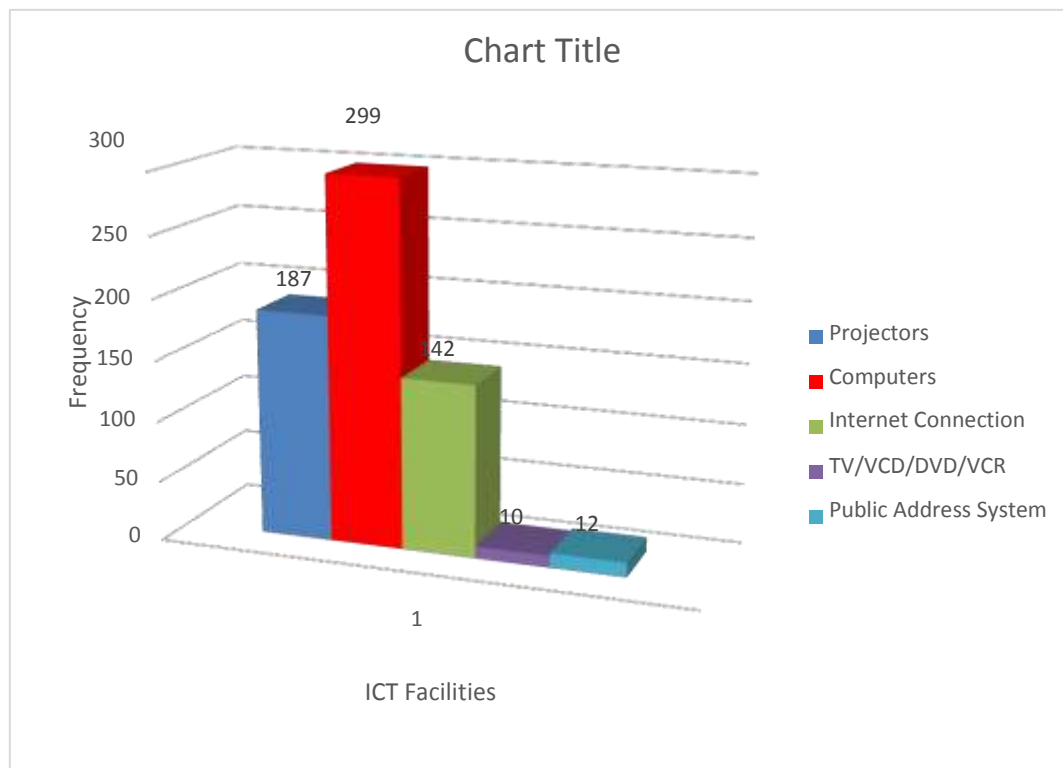


**Source:** Fieldwork (2019)

The researcher enquired to know the ICT facilities made available to them in their lecture halls to support their teaching and learning activities. Out of the 62 lecturer respondents, all 62(100%) affirm the presence of projectors in the lecture halls for lecturing purposes, 47 (63.2%) said there are computers for use in the lecture halls, 19 (72.0%) said there is

internet connectivity, 4 (2.3%) said they have TV/VCD/DVD/VCR for use for lecturing purposes as illustrated in Figure 4.1

**Figure 4.2. A Histogram Showing Students Response on the Availability of ICT Facilities in Lecture Halls.**



**Source:** Fieldwork (2019)

Out of the 508 student respondents, majority 299 (63.2%) said they have computers in their lecture halls, 187 (61.2%) said they have projectors, 142 (72.0%) said they have internet connection, 12 (2.3) said they have PA System and 10 (2.0%) said they have TV/VCD/DVD/VCR as illustrated in Figure 4.2

Pertaining to lecturers' response to whether they use ICT for teaching purposes, All 62(100%) lecturers said „Yes“ in affirmation. Out of 62 lecturers, majority 55 (88.7%) said they enjoy using ICT to teach whereas few 7(11.3%) said they do not enjoy using ICT to teach. Majority of lecturers 56(90.3%) affirm that they use ICT facilities during their lecture periods and 6(9.7%) said „No“ to that. When they were asked if they apply the available ICT facilities during their lecture sections, 55(88.7%) affirmed that they use some of the facilities and 7(11.3%) said they use all the available facilities during lecture.

In the case of students response to whether they use ICT for learning purposes, out of 508 students, 479 (95%) said Yes and 29 (5%) said No. Out of 508 student respondents, majority 488 (96.1%) said they would like their lecturers to use ICT during teaching whereas few 20 (3.9%) said „No“ to that. Majority of student respondents 444 (87.4%) affirm that ICT facilities are used during their lecture periods. When they were asked if their lecturers apply the available ICT facilities, out of the 444 who affirm that ICT facilities are used for lectures, majority 370 (72.8%) said their lecturers apply some during lectures, and 74 (14.6%) said their lecturers apply all.

#### **4.2.4 Lecturers' and Students' Use of ICT for Teaching and Learning**

The second research objective of the study was to examine lecturers and students use of ICT for teaching and learning in UDS and TaTU. In view of this, the researcher examined the use of ICT for teaching and learning by examining use in terms of use of ICT facilities, use of ICT software, use of ICT services and use of learning management system

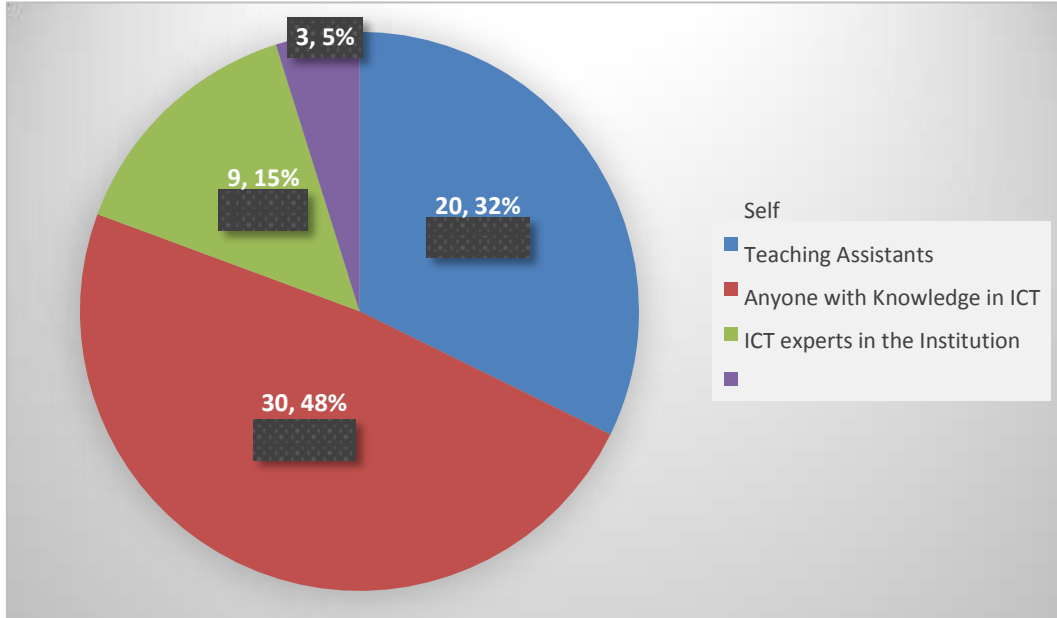
#### ***4.2.4.1 Use of ICT Facilities for Teaching and Learning***

To examine the lecturers and students use of ICT facilities for teaching and learning, the use of the available facilities was examined in terms of ability to use and frequency of use.

##### ***4.2.4.1.1 Ability to use ICT Facilities***

Regarding the ability of lecturers and students to use the available ICT facilities in their teaching and learning activities. Lecturers and students were asked if they use the available facilities and whether they are able to use it themselves, or through the help of other people such as anyone with knowledge in ICT they come across, through the help of teaching assistants or friends etc. as shown in Figure 4.3 and Figure 4.4

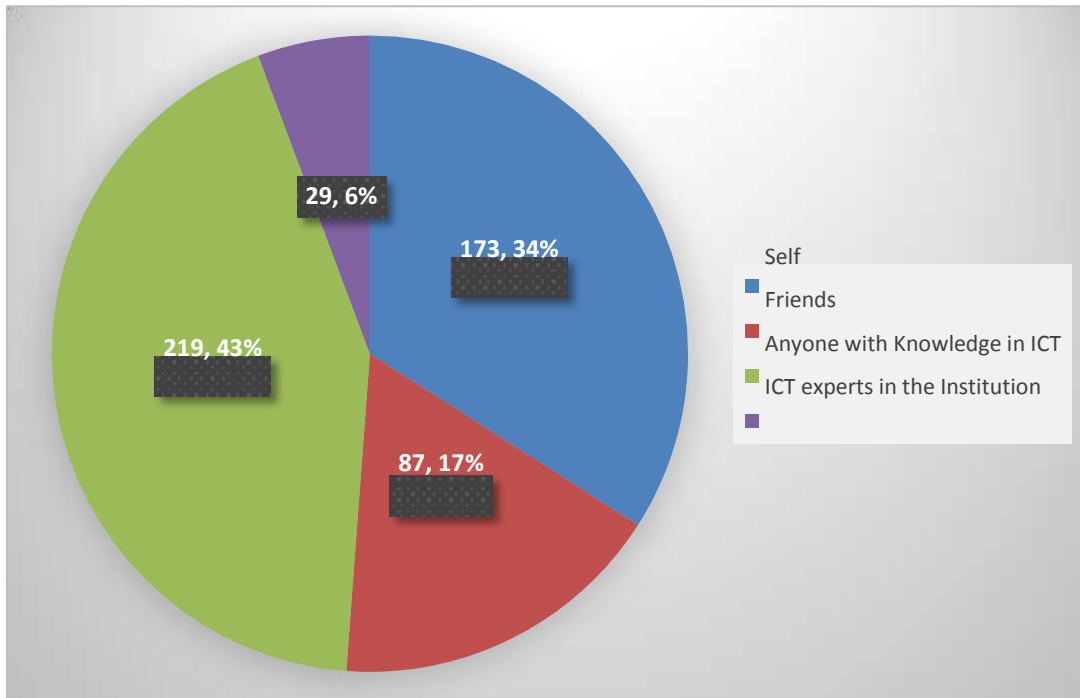
**Figure 4.3. A Pie Chart Showing Lecturers' Ability to Use ICT Facilities**



**Source:** Fieldwork (2019)

In the application of the available ICT facilities such as the computer, projector, internet etc lecturers were asked if they apply them themselves or through the help of somebody, majority 30 (48%) said they apply it through the help of Teaching Assistants, 20 (32%) said they apply the facilities themselves, and 9 (15%) said through the help of anyone with knowledge in ICT and 3 (5%) said through the help of ICT experts in the institution as shown in Figure 4.3

**Figure 4.4. A Pie Chart Showing Students' Ability to Use ICT Facilities**



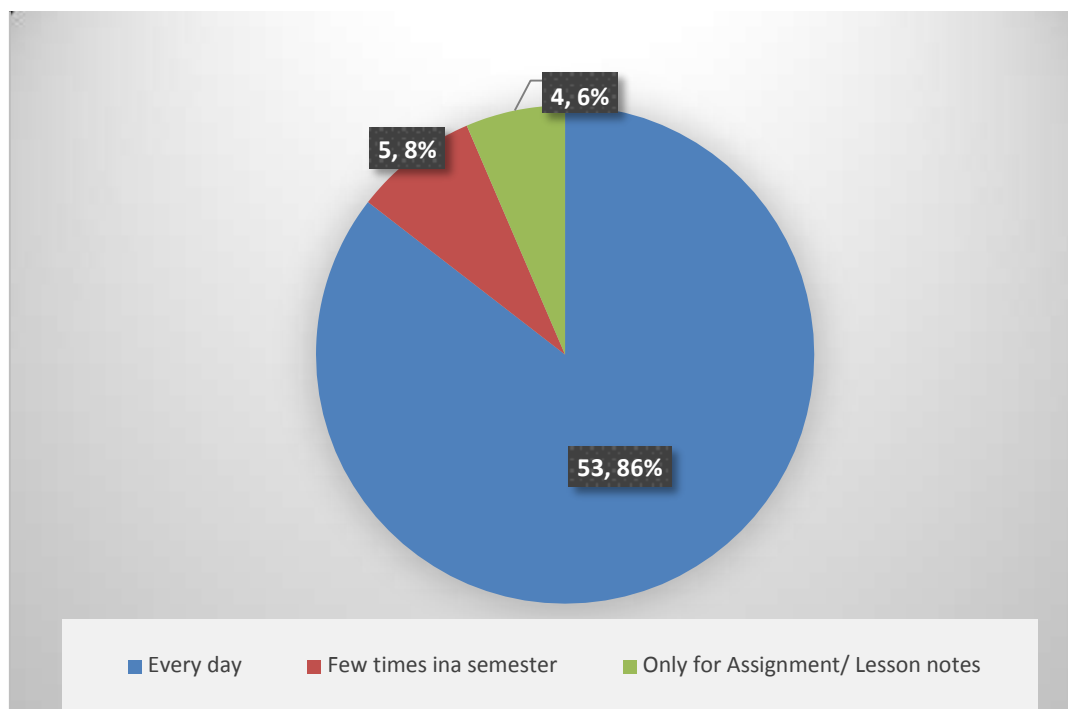
**Source:** Fieldwork (2019)

Students' response to these question about their ability to use ICT facilities is illustrated in Figure 4.4. According to the results from the students survey, 219 (43%) said they apply it through the help of anyone with knowledge in ICT, 173 (34%) said they are able to apply it themselves, 87 (17%) said they apply it through the help of friends and 29 (6%) said through the help of ICT experts in the institution

#### 4.2.4.1.2 Frequency of Use of ICT Facilities

Frequency of use of every tool plays a major role in the individual mastery of the use of that particular tool. To ascertain how frequent lecturers and students use ICT tools in their teaching and learning activities, they were asked the number of times they use the facilities as shown in Figure 4.5 and Figure 4.6.

**Figure 4.5. A pie chart showing Lecturers' Frequency of use of ICT.**

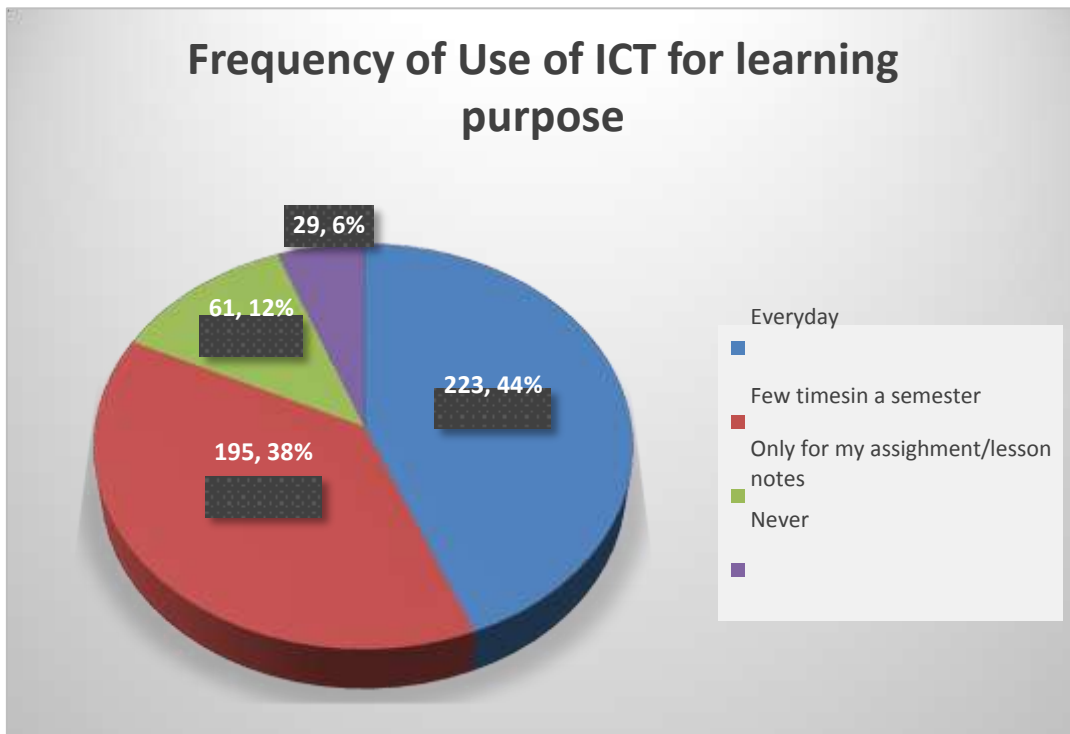


**Source:** Fieldwork (2019)

With regard to frequency of use of ICT for teaching purposes by lecturers, the lecturers were asked to specify how frequent they use the available ICT facilities for teaching

purposes, out of 62 lecturer respondents, majority 53(86%) reported to use ICT/computer for teaching purposes every day, 5 (8%) uses it few times in a semester 4 (6%) uses it only for preparing assignments and lesson notes. This is illustrated in Figure 4.5.

**Figure 4.6. A pie chart showing Students' Frequency of use of ICT/computers.**



**Source:** Fieldwork (2019)

With regard to frequency of use of ICT for learning purposes by students, the students were asked to specify how frequent they use the available ICT facilities for learning purposes, out of 508 student respondents, majority 223 (43.8%) reported to use ICT/computer for learning purposes every day, 195(38.3%) uses it few times in a

Semester 61(12%) uses it only for assignments and lesson notes and 29(5.7%) said they don't use it. This is illustrated in Figure 4.6.

#### 4.2.4.2 Use of ICT Software by Lecturers and Students

To be skilled enough to apply ICT to ones activities require one to have a fair knowledge with the functions and use of basic computer software. In view of this, lecturers and students were asked to indicate how familiar they are with listed ICT software and those that are not listed.

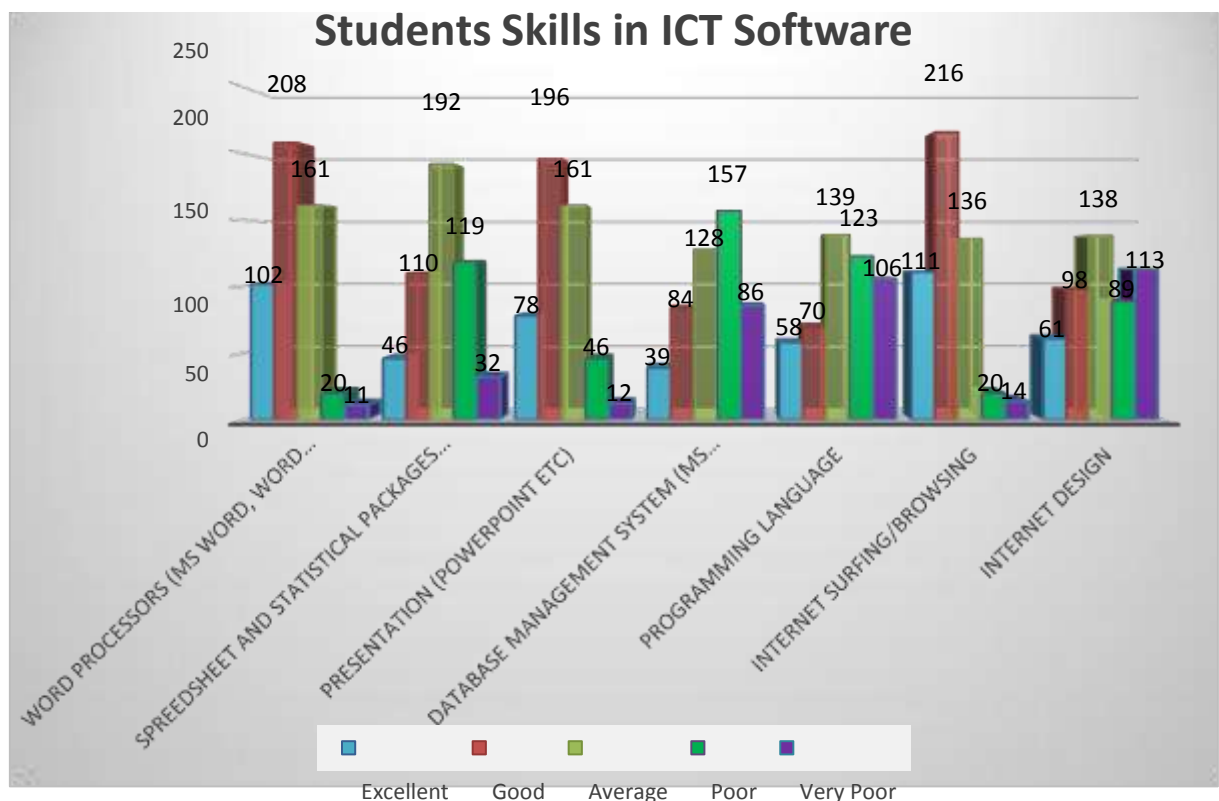
**Table 4.21: Lecturers in ICT software**

<b>Software</b>	<b>Excellent N (%)</b>	<b>Good N (%)</b>	<b>Average N (%)</b>	<b>Poor N (%)</b>	<b>Very Poor N (%)</b>
<b>Word processors (Ms Word, Word Perfect etc.)</b>	12 (19.4)	26 (41.9)	24 (38.7)		
<b>Spreadsheet and statistical packages (Ms Excel,SPSS, Epi-info, etc)</b>	12 (19.4)	7 (11.3)	24 (38.7)	15 (24.2)	4 (6.5)
<b>Presentation (powerpoint etc)</b>	23 (37.1)	39 (62.9)			
<b>Database management system (Ms Access, Oracle etc)</b>	8 (12.9)	4 (6.5)	41 (66.1)	9 (14.5)	
<b>Programming Language</b>	14 (22.6)	8 (12.9)	4 (6.5)	36 (58.1)	
<b>Internet Surfing/ browsing</b>	16 (25.8)	32 (51.6)	7 (11.3)	7 (11.3)	
<b>Internet Design</b>	22 (35.5)	31 (50)	9 (14.5)		

**Source:** Fieldwork (2019)

Regarding software application by lecturers, lecturers were more familiar with Powerpoint application followed by word processing. This result is also in agreement with Chapman (2003) who found that most teachers reported integrating word processing into their teaching. Database application and programming were least integrated into teaching since lecturers are least familiar with them. This result is in agreement with (Albirini, 2006) who found that majority of teachers were not using database application in their teaching due to lack of the required skills to use them.

**Figure 4.7. A Histogram Showing Students Skills in ICT Software.**



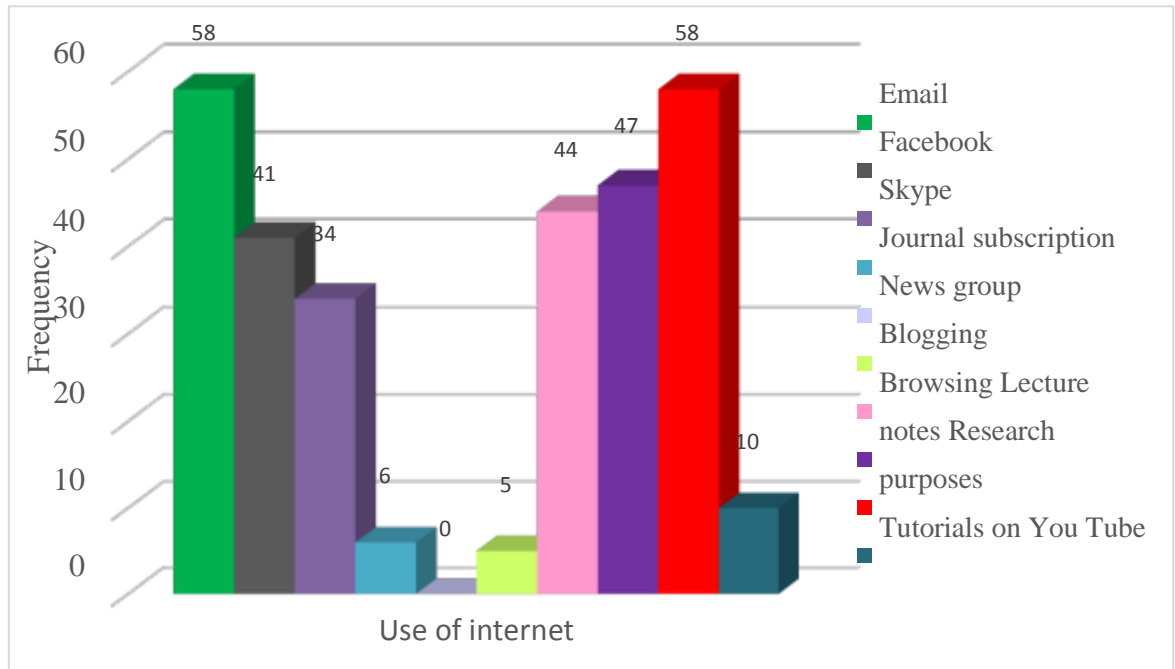
**Source:** Fieldwork (2019)

Students" were asked to rate their ICT skills on a four-point Likert-type scale ranging from "Excellent (1)" to "Very Poor (5)". majority of the respondents were good in word processor (208), internet surfing/browsing (216) and Presentation (Powerpoint etc) (196). On the other hand, majority of the respondents perceived their skill in database as "low" or "Poor". The result is in agreement with Jegede et al. (2007) and Lau and Sim (2008) who found students and teachers to be more proficient in word processing than the other applications. This is illustrated in Figure 4.7

#### ***4.2.4.3 Use of ICT Services by Lecturers and Students***

To examine lecturers and students use of ICT services, mostly characterized by Internet use for teaching and learning. Lecturers and students were asked to indicate purposes for which they use the internet by ticking some uses provided in the question. However they were given the option to state any use they know of which may not be part of the options given.

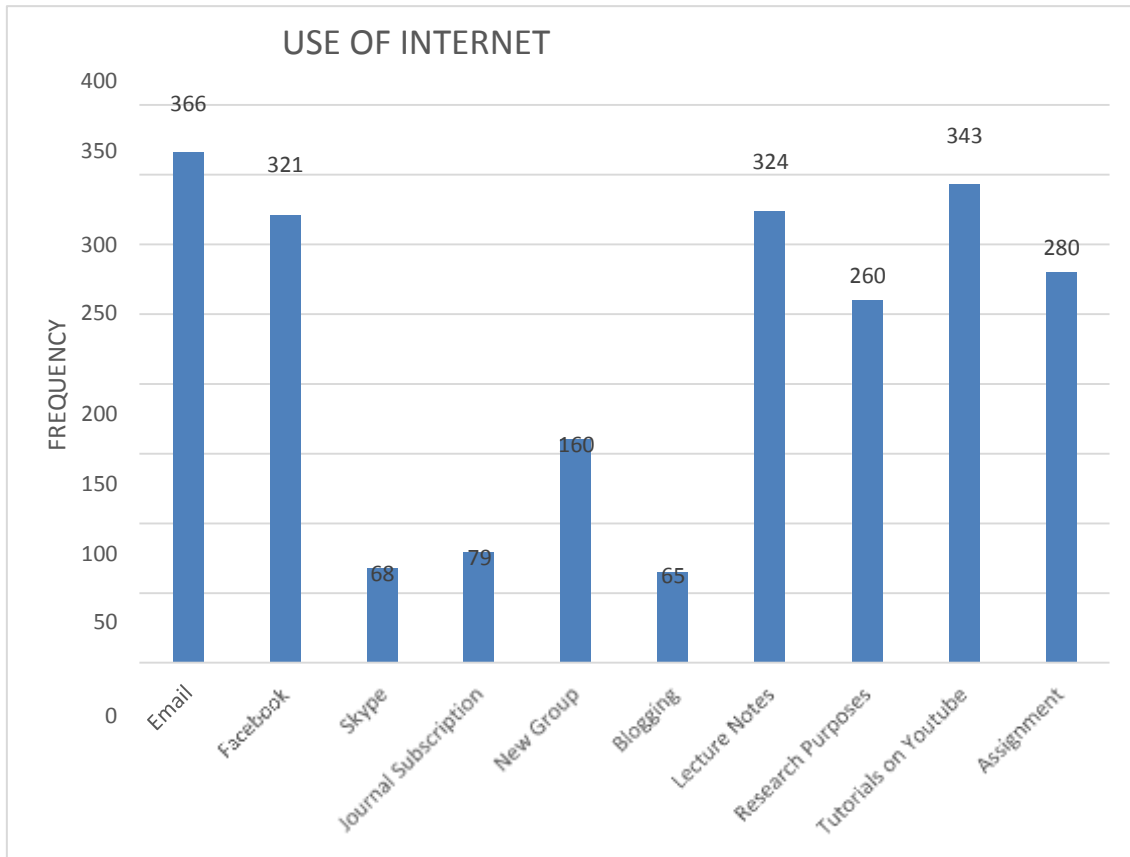
**Figure 4.8 A histogram illustrating Lecturers' Use of the Internet**



**Source:** Fieldwork (2019)

The results from Lecturers survey indicated that lecturers uses the internet for purposes such as Research, Email, Look for lecture notes, Browsing, Facebook, Skype, Tutorials on Youtube, Journal subscription, Blogging in that order as illustrated in Figure 4.8

**Figure 4.9 A Bar Graph Illustrating Students' Use of Internet.**



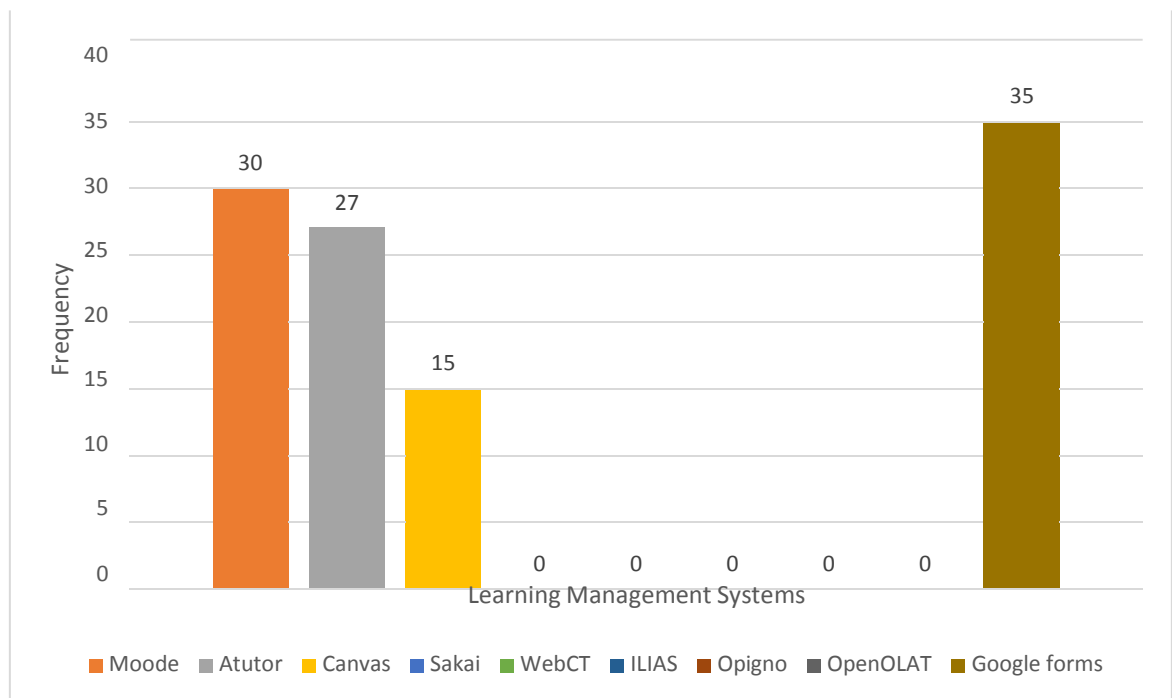
**Source:** Fieldwork (2019)

The results from Students survey indicated that students uses the internet for purposes such as Email, Research, Browsing, Facebook, Tutorials on Youtube, Looking for lecture notes, News group, Journal subscription, Skype, Blogging in that order as illustrated in Figure 4.9

**4.2.4.4 Use of Learning Management System**

To assess lecturers and students pedagogical use of ICT for teaching and learning in UDS and TaTU, the results of the study as shown in Figure 4.10 and Figure 4.11 indicate students and lecturers responses regarding students’ awareness and usage of learning management software and lecturers use of these software for their lecturing activities.

**Figure 4.10 A bar graph showing Lecturers’ use of learning management systems**



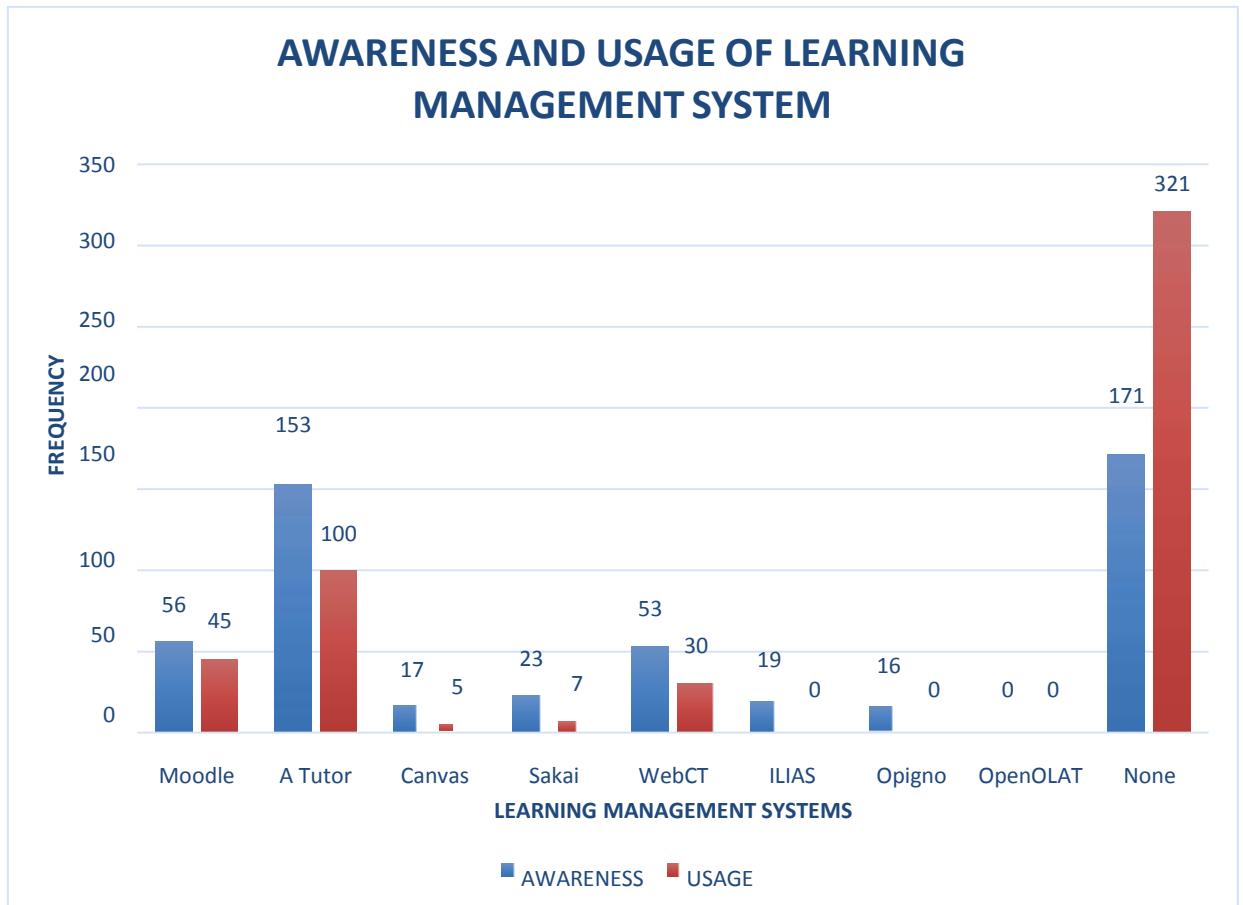
**Source:** Fieldwork (2019)

The results of the lecturer’s survey on the use of learning management system for their teaching activities indicated that out of the 62 lecturers selected for the study, 35 (56.5%)

uses Google forms, 30 (48.3%) uses Moodle, 27 (43.5%) uses A Tutor, and 15 (24.2%) uses Canvas. The rest of the five Learning management systems are not used by any of the 62 lecturers in UDS and TaTU. This is also illustrated in Figure 4.11.

When lecturers were asked if they have any form of online interaction with their students, 39 (62.9%) lecturers said „Yes“ while the remaining 19 (30.6%) said „No“. However, observation revealed that the commonest online interactions that takes place between lecturers and students is interaction through email.

**Figure 4.11 A bar graph showing Students Awareness and Use of learning management systems**



**Source:** Fieldwork (2019)

The results of the study indicates that out of 508 students selected for the study, majority (171) are not aware of any learning management system, 153 knows of „A Tutor“, 56 knows of Moodle, 53 knows of WebCT, 23 knows of Sakai, 19 knows of ILIAS, 17 knows of Canvas and 16 knows of Opigno. However, in terms of Usage, 321 have never used any learning management system, 100 used “A Tutor”, 45 used Moodle, 30 used WebCT, 7 used Sakai and 5 used Canvas. The rest has never been used by any of the respondents. This is illustrated in Figure 4.11.

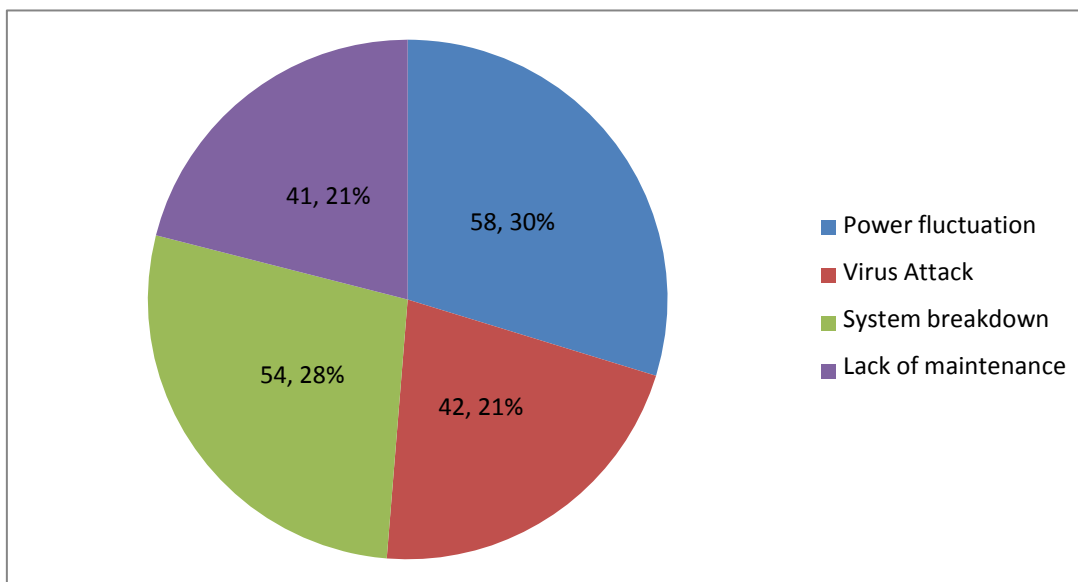
When students were asked if they have any form of online interaction with their lecturers, majority 360 (70.9%) of students said „No“ while the remaining 148 (29.1%) said „Yes“. This is an indication that the communication aspect of ICT and the potential of ICT to solve the limitations of time and space in teaching and learning has not been utilized by lecturers and students of UDS and TaTU.

#### **4.2.5 Challenges to ICT Integration**

The fourth objective of the study was to find out the challenges lecturers and students encounter in using ICT in their teaching and learning activities in UDS and TaTU, the Figures and Tables below illustrates students and lecturers response

#### 4.2.5.1 Challenges to ICT Integration by Lecturers

**Figure 4.12** A pie chart showing Lecturers' view on the Challenges of ICT integration in teaching and learning.



**Source:** Fieldwork (2019)

From the findings of the study, lecturers indicated challenges to effective ICT integration in teaching and learning as follows; power fluctuation 58 (30%), followed by system breakdown 54 (28%), virus attack 42 (21%) and lack of maintenance 41 (21%) as the most disturbing phenomenon hindering the effective integration of ICT in teaching and learning as shown in Figure 4.12.

**Table 4.22: Lecturers View on Challenges to ICT integration in Teaching and Learning.**

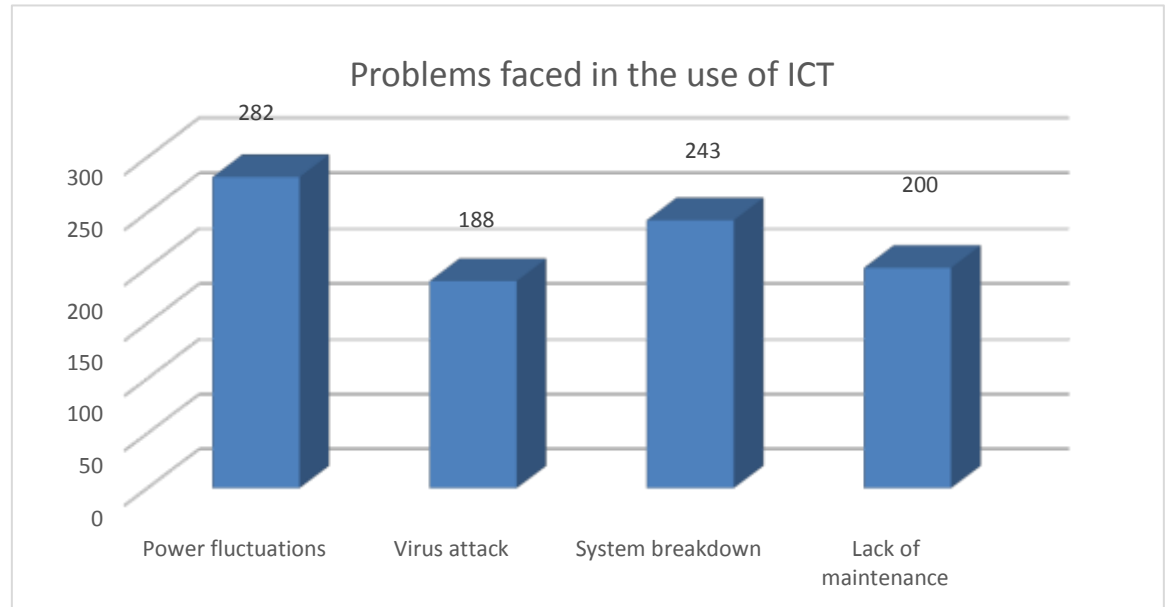
SN	QUESTION	NOT AFFECTED	PARTIALLY AFFECTED	AFFECTED	ADVERSELY AFFECTED
		FREQUENCIES AND PERCENTAGES			
1	Insufficient number of computers		15 24.2%	2 3.2%	41 45.1%
2	Insufficient number of internet connected computers		11 17.7%	6 9.7%	45 66.1%
3	Insufficient Internet bandwidth or speed		15 24.2%	2 3.2%	45 66.1%
4	Insufficient number of interactive whiteboards		27 43.5%	5 8.1%	30 48.4%
5	School computers out of date and/or needing repair	1 1.6%	31 50%	8 12.9%	22 35.5%
6	Lack of adequate skills of teachers	7 11.3%	28 45.2%	20 32.3%	7 11.3%
7	Insufficient technical support for teachers		26 41.9%	29 46.8%	7 11.3%
8	Insufficient pedagogical support for teachers	7 11.3%	25 40.3%	26 41.9%	4 6.5%
9	Lack of adequate content/material for teaching	4 6.5%	19 30.6%	35 56.5%	4 6.5%
10	Too difficult to integrate ICT use into the curriculum	7 11.3%	22 35.5%	15 24.2%	18 29%
11	Lack of pedagogical models on how to use ICT for learning.	1 1.6%	36 58.1%	10 16.1%	15 24.2%
12	Pressure to prepare students for exams and tests	15 24.2%	27 43.5%	19 30.6%	1 1.6%
13	Most teachers are not in favour of the use of ICT at school	21 33.9%	34 54.8%	7 11.3%	
14	No or unclear benefit on the use of ICT for teaching	28 45.2%	33 53.2%	1 1.6%	
15	Using ICT in teaching and learning is not an evaluative goal in our institution	16 25.8%	23 37.1%	18 29%	5 8.1%

**Source:** Fieldwork (2019)

Lecturers were further probed on the challenges to effective ICT integrating in teaching and learning through a four-likert-scale from „Adversely affected“ to „Not affected“. According to the results of the study, out of 62 Lecturer respondents view on ICT integration in teaching and learning 45 (66.1%) are of the view that ICT integration in teaching and learning is adversely affected by Insufficient number of internet connected computers and insufficient internet bandwidth or speed. 35 (56.5%) said it is affected by lack of adequate content/material for teaching. 36 (58.1%) said it is partially affected by lack of pedagogical models on how to use ICT for learning and 28 (45.2%) said it is not affected by the view that there is no or unclear benefit on the use of ICT for teaching. This is shown in Table 4.22.

#### 4.2.5.2 Challenges to ICT Integration by Students

**Figure 4.13 A bar chart showing Students' view on the Challenges of ICT integration in teaching and learning**



**Source:** Fieldwork (2019)

Similar to the lecturers' survey results, students also indicated challenges to effective ICT integration to teaching and learning. According to student respondents, power fluctuation 282 (55.5%), followed by system breakdown 243(47.8%), then lack of maintenance 200 (39.3%) and virus attack 188 (37%) is the most disturbing phenomenon hindering the effective integration of ICT in teaching and learning as shown in Figure 4.13

**Table 4.23: Students View on Challenges to ICT integration in teaching and learning.**

SN	QUESTION	NOT AFFECTED	PARTIALLY AFFECTED	AFFECTED	ADVERSELY AFFECTED
		FREQUENCIES AND PERCENTAGES			
1	Insufficient number of computers	41 8.1%	112 22.0%	256 50.4%	83 16.3%
2	Insufficient number of internet connected computers	55 10.8%	66 13.0%	273 53.7%	102 20.1%
3	Insufficient Internet bandwidth or speed	39 7.7%	104 20.5%	231 45.5 %	122 24.0%
4	Insufficient number of interactive whiteboards	51 10.0%	154 30.3 %	222 43.7 %	69 13.6 %
5	School computers are out of date and/or needing repair	65 12.8%	131 25.8 %	229 45.1 %	71 14.0 %
6	Lack of adequate skills of teachers	58 11.4%	115 22.6 %	218 42.9%	93 18.3%
7	Lack of pedagogical models on how to use ICT for learning	51 10.0%	103 20.3 %	277 54.5 %	60 11.8 %
8	Most teachers are not in favour of the use of ICT at school	124 24.4%	128 25.2 %	143 28.1 %	101 19.9 %
9	No or unclear benefit on the use of ICT for teaching and learning	124 24.4%	97 19.1 %	196 38.6 %	79 15.6 %
10	Using ICT in teaching and learning is not an evaluative goal in our institution	158 31.1%	115 22.6 %	149 29.3 %	74 14.6 %

**Source:** Fieldwork (2019)

Students were further probed on the challenges to effective ICT integrating in teaching and learning through a four-likert-scale from „Adversely affected” to „Not affected”.

According to the results of the study, student respondents’ view on ICT integration in

teaching and learning were as follows; 122 (24%) said ICT integration in teaching and learning is adversely affected by insufficient internet bandwidth or speed. 277 (54.5%) are of the view that, it is affected by lack of pedagogical models on how to use ICT for learning. 154 (30.3%) said it is partially affected by insufficient number of interactive whiteboards and 158 (31.1%) said it is not affected by the view that using ICT in teaching and learning is not an evaluative goal in their institution. This is illustrated in Table 4.23

### **4.3 Qualitative Analyses**

This section consist of a content analyses of interviews of management and ICT personnel of UDS and TaTU. The third objective of the study was to find out the role of management and the ICT directorate of UDS and TaTU in the integration of ICT in teaching and learning. The researcher for that matter, interviewed four management and ICT personnel from UDS and TaTU to solicit their views on this objective. One person from management and one from the ICT directorate of UDS. Then one person from management and one from the ICT directorate of TaTU. Findings was however presented under the following headings based on the third objective of the study.

1. Provision of ICT Infrastructure
2. ICT Training
3. System Maintenance
4. Challenges

### **4.3.1 Provision of ICT Infrastructure and Services**

#### ***4.3.1.1 Role of Management in the Provision of Infrastructure***

The researcher asked what role management play in the integration of ICT in teaching and learning. The response from respondents was as follows:

Mr. A said;

*“The role of management is usually to provide the financial resources for the provision of ICT infrastructure either through internally generated funds, government support or support from stakeholders. However, before that is done a request has to come from the ICT directorate for management to brainstorm during management meetings. When the requested items are approved, then it is forwarded to the finance office for necessary actions.”*

Mr. C added that;

*...“Management plays a vital role in ensuring that whatever policy item we want to implement comes to reality. Management is the decision body and they decide how scarce resources should be distributed to solve the numerous demands of the institution. Management decide on the purchase of ICT equipment through the recommendations of the ICT department and whatever they need to make ICT a reality in the university.”*

#### ***4.3.1.2 Role of ICT Directorate in the Provision of Infrastructure***

The researcher asked what role the ICT directorate play in the integration of ICT in teaching and learning. The response from respondents was as follows:

Mr. B said;

*... “There is ICT policy and ICT steering committee responsible for making ICT related decisions in the institution. The committee meets to decide in accordance to the policy the ICT needs of the university, then the outcome of the steering committee meeting in terms of the ICT needs is sent to management meeting by the ICT director for approval by management. Then when the items are supplied we carry on with the necessary implementations. Usually in our request we add specifications”*

Mr. D also said;

*... “The ICT department has a key role of ensuring that ICT is running in the institution, the equipment are in good condition and there is internet access at least on campus. So day in day out we are called to solve ICT related problems in every department. Before management purchase any ICT equipment the ICT department looks into it to make sure the right equipment is purchased. We sometimes give specifications and ensure that they purchase the right item.”*

#### 4.3.2 ICT Training

The researcher asked what management has done to support lecturers and students in the form of training to use ICT for teaching and learning. Response to this is as follows:

Mr. A said;

*...“Some departments were given laptops for lecturers to use during lecturing including projectors but some have left it in their homes and they are not using it. But some are also using it. The library usually organize workshops and training sections on how they will use electronic resources and how to do some activities on the internet with their computer but most of them don’t attend. They always complain that they don’t get enough time to attend those workshops and also that they don’t have enough time to cover their termly tight schedules. So anytime such workshops are organized, it is difficult to get the lecturers to attend. As for the students they are usually too many for us to organize such workshops for them, but sometimes they get technical assistance from the librarians. They go through some orientation sections from the librarians and they also get support on using computers and browsing the internet from the librarians but the lecturers don’t usually visit the library for such assistance. Sometimes SRC and other students associations do organize ICT related workshops for students to participate”*

Mr. B added;

*...“We are not many and we are the same people solving all the ICT related issues in all*

*the departments so we don't train we just solve some of the problems they encounter while using our services like if there is system breakdown, no internet access, virus attacks, damaged equipment and so on. But they have ICT related courses which some lecturers are handling."*

Mr. D said;

*... "We have lecturers who teach ICT in the institution since we run ICT related courses so they can handle that. Ours is to ensure that hardware and software are functioning properly. The teaching staff also handle things relating to teaching."*

#### **4.3.3 System Maintenance**

The researcher enquired about the role of management and the ICT directorate in relation to system maintenance

Mr. B said;

*... "We are in charge of solving all the ICT related issues in all the departments. We solve some of the problems they encounter while using our services like if there is system breakdown, no internet access, virus attacks, damaged equipment and so on. So we are to make sure that the system is running in every department and on every campus. Management comes in when we have to buy anything to solve any problem. The request for that is sent to management for the necessary action."*

In addition to this, the findings presented earlier reveals that almost all the respondents answered this question while answering other questions. They all agree to the findings that management provide the approvals and the financial support for any request from the ICT directorate whether for new implementations or purchases in relation to maintenance of the system. The ICT directorate is however directly responsible for maintenance, upgrades and repairs of ICT hardware and software in the two universities

#### **4.3.4 Challenges of Management and ICT directorate**

To buttress the findings of the study the researcher also enquired to know some of the challenges of management and the ICT directorate in the performing of their roles towards a successful integration of ICT in teaching and learning. The response is as follows;

Mr. A

*...“Sometimes is not that items requested does not receive approval, but it is usually kept on hold due to financial constraints. The ICT equipment are usually costly, sometimes you will see a very small pin or cable and the amount needed to acquire it can solve another department or two departments problems. So we rather choose to solve those problems first. Other times, because of our multi campus system, an equipment we would have bought once we have to buy for all the campuses. When it happen like that we choose to solve the problem from one campus to the other so other places will definitely experience delays and sometimes total breakdown depending on the problem at hand and the resources available. Government support is usually not enough coupled with*

*internally generated funds to solve all the problems confronting every department. In fact the ICT stuff are too expensive and we are trying our best.”*

Mr. B also said;

*...“Usually ICT infrastructure becomes obsolete and so the need for frequent system upgrades and maintenance to make sure the system is always up to date. These require quite huge sums of money which become a huge burden for management. Also there is too much bureaucracy which causes delays in management providing the needed resources for us to deliver quality services. ICT infrastructure is capital intensive and require huge investment. Another challenge is that usually management lack knowledge about ICT and so they don’t place much importance to ICT issues that should even be handled with urgency. Also the frequent power outage is another issue that always affect our services, but due to our multi campus system it become a very huge financial demand to get a plant for all the campuses in order to stabilize our system. Because of these, instead of moving on to improve and add more services, more money is rather spent on repairs and maintenance of ongoing services, so no improvement”*

Mr. C added that;

*...“Mostly the main challenge is with finance because we cannot use the little we have to provide for only one side when we have the needs of many departments awaiting to be met. So we will definitely spread the little money across so that every department will have at least one or two issues solved. You know ICT equipment are very expensive and the financial support we get from government is not enough. Sometimes the support even delays when there are so many issues to deal with.”*

Mr. D also said;

*...“Our main challenges is finance, so it makes the purchase of ICT equipment to delay when the request is made. Also the administrative procedures are too much and the people involve do complain especially because our items are usually expensive and they seem not to know the significance of what we are requesting for so there is always some kind of reluctance in processing out documents and giving of approval for quick delivery.”*

From the interviews, it was realized that major challenges faced by management and the ICT directorate is financial constraints, and bureaucracy leading to delays.

## **CHAPTER FIVE**

### **DISCUSSION OF FINDINGS**

#### **5.1 Introduction**

This chapter presents the discussion of major findings of the study. The findings of the study were discussed under the following headings based on the objectives of the study:

1. Availability of Teaching and Learning Technologies
2. Lecturers' and Students' Use of ICT for Teaching and Learning
3. Role of Management and ICT Directorate in ICT integration in Teaching and Learning
4. Challenges to ICT Integration

#### **5.2 Availability of Teaching and Learning Technologies**

The first research objective of the study was to examine the availability of teaching and learning technologies in UDS and TaTU. According to Sutherland et al (2004) a good starting point for teachers to embed ICT into their subject teaching is to creatively exploit readily available ICT hardware/software for teaching and learning. In view of this, issues considered were; students and lecturers level of ICT knowledge, ownership of computers by students and lecturers, access to computer, access to the internet, and ICT facilities available for use in the lecture halls.

The findings from the study showed that all the lecturers have their own computers, but the same thing cannot be said about the students though majority of them have their own computers. They were further probed to know the source of their computers and no student mentioned the institution as the source. Only few lecturers mentioned the institution as the source. Observation showed that those computers were bought for departments for lecturers to use during their lecture periods, meaning no individual lecturer owe those computers and so there is limitations to its usage to the advantage of any individual lecturer. This means that both universities are not enjoying from any kind of laptop initiative. Unlike other universities like University of education and University of Cape coast, students are given laptops during admission to encourage the use of ICT for teaching and learning. This initiative is not costly since the cost of the laptops are usually incorporated in their fees, but when students receive it they get so excited about it and get more encouraged to use it.

In addition, the findings from the study indicated that projectors and computers are available in all the lecture halls yet the response on other ICT facilities such as Public Address System and TV, VCD/DVD/VCR was not encouraging. From the findings, it can be concluded that there are inadequate provision of ICT facilities in UDS and TaTU to support teaching and learning.

This is in line with Owusu-Ansah (2015) study on assessing information and communication technology resources in polytechnic libraries in Ghana. The findings of his study showed that majority of respondents sampled from 10 polytechnic libraries did not have ICT facilities in their libraries and so those libraries cannot support modern academic library services that is expected to offer value-added services to users. The

study recommended the acquisition of ICT facilities that provide modern academic library services.

According to Mishra and Koehler (2006), careful interweaving of technological knowledge, pedagogic knowledge and content knowledge will ensure an effective and efficient integration of ICT in teaching and learning. It is impossible to integrate ICT in teaching and learning when the needed ICT facilities for that purpose is unavailable or limited in supply. The availability of technology is therefore paramount to a successful integration since the technology serves as the platform for the attainment of teaching and learning that goes beyond the limitations of time and space. One cannot utilize the potentials of ICT to support teaching and learning if ICT facilities are unavailable to serve the purpose of teaching and learning. In addition to the availability of ICT facilities, strict strategies should be put in place to ensure its maximum usage. This is because the mere provision of ICT facilities without ensuring its usage will not unleash the potentials of the ICT facilities.

### **5.3 Lecturers' and Students' Use of ICT for Teaching and Learning**

The second objective of the study is to examine lecturers' and students' use of ICT for teaching and learning. The Technological, Pedagogic, Content Knowledge Theory (TPAC) was the framework of this study, which looked at the interpretational role of the elements of teaching and learning in order to have a successful transmission of knowledge. According to Mishra and Koehler (2006) the outcome of any teaching and learning activity depends on the perfect combination of content knowledge, pedagogic knowledge and

technological knowledge by the lecturer who is the transmitter of the knowledge. In view of this, the researcher examined the use of ICT in teaching and learning by examining use in terms of use of ICT facilities, use of ICT software, use of ICT services and use of learning management system.

### **5.3.1 Use of ICT Facilities**

The researcher examined the use of ICT facilities in UDS and TaTU in terms of ability to use and frequency of use of the available ICT facilities in UDS and TaTU

#### ***5.3.1.1 Ability to use ICT Facilities***

Regarding the ability of lecturers and students to use the available ICT facilities in their teaching and learning activities, the findings of the study showed that majority of lecturers and students cannot operate their ICT tools themselves. This is an indication that these lecturers and students are unable to integrate ICT effectively.

According to Graham (2011), the ability of the teacher to set up the ICT tools correctly influences how the teacher uses these ICT tools in the teaching process. The outcome of any teaching and learning activity may largely depend on the tools used to undertake the activity and the skills and understanding of the individual user concerning the effective application of the tool. It is therefore necessary that the ICT skills of students and lecturers and their interest in ICT is given prior attention in order to foster their application of ICT to make their teaching and learning effective.

The findings of the study is in line with Obiri-Yeboah et al (2013) study on the factors affecting ICT adoptions in tertiary institutions in Ghana at the KNUST. Findings showed that ICT was not fully integrated into research, teaching and learning. And the major obstacles pointed out were inadequate infrastructure and skills to use ICT. According to Russell et al (2003), teachers should be trained on specific instructional use of technology instead of general use of computers. This is because a person's ability to use a technology determines the extent to which that person is able to utilize the potentials of that technology. It is expedient for management to provide a clear model of integration that will help increase adoption and use.

#### ***5.3.1.2 Frequency of Use of ICT Facilities***

Frequency of use of every tool, plays a major role in the individual mastery of the use of that particular tool. The findings of the study indicated that there was a clear demonstration of ICT use by both students and lecturers in terms of frequency.

It was clear from the findings that students are interested in an ICT integrated teaching. However, though more than half of the lecturers indicated applying ICT during teaching, quite an appreciable number of them do not. Although the study proved that most lecturers were ICT literate, only a few of them rated their skills as being good and only a few of the ICT facilities are applied in their teaching.

From the findings of the study both lecturers and students have interest in an ICT integrated teaching and learning as demonstrated in their ownership of computers and

frequency of use of the internet. This finding is positive to Noor-Ul-Amin (2013) assertion that, the adoption and use of ICTs in education have a positive impact on teaching, learning, and research which can affect the delivery of education and also enable wider access to education. However, though majority use ICT everyday, they frequently use it for other purposes other than academic purposes. This may be due to the reason that they don't know how to use it for their academic gain. There is therefore the need to teach students how to practically use ICT for academic purposes.

### **5.3.2 Use of ICT Software by Lecturers and Students**

To ascertain the familiarity and use of application software in the teaching and learning process, word processing and PowerPoint was the most dominant. In terms of skills rating, both students and lecturers could be said to be efficient in the use of word processors and PowerPoint and a few of them are also averagely skilled in spreadsheet (Microsoft Excel) and SPSS.

This finding confirms the findings of Chapman (2003), he found that most teachers reported integrating word processing and presentation tools into their teaching. Database application and programming were least integrated into teaching since lecturers are least familiar with them. This is partly due to the habit of teachers and students engaging other people other than them when it comes to using ICT in areas they are not familiar with and they do not make any effort to learn from those people. Lecturers should begin to see learning how to apply ICT themselves as part of their professional demands and students should also see it as part of their academic pursuit. This will grow in them the desire and

zeal to understand and use ICT applications by themselves and to learn how to apply it achieve various purposes that will not limit them to only Microsoft word, PowerPoint and excel.

### **5.3.3 Use of ICT Services by Lecturers and Students**

Concerning ICT services, mostly characterized by Internet use for teaching and learning, the findings of the study revealed that a great number of lecturers and students make use of the internet mostly for research purposes, email, lecture notes, browsing, and Facebook. Most students also use it to watch tutorials on YouTube and for their assignments. Observation showed that most of those who use it for Facebook don't even use it for academic purposes and most of them don't use Facebook for video calls which can be utilized for discussions. Though all these uses enhance teaching and learning, observations showed that their use of these services for academic purposes is quit minimal.

This supports the work of Akeriwe et al. (2015) on using mobile technologies for social media based library services in UDS. In their study, respondents were requested to indicate their use or none use of applications and how often they use them in order to ascertain the familiarity of respondents with social media in general considering ICT tools such as iPad, laptop, mobile phone and ICT services such as drop box, Skype, whatsapp etc. It was revealed that they did not use the tools. And the reasons respondents gave was mainly because they did not have the ability to use them. This means awareness is not utilization. Lecturers and students can be aware of the existence and use of certain

ICT facilities but may not know how to practically apply them to their benefit. According to the theory for this study, it is the practical application of technology to teaching and learning with understanding that can facilitate an effective integration of that technology to teaching and learning.

#### **5.3.4 Use of Learning Management System (LMS)**

The study examined use of ICT in teaching and learning in terms of Lecturers' use of learning management system and students' awareness and use of learning management system. The findings of the study showed that, few lecturers apply some learning management systems such as Moodle, A Tutor, Canvas and Google forms for assignments and quizzes and this is evident in the student survey on awareness and use of learning management system where majority of students used none, while majority were also unaware of any of the listed LMS and even others that were not listed, since they were given the opportunity to indicate LMS they know and those they use aside what was listed as shown in Figure 4.8 and Figure 4.9. This is an indication that the communication or interactive aspect of ICT in teaching and learning has not been utilized and also the potential of ICT to solve the limitations of time and space in teaching and learning has not been utilized

This is in line with the findings of Ofosu-Appiah (2017), he asserted that lack of an online interactive page for students at Wisconsin University, makes the communication aspect of ICT not fully utilized. Online interactive page like "Sakai" which is used by the

University of Ghana for instance, give students the opportunity to create forums from which they can brainstorm and be assessed by their lecturers on assignments. Students can have group and individual discussions with their colleagues and lecturers through conference calls, video conferencing, video calls via whatsapp video call, facebook video call, imo etc. this aspect of technological use in teaching and learning helps to overcome the limitation of space. Group discussions and other academic interaction can go on without necessarily being at one particular location.

#### **5.4 Role of Management and ICT Directorate in ICT integration in Teaching and Learning**

The third objective of the study was to find out the role of management and the ICT directorate of UDS and TaTU in the integration of ICT in teaching and learning. From the findings of the study, both universities seem to have almost the same responses with regard to ICT integration in teaching and learning. Both universities indicated that management is responsible for the provision of ICT infrastructure through recommendations of the ICT directorate. They play this roles in conjunction with their policies on ICT. Also, support sometimes comes from government and other stakeholders in terms of donations of equipment and finance. Though it is the heartbeat of management to ensure effective ICT integration since it is in their policy, the result of the interview indicates that inadequate government support has been a major setback. ICT is capital intensive and require huge investments in order to have effective integration. Also in UDS, the multi-campus system run by the university require extra cost in the provision and maintenance of ICT infrastructure for a successful integration of ICT in teaching and learning. The findings

also revealed that low level of technological knowledge of management and bureaucracy results in delays in the provision of ICT needs to facilitate the delivery of ICT services by the ICT directorate.

The findings of Egoeze (2014) study on evaluation of ICT infrastructure and its application in Nigerian universities identified ICT facilities often used in universities as computer, internet, telephone and email services. She found underutilization due to limited supply of this facilities. And concluded that the benefits of ICT infrastructure are enormous and the extents to which it is provided and utilized define the status of every academic institution.

Yee (2000) believes that a leader who implements technology plans and also shares a common vision with the lecturers who are directly involved in its implementation, stimulates them to use technology in their lessons.

### **5.5 Challenges to ICT Integration**

The fourth objective of the study was to identify challenges to ICT integration in teaching and learning in UDS and TaTU.

From the findings of the study, lack of constant electricity supply was found to be the major difficulty encountered by students and lecturers alike in the use of ICT in the two universities. The universities have no generators to support the lecture halls. The few generators are usually for management and administrative use. And these frequent power outages make the use of ICT for teaching and learning very boring and therefore

unattractive. Frequent power fluctuations makes ICT integrated teaching very difficult as lectures sometimes have to be cancelled or end abruptly. Without electricity, ICT is but a dormant tool and its potentials cannot be utilized effectively since the use of ICT equipment and services heavily rely on electricity

Other factors students and lecturers indicated were lack of maintenance. ICT equipment and services are not static; they get obsolete overtime and hence require frequent upgrades and maintenance. When this is not done, it leads to frequent system breakdown and virus attacks

In relation to the above, system breakdown was also identified as a factor that inhibits the use of ICT for teaching and learning. To address this, it is important to have ICT support staff in every department to assist in the integration of ICT in teaching and learning as well as system maintenance. This will encourage lecturers in the application of ICT during teaching as they will acquire skills with the help of the ICT personnel which will help in proper interweaving of their knowledge of content, methods and technology for effective integration of ICT in teaching and learning.

According to Miller (2002), internet bandwidths, user-unfriendly computer application and lack of access to the web are some of the well-known barriers of ICT. This finding to a large extent proves to be true from the findings of the study. Students and lecturers sometimes complain about long hours spent to retrieve information on the internet due to inadequate bandwidth coupled with inadequate number of internet connected computers.

Inadequate internet connected computers, inadequate ICT Infrastructure and lack of pedagogical Models on how to use ICT for teaching and learning are also some challenges identified by the study.

## **CHAPTER SIX**

### **SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS**

#### **6.1 Introduction**

This chapter presents the summary of findings, conclusion and recommendations based on the objectives of the study under the following themes:

1. Summary of findings
2. Conclusion
3. Recommendations

#### **6.2 Summary of Findings**

The purpose of this study was to examine the use of ICT in teaching and learning in UDS and TaTU. The summary of major findings of this study is presented based on the specific objectives of the study.

##### **6.2.1 Availability of Teaching and Learning Technologies**

The first objective of the study was to examine the availability of teaching and learning technologies in UDS and TaTU. the availability of instructional facilities increases the degree of success of teaching and learning and vice versa

The results of the study showed that, projectors, computers and the internet are mainly the ICT facilities available for teaching and learning in the lecture halls. Also, available computers are mostly owned by individuals while projector and internet is provided by the institution.

### **6.2.2 Lecturers and Students Use of ICT for Teaching and Learning**

The second objective of the study was to examine lecturers' and students' use of ICT for teaching and learning in UDS and TaTU. Lecturers' and students' use of ICT for teaching and learning was examined in terms of use of facilities, use of ICT services, use of application software and use of learning management system.

- Regarding the use of ICT facilities by lecturers and students. The findings of the study showed that majority of lecturers cannot operate the available ICT tools themselves, an indication that these lecturers and students are unable to use or integrate ICT effectively in their teaching and learning activities.

This is in line with Buzzard et al (2011) study of the use of digital technologies by students and faculty members. Findings showed that students and instructors are eager to learn and teach with variety of digital technologies. The research highlighted major concerns to the use of technology as disciplinary differences, Meta teaching demands and tool sophistication. This means lecturers and students need more than basic ICT skills in order to effectively integrate ICT in their teaching and learning

activities. This is because, thoughtful interweaving of technology, content, and pedagogical knowledge require specialized training that goes beyond basic ICT skills.

- Regarding the use of ICT software, the findings of the study showed that, both students and lecturers are familiar with word processing software, PowerPoint presentation and excel tools. Database, programming, internet design etc were least integrated. Database application and programming were least integrated into teaching since lecturers are least familiar with them.
  
- Regarding the use of ICT services, the findings of the study showed that, both students and lecturers are familiar with using the internet for research, email, lecture notes, internet surfing/browsing and facebook. Though all these uses enhance teaching and learning, observations showed that their use of these services for academic purposes is quit minimal
  
- On the use of learning management systems, the findings showed that few lecturers apply some learning management systems such as moodle, A tutor, canvas and google forms for assignments and quizzes, majority of students and lecturers are not even aware of the numerous LMS available. An indication that the communication aspect of ICT has not been fully utilized. The lack of an online interactive page for students at the Wisconsin University such as “sakai” which is used by the University of Ghana to create forums from which students can brainstorm and be assessed by their lecturers on assignments makes the communication aspect of ICT not fully utilized.

### **6.2.3 Role of Management and ICT Directorate in the integration of ICT in Teaching and Learning**

The third objective of the study is to solicit information on the role of management and ICT directorate in the integration of ICT for teaching and learning in UDS and TaTU.

The findings of the study showed that management is responsible for the provision of ICT infrastructure and services through recommendations of the ICT directorate.

Findings also revealed that management is very slow at providing ICT needs which was partly attributed to bureaucratic nature of the administrative systems and low level of technological knowledge of management.

Findings also revealed that the role of management and ICT directorate in relation to training is not clearly spelt out. Hence training of lecturers and students is dependent on any department or association that organizes. It will be appropriate for both institutions to have a clearly defined training plan for both lectures and students to equip them to incorporate ICT in their teaching and learning activities. It must be noted that, the level of support management gives in the integration of ICT in the teaching and learning process determines how well the diffusion will take place

### **6.2.4 Challenges to ICT integration in Teaching and Learning**

The fourth objective of this study was to identify challenges to ICT integration in teaching and learning in UDS and TaTU.

The findings of the study identified challenges to ICT integration in teaching and learning to include; power fluctuations, system breakdown, lack of maintenance, virus attack among other factors the study also identified factors such as low internet bandwidth, inadequate ICT facilities, lack of pedagogical models on how to use ICT for teaching and learning etc

This is partly attributed to the high cost of setting up ICT in the universities in Ghana including high cost of hardware and software, high cost of setting up of telecommunication networks, high cost of maintenance and repair of infrastructure looks impossible for developing countries. Bingimlas (2009) study on barriers of successful integration of ICT in teaching and learning also confirms this. However, their study did not identified lack of pedagogical models on how to use ICT for teaching and learning which was identified by this study. This is a very important factor since most of the challenges identified in relation to underutilization of available resources is due to the inability of lecturers and students to use them.

### **6.3 Conclusion**

Information and communication technologies (ICT) offer innumerable benefits in enriching the quality and quantity of learning in universities. Despite the prevalent nature of ICT in almost every aspect of human life, they have not been widely integrated into the teaching and learning process in UDS and TaTU. Vigorous integration through vigorous use of ICT facilities and services to its full potential, will not only revolutionize teaching and learning in UDS and TaTU, but will also facilitate the development of

lecturers and students' innate scientific inquiry mind and their critical thinking abilities. When available ICT resources are fully utilized it will worth more and greater investments for a higher and greater accomplishment in education.

## **6.4 Recommendations**

Based on the findings of the study the following recommendations could be considered towards an effective integration of ICT in teaching and learning.

### **6.4.1 Training of Lecturers**

From the findings of the study, lecturers should be trained on how to use ICT in their teaching and learning processes to acquire the requisite knowledge and skills in integrating the technology in classrooms. This will provide opportunities for lecturers to support student-centered learning. In addition, training should be provided on the use of other ICT software other than simple word processing and presentations.

Professional development programs should be provided continuously for lecturers to update their ICT knowledge and skills since ICT keeps evolving every day.

Also, courses such as computer supported learning, information literacy and design of teaching materials should be introduced in initial teachers' training schools to increase teacher trainees' level of confidence and perceptions of the use of ICT and how to

interweave their pedagogic content knowledge with that of their technological knowledge.

Finally, lecturers should be provided with adequate technological resources, technical support and administrative support to encourage them to successfully use ICT in the classroom.

#### **6.4.2 Training of Students**

ICT should be an evaluative tool in UDS and TaTU. Hence ICT courses should be incorporated into the curriculum to equip students with technological knowledge right from school so that before they come out of school they are fully equip to apply these technological knowledge to solve every life issue.

Students are also encouraged to attend workshops or join online teacher support sites/chatrooms/newsgroups. Many websites provide valuable information on various technological teaching aids/assistance and videos on how to apply them in teaching and learning for a successful outcome.

Lecturers should also give students more assignments and involve them in activities that will require them to utilize ICT resource frequently. This is because, frequency of use of ICT tools, plays a major role in the individual mastery of the use of that tool in their activities.

### **6.4.3 Provision of Learning Management System**

Online interactive page like “Sakai” should be integrated on the institutions website to be used by lecturers and students for teaching and learning purposes. This will give students the opportunity to create forums from which they can brainstorm and be assessed by their lecturers on assignments. The use of other learning management software by lecturers and students should be encouraged

### **6.4.4 Provision of ICT Infrastructure**

Government attention is required in order to provide these universities with the required ICT infrastructure in order to implement vigorous ICT integration programs for a more improved teaching and learning outcome

It is also recommended that laptop initiatives should be adopted by management of UDS and TaTU to give laptops to Lecturers and students to motivate them to use it in their teaching and learning activities.

Internet bandwidth should be given attention, since low bandwidth make the system slow and the use of ICT for teaching and learning and any other activity very boring. Especially regarding the use of internet. This discourage usage to a very large extent and needs to be given priority.

#### **6.4.5 Regular System Maintenance**

Attention should be given to the maintenance of the few ICT systems in place so that lecturers and students can maximize its usage. If they are not maintained on regular bases, there will be viral attacks and other issues that will result in system breakdown. When this happens the entire operations of the institution would be affected and it will be a complete lost of what has already been invested.

#### **6.4.6 Regular Electricity Supply**

ICT depends heavily on electricity for functionality. There is therefore the need to ensure regular supply of electricity for effective use. Without electricity ICT is but a dormant tool. Therefore it is recommended that generators be provided in all the departments to ensure continuity of operations during power outage.

#### **6.4.7 Sensitisation of Management**

Sensitization exercises in the form of seminars, workshops and forums should be organised on regular bases for management to abreast management with knowledge and issues pertaining to ICT and its growing potentials in order to boost their zeal for vigorous ICT implementation programs in UDS and TaTU, in order to enhance ICT supported teaching and learning and to reap the full benefits of ICT for the entire growth and development of these institutions.

## **6.5 Areas for Further Studies**

The following areas must be further researched into:

- Curriculum provision and its application for ICT integration in teaching and learning in tertiary institutions
- The Role of Policy makers in ICT integration for Teaching and Learning in tertiary institutions
- Awareness and Use of Learning Management Systems towards ICT integration in Teaching and Learning in tertiary institutions.

## REFERENCES

- Abimbade, A. (1996). Principles and practice of educational technology. *Ibadan: International Publishers Limited.*
- Addy, N. A. & Ofori-Boateng, P. (2015). ICT and education: An analysis into Ghana's universities. *International Journal of ICT and Management*, 3(2), 23-28.
- Adekunle A. (1997). Educational opportunity through technology: A comparative analysis of Ghana and Nigeria. *In the annual convention of the Nigeria Association for Educational Media and Technology.*
- Adu-Manu, K. S., Arthur, J. K., & Yeboah, C. (2013). Challenges and opportunities for the implementation of social network technologies (SNTs) in Teaching in universities in Ghana. *International Journal of Computer Science Issues (IJCSI)*, 10(5), 268.
- Agbovi, W.S. (2003). The impact of Information Technology on Students' learning process at Koforidua Secondary School. *(Unpublished Long Essay presented to the Department of Information Studies, University of Ghana, Legon).*
- Agyei, D. D. & Voogt, J. (2011). Exploring the potential of the will, skill, and tool model in Ghana: Predicting prospective and practicing teachers' use of technology. *Computers & Education*, 56(1), 91-100.

- Agyei, D. D., & Voogt, J. (2012). Developing Technological Pedagogical Content Knowledge in pre-service mathematics teachers, through Teacher Design Teams. *Australasian Journal of Educational Technology*, 28, 547–564
- Aina, L. O. (2004). Library and information sciences text for Africa. *Ibadan: Third World Information Services Limited*.
- Akeriwa, M., Penzhorn, C., & Holmner, M. (2015). Using mobile technologies for social media based library services at the University of Development Studies Library, Ghana. *Information Development*, 31(3), 284-293.
- Akuoma, A. K. (2012). A Comparative study of computer literacy in urban and rural primary schools in Rivers State of Nigeria. *computer*, 3(2).
- Albirini, A. (2006). An exploration of the factors associated with the attitudes of high school EFL teachers in Syria toward information and communication technology (*Unpublished dissertation*). *Ohio State University*.
- Alreck, P. L. & Seitel R. B. (1995). The Survey research handbook. USA, Richard D., Irwin Inc.
- Alvi, M. (2016). A manual for selecting sampling techniques in research.
- Amega-Selorm, C., & Awotwi, J. (2010, October). Free and open source software (FOSS): it's significance or otherwise to the e-governance process in Ghana. In *Proceedings of the 4th International Conference on Theory and Practice of Electronic Governance* (pp. 91-95). ACM.

- Amoafu, E. A. (2011). The use of ICT as a tool for teaching and learning in the University of Ghana. *Unpublished M. Phil thesis*.
- Ankrah, E. (2014). The impact of information systems strategy on Bank performance in Ghana. (*Unpublished doctoral thesis*). Department of Information Studies, University of Ghana, Legon.
- APF (2008). ICT in Africa: Boosting Economic Growth and Poverty Reduction. Available at: <http://www.africapartnershipforum.org/dataoecd/46/51/40314752.pdf>
- Appiah-Kubi, K. (2002). IT and National Development. *Daily Graphic Friday March 15*, p.28.
- Ayoung, A. P. V. (2003). The role of Information Technology in the public education system of Ghana: a case study of the Accra Girls' Secondary School and the Presbyterian Boys' Secondary School. (*Long Essay, Department of Information Studies, University of Ghana, Legon*) pp 36-38.
- Badu, E. E. (1998). Computer Science in Second Cycle School. *Daily Graphic. June*, p.9.
- Bakar, K. A., Ayub, A. F. M., Luan, W. S., & Tarmizi, R. A. (2010). Exploring secondary school students' motivation using technologies in teaching and learning mathematics. *Procedia-Social and Behavioral Sciences*, 2(2), 4650-4654.
- Bayindir, N., & Inan, H. Z. (2009). The educational quality of the technology used in teacher training. *World Applied Science Journal*, 6(6), 855-860.

- Bebell, D., Russell, M., & O'Dwyer, L. (2004). Measuring teachers' technology uses: Why multiple measures are more revealing. *Journal of Research on Technology in Education*, 37(1), 45-63.
- BECTA (2002) Barriers to the use of ICT in teaching from [http://www.becta.org.uk/page\\_documents/research/wtrs\\_barriersinteach.pdf](http://www.becta.org.uk/page_documents/research/wtrs_barriersinteach.pdf).
- BECTA (2004), An exploration of the use of ICT at the Millennium Primary School, Greenwich. Coventry. .
- BECTA. (2015) Harnessing technology: *Schools survey 2008*. Retrieved 20 October 2018 from [http://emergingtechnologies.becta.org.uk/uploaddir/downloads/page\\_documents/research/ht\\_schools\\_survey15\\_analysis.pdf](http://emergingtechnologies.becta.org.uk/uploaddir/downloads/page_documents/research/ht_schools_survey15_analysis.pdf).
- BECTA. (2003). What the research says about ICT and homeschool links. Coventry: Becta. from [http://www.becta.org.uk/page\\_documents/research/ict\\_sm.pdf](http://www.becta.org.uk/page_documents/research/ict_sm.pdf)
- Bingimlas, K. (2009). Barriers to successful integration of ICT in teaching and learning environment: A review of the literature. *Eurasia Journal of Mathematics, Science and Technology Education*, 5(3), 235-245.
- Bradley, M. A., & Harell, M. C. (2009). Data collection Methods: Semi structured interviews and Focus Groups.
- Brophy, J. (1999) Teaching. Educational practices series 1, IBE/UNESCO; *International Academy of Education*

- Brophy, J. (2013). *Motivating students to learn*. Routledge.
- Buabeng-Andoh, C. & Yidana, I. (2015). Teachers' ICT usage in second-cycle institutions in Ghana: A qualitative study. *International Journal of Education and Development using Information and Communication Technology (IJEDICT)*, 11: 2, 104-112.
- Burns, N. & Grove, S. K. (1999). *Understanding Nursing Research*. W.B: Saunders Company.
- Buza, A. D. K., & Mula, M. F. (2017). The role of the Teachers in the integration of ICT in Teaching in Secondary Low Education. *European Journal of Social Science Education and Research*, 4(4), 240-247.
- Buzzard, C., Crittenden, V. L., Crittenden, W. F., & McCarty, P. (2011). The use of digital technologies in the classroom: A teaching and learning perspective. *Journal of Marketing Education*, 33(2), 131-139.
- Carlson, S. & Gaido, C.T. (2002). "Teacher Professional Development in the Use of Technology" [Online]. Available at:  
[http://www.ictinedtoolkit.org/usere/library/tech\\_for\\_ed\\_chapters/08.pdf](http://www.ictinedtoolkit.org/usere/library/tech_for_ed_chapters/08.pdf).
- Chapman, B. (2003). An assessment of business teacher educators' adoption of computer technology (Unpublished dissertation). Virginia Polytechnic Institute and State University.

- Chijioke J. E. (2009). Emerging Trajectories and Sustainability of ICTs in Educational Reforms in Africa: Exploring the Prospects of the Teacher Laptop Policy in South Africa. *Journal of Education for International Development*.
- Chisholm, I. M., & Beckett, C. E. (2003). Teacher preparation for equitable access through the integration of TESOL standards, multiple intelligences and technology. *Technology, Pedagogy and Education*, 12(2), 249-275.
- Christensen, R. (2002). Effects of technology integration education on the attitudes of teachers and students. *Journal of Research on technology in Education*, 34(4), 411-433.
- Colwell (2000)
- Collinson, V. & Cook, T. F. (2007). Organizational Learning – Improving Learning. *Boston: Prentice Hall*.
- Commission of the European Communities. (2001). The eLearning action plan. Designing tomorrow's education. *Brussels: Directorate General for Education and Culture*.
- Creswell, J. W. (2008). Educational research: Planning, conducting, and evaluating quantitative and qualitative research. *Upper Saddle River, N.J: Pearson/Merrill Prentice Hall*.
- Creswell, J. W. (2014). Research Design Qualitative, Quantitative, and Mixed Methods Approaches. *Thousand Oaks, CA: SAGE Publications*.

- Creswell, J. W., Plano, C. V., Gutmann, M. L., & Hanson, W. E. (2003). Advanced mixed methods research designs. *Thousand Oaks*, 209–240.
- Cuban, L. (2001). Oversold and underused: Computers in the classroom. Cambridge, Mass: Harvard University Press.
- Davis, F. D., Bagozzi, R. P. & Warshaw, P. R. (1989). User acceptance of computer technology: A comparison of two theoretical models. *Management Science*, 35(8), 982-1003.
- [http://www.vvenkatesh.com/it/organizations/Theoretical\\_Models.asp#Con=struct\\_defs](http://www.vvenkatesh.com/it/organizations/Theoretical_Models.asp#Con=struct_defs)
- Davis, N. (2003) Technology in teacher education in USA: What makes for sustainable good practice? *Technology, Pedagogy, and Education*, 12 (1), 59-84. [Online]. <http://www.triangle.co.uk/jit/index.htm> [Accessed October 1, 2017]
- Davis, N., Preston, C. & Sahin, I. (2009). ICT teacher training: Evidence for multinivel evaluation from a national initiative. *British Journal of Educational Technology*.
- Davis, N. E. & Tearle, P. (1999). A core curriculum for telematics in teacher training. Teleteaching 98 Conference, Vienna [Online]. <http://www.ex.ac.uk/telematics/T3/corecurr/tteach98.htm> [Accessed November 23, 2016]
- Dean, G. (2013). *Teaching Reading in the Secondary Schools*. David Fulton Publishers.

- Effah, P. (1998). An Address at a Students' Symposium, 14th May. *Nyankpala Campus, UDS, Tamale*. Hawkins (2002)
- Egoeze, F., Misra, S., Akman, I., & Colomo-Palacios, R. (2014). An Evaluation of ICT infrastructure and application in Nigeria universities. *Acta Polytechnica Hungarica*, 11(9), 115-129.
- Emans, B. (2002) Integration of ICT in Education: Guidelines for school Directors and policy makers - IPETCCO Consortium.
- Eze, O. C. (2015). Enhancing the Use of Instructional Facilities in Technical Colleges for Qualitative Skills Acquisition in Nigeria. In *Information and Knowledge Management* (Vol. 5, No. 10, pp. 88-92).
- Ezekoka, G. K. (2007). Evaluation of secondary school teachers' use of ICT for curriculum implementation. *Journal of Women in Academics* 4(1) 210-219.
- Ezekoka, G. K. (2008). A survey of learning resources for the teaching of Education Technology in Nigerian universities, challenges for the 21st century. Proceedings to the 29th annual convention and International conference of the Nigerian Association for Educational Media and Technology (NAEMT)
- Fathima, S. (2013). Challenges of ICT in Teaching Learning Process. *International Journal of Engineering and Science*, 2: 12, 51-54.
- Fraenkel, J. R. & Wallen, N. E. (2000). How to Design and Evaluate Research in Education 4th ed. Boston: McGraw-Hill.

- Fuglestad A. (2011). Challenges teachers face with integrating ICT with an inquiry approach in Mathematics, Retrieved from [http://www.cerme7.univ.rzeszow.pl/WG/15a/CERME7-WG15A-Paper02\\_Fuglestad.pdf](http://www.cerme7.univ.rzeszow.pl/WG/15a/CERME7-WG15A-Paper02_Fuglestad.pdf)
- Ghuri, P. N., & Grønhaug, K. (2005). *Research methods in business studies: A practical guide*. Pearson Education.
- Gleeson, C. A. (2001). Information-Seeking Behavior of Scientists and their Adaptation to Electronic Journals. Available at: [www.ils.unc.edu/MSpapers/2672.pdf](http://www.ils.unc.edu/MSpapers/2672.pdf).
- Graham, C. R. (2011). Theoretical considerations for understanding technological pedagogical content knowledge (TPACK). *Computers & Education*, 57(3), 1953-1960.
- Hajara, I. P. N. & Bukari, M. (2017). Students' Perception of ICTs on Teaching and Learning at Wurishei Community Al-Badah Junior High School, Tamale, Ghana. *Journal of Education, Society and Behavioural Science*, 1-10.
- Hassan, I. (2002) Isoun Challenges African Countries on ICT Policy Implementation Retrieved from: <http://allafrica.com/sustainable/stories/200211180091.html>
- Hengst, M. D. & Sol, H. G. (2001). The impact of information communication technology on interorganisational Coordination: Guidelines from Theory. Available at: <http://inform.nu/Articles/Vol4/v4n4p129-138.pdf>.

- Higgins, S. (2003). Does Ict Improve Learning and Teaching in Schools? *Journal of Science and Technology*, 17(6), 586–594. Retrieved from <http://www.bera.ac.uk/files/reviews/ict-pur-mb-r-f-p-1aug03.pdf>
- Howell, K. (2013). An introduction to the philosophy of methodology. Retrieved from <http://www.amason.co.uk>
- Howell, K. E. (2013). Introduction to the philosophy of methodology. Sage.
- Howie, S. J. (2010). ICT-supported pedagogical policies and practices in South Africa and Chile: emerging economies and realities. *Journal of Computer Assisted Learning*, 26: 507–522. doi: 10.1111/j.1365-2729.2010.00377.x
- Ifebo, P. C. (2005). Integrating information and communication technology in the teaching and learning of science at the primary school level. *Alvan Journal of School of Science*
- Inan, F. A. & Lowther, D. L. (2010). Factors affecting technology integration in K-12 classrooms: A path model. *Educational Technology Research & Development*, 58(2), 137-154
- Jamieson-Proctor, R., Albion, P., Finger, G., Cavanagh, R., Fitzgerald, R., Bond, T., & Grimbeek, P. (2013). Development of the TTF TPACK Survey Instrument. *Australian Educational Computing*, 27(3),26-35.
- Jaway, B. T. Y. (2003) The Possibility of Backing Distance Learning with Information Technology in Ethiopia’s Universities.

- Jegade, P. O., Odusola, O. D., & Ilori, M. O. (2007). Relationships between ICT competence and attitude among Nigerian tertiary institution Lecturers. *Educational Research and Review*, 2(7), 172-175.
- Kaur, A. P. (2011). Pre-Service Science Teachers' Attitudes towards the use of selected ICT tools in Teaching: An Exploratory Study. *Advancing Education Journal*. Retrieved on 03/08/2016 from <http://www.naace.co.uk/1718>.
- Kaweesa, C. (2002) From chalk to ICT: Uganda embraces ICT-supported education strategy from <http://www.iicd.org/articles/IICDnews.import1845>
- Kennah, M. (2016). The use of ICT in the teaching and learning process in secondary schools: a case study of two Cameroonian schools.
- Kennewell, S., Parkinson, J., & Tanner, H. (2000). Developing the ICT-capable School. London: Routledge.
- Kirschner, P. & Wopereis, I. G. (2003). Mindtools for teacher communities: A European perspective. *Technology, Pedagogy and Education*, 12(1), 105-124..
- Kumekpor, K. B., (2002). Research Methods and techniques of Social Research. *Accra: SonLife Press & Services*.
- Kwache, P. Z. (2007). The imperatives of information and communication technology for teachers in Nigeria higher education. *MERLOT Journal of Online learning and Teaching*, 3(4), 359-399.

- Lamb, D. (2016). The Uses of Analysis: Rhetorical Analysis, Article Analysis, and the Literature Review. Academic Writing Tutor. Archived from the original on 23 May 2014. Retrieved 03/08/2018 from <https://web.archive.org/web/20140523035105/http://www.academicwritingtutor.com/uses-analysis-rhetorical-analysis-article-analysis-literature-review/>
- Lau, C. T. & Sim, C. H. (2008). Exploring the extent of ICT adoption among secondary teachers in Malaysia. *International Journal of Computing and IT research*, 2(2), 19-36.
- Laurillard, D. (2007). The pedagogical challenges to collaborative technologies. Available at: [http://www.telearn.org/warehouse/DL\\_CSCL\\_paper\\_FinalWithFigs\\_%28001940v1%29.pdf](http://www.telearn.org/warehouse/DL_CSCL_paper_FinalWithFigs_%28001940v1%29.pdf).
- Laurillard, D. (2002). Rethinking university teaching. A conversational framework for the effective use of learning technologies. *2nd ed. London: RoutledgeFalmer*.
- Lemke, C. & Coughlin, E. C. (1998). Technology in American Schools. Seven dimensions for gauging progress. Milken Exchange Commission on Educational Technology. [Online]. <http://www.mff.org/pubs/ME158.pdf> [Accessed October 1, 2017]
- Liverpool, L. S. O. (2002). Information and communication technology in teacher education. In A. M. Mohammed & A. Umar (Eds.) *Teacher education in Nigeria: past, present and future. Kaduna: National Teachers Institute*.

- Ireck, P. & Settle, R. B. (1985). *The survey research handbook*. Illinois; IRWIN
- Middleton, J. A., Toluk, Z., De Silva, T., & Mitchell, W. (2001). The Emergence of Quotient Understandings in a Fifth-Grade Classroom: A Classroom Teaching Experiment.
- Miller, M. D., & Corley, K. (2002). The effect of e-mail messages on student participation in the asynchronous online-course: A research note. *Online Journal of Distance Learning Education*. Available online <http://www.westga.edu/~distance/ojdla/fall43/miller43.html>
- Ministry of Education (2009). ICT in education policy. Retrieved on 27/12/2012 from [http://moe.gov.gh/docs/ICT in Education policy\\_NOV\\_2008.pdf](http://moe.gov.gh/docs/ICT%20in%20Education%20policy_NOV_2008.pdf)
- Mishra, P. & Koehler, M. J. (2006). Technological Pedagogical Content Knowledge: A Framework for Teacher Knowledge. *Teachers College Record*, 108:6, 1017–1054.
- Mishra, P. & Koehler, M. J. (2008). Technological Pedagogical and Content Knowledge Framework. *Journal of Education for International Development*, 4:2, 1018-1054.
- Moursund, D. & Bielefeldt, T. (1999). Will new teachers be prepared to teach in a digital age? A national survey on information technology in teacher education.

- Moya, M., Musumba, I. R. E. N. E., & Akodo, R. (2011). Management attitude, support and integration of information communication technologies in higher education in Uganda. *Journal of Modern Accounting and Auditing, USA, ISSN: 1548-6583*.
- Mugo, F. W. (2002). Sampling in research. Available at:  
[http://www.uonbi.ac.ke/openscholar/fridah\\_mugo/files/mugo02sampling.pdf](http://www.uonbi.ac.ke/openscholar/fridah_mugo/files/mugo02sampling.pdf)
- Muwonge, J. (2005). Why doesn't Makerere ever make use of the Computer Department? *The New Vision* Pg 9.
- Neuman, W. L. (2006). *Social research methods: Qualitative and Quantitative Approaches*. 6<sup>th</sup> Ed. Boston: Pearson Education, Inc. Pp. 224-225, 241, 287-288
- Noor-Ul-Amin, S. (2013). An Effective use of ICT for Education and Learning by Drawing on Worldwide Knowledge, Research, and Experience: ICT as a Change Agent for Education. *Department Of Education University of Kashmir, 1(1)*, 1–13. <https://doi.org/6th August>
- Obiri-Yeboah, K., Kwarteng, K. O., & Kyere-Djan, R. (2013). Factors affecting ICT adoption in tertiary institutions in Ghana: A case of Kwame Nkrumah University of Science and Technology. In *Information and Knowledge Management* (Vol. 3, No. 6, pp. 13-21).
- OECD (2010), *OECD Information Technology Outlook 2010*, OECD Publishing, Paris. DOI: [http://dx.doi.org/10.1787/it\\_outlook-2010-en](http://dx.doi.org/10.1787/it_outlook-2010-en)

- Ofori-Appiah, Justice. (2017). The Use of ICT in Teaching and Learning at the Wisconsin International University College. *Unpublished M. Phil thesis.*
- Onuma, N. (2006). Utilization of ICT in Schools. In *A Paper presented at NAEAP Conference. Enugu.*
- Osei-Akoto, A.A.A. (2010). Enhancing quality Education in Ghana through ICT. Retrieved on 15/07/2016 from [www.unescoghana.org](http://www.unescoghana.org).
- Owusu-Ansah, C. M., & Adjei, K. O. K. (2015). Assessing Information and Communication Technology (ICT) Resources in Polytechnic Libraries in Ghana.
- Oxfam Educational Report, (2008). A review of good practice in ICT and Special Education needs in Africa.
- Passey, D. (2002). ICT and School Management A Review of Selected Literature
- Robinson, W. I. (2003). External and internal factors which predict teachers' computer usage in K12 classrooms. *Detroit, MI: Wayne State University.*
- Rogers, R. W. (1983). Cognitive and psychological processes in fear appeals and attitude change: A revised theory of protection motivation. *Social psychophysiology: A sourcebook*, 153-176.
- Rogers, R. W. (1985). Attitude change and information integration in fear appeals. *Psychological Reports*, 56(1), 179-182.

- Russell, M., Bebell, D., O'Dwyer, L. and O'Connor, K. (2003). Examining teacher technology use: Implications for preservice and inservice teacher preparation. *Journal of Teacher Education*, 54(4), 297-310.
- Saret, L. (2001) Programming Logic for Business, 4<sup>th</sup> Ed. New York: McGraw-Hill/Irwin.
- Schulman, L. S. (1986). Those who understand: Knowledge growth in teaching. *Educational Researcher*, 15(2), 4-14.
- Sey, Jacob. (2013). Access to and use of ICT Infrastructure in Teaching and Learning: A comparative study of rural and urban public Junior High Schools in the Ga South Municipality. *Unpublished M. Phil thesis*
- Smith, A. (1998). Accelerated learning in practice. *New Educational Press Limited. Stafford.*
- Snoeyink, R. & Ertmer, P. A. (2001). Thrust into technology: How veteran teachers respond. *Journal of Educational Technology Systems*, 30(1), 85-111.
- Sutherland, R., Armstrong, V., Barnes, S., Brawn, R., Breeze, N., Gall, M., Mathewman, S., Olivaro, F., Taylor, A., Triggs, P., Wishart, J., and John, P. (2004) Transforming Teaching and Learning: Embedding ICT into everyday classroom practices. *Journal of computer Assisted Learning*. Vol. 20.
- Swanson, R. A. (2013). Theory Building in Applied Disciplines. *San Francisco, CA: Berrett-Koehler Publishers.*

Tamale Technical University Official Home - <http://www.tatu.edu.gh>

Taylor, D. (2015). The Literature Review: A Few Tips on Conducting *It*. Retrieved on 03/08/2017 from <http://www.writing.utoronto.ca/advice/specific-types-of-writing/literature-review>.

The American Association for the Advancement of Science, (1990). Effective Learning and Teaching. Available at:  
<http://www.project2061.org/publications/sfaa/online/sfaatoc.htm>.

Tilbury, D. (2011). Education for sustainable development: an expert review of processes and learning, Paris, UNESCO. Available at:  
[unesdoc.unesco.org/images/0019/001914/191442e.pdf](http://unesdoc.unesco.org/images/0019/001914/191442e.pdf).

Tinio, V. L. (2003). ICT in education. Available at:  
[www.apdip.net/publications/iespprimers/eprimer-edu.pdf](http://www.apdip.net/publications/iespprimers/eprimer-edu.pdf).

Turban, E., Aronson, J. E., & Liang, T. P. (2005). Decision Support System and Intelligent System. *Indiana: Pearsan Hall Universitas Indiana*.

Tusubira, F. (2005) Supporting University ICT Developments: The Makerere University Experience from [http://www.codesria.org/Links/Publications/ad1\\_05/tusubira.pdf](http://www.codesria.org/Links/Publications/ad1_05/tusubira.pdf)

Ukwungwu, J. O. (2004). Integrating ICT in curriculum for human resource development. *Nigerian Journal of Curriculum Studies*.

UNESCO (2002). Information and Communication Technology in Education—A Curriculum for Schools and Programme for Teacher Development. Paris: UNESCO.

UNESCO (2003). Communiqué of the ministerial roundtable on „Towards Knowledge Societies’. Paris: UNESCO.

University for Development Studies Official Home - <http://www.uds.edu.gh>

University of Texas (2007) Learning Technology Center. Available at:

<http://www.edb.utexas.edu/education/centers/Itc/about/research/previous/onlineCourses/>

van Braak, J., Tondeur, J., & Valcke, M. (2004). Explaining different types of computer use among primary school teachers. *European Journal of Psychology of Education*.

Walberg, H. J. & Paik, S. J. (2000). Effective educational practices. Available at:

<http://unesdoc.unesco.org/images/0012/001254/125452e.pdf>

Wals, A. E. J. (2009) Review of Contexts and Structures for Education for Sustainable Development. Paris: UNESCO. Available at:

<http://unesdoc.unesco.org/images/0018/001849/184944e.pdf>.

Wilmore, D. & Betz, M. (2000) Information Technology and schools: the principal’s role

Retrieved from: [http://www.ifets.info/journals/3\\_4/discuss\\_october2000.html](http://www.ifets.info/journals/3_4/discuss_october2000.html)

Yee, D. L. (2000). Images of school principals' information and communication technology leadership. *Technology, Pedagogy and Education*, 9(3), 287-302.

Yusufu, M. O. (2005). Information and Communications technologies and education: analyzing the Nigerian National policy on Information Technology. *International Education Journal* 6(3) 316-321.

**APPENDICES**

**APPENDIX I: QUESTIONNAIRE FOR LECTURERS**

UNIVERSITY OF GHANA, LEGON

DEPARTMENT OF INFORMATION STUDIES

Dear Sir/Madam,

I am investigating on **ICT application in Teaching and Learning in Tertiary institutions: A Study of University for Development Studies and Tamale Technical University**, in order to write my thesis for an M.Phil degree. I will entreat you to spare some moment completing the questions to help me achieve this objective. Please be assured that all responses will be treated confidentially.

Please answer the questions by ticking or providing an appropriate answer.

**PART I**

**DEMOGRAPHIC DATA**

1. Gender      a. Male [ ]                      b. Female[ ]
2. Age    a. 20 – 29[ ]    b. 30 – 39[ ]    c. 40 – 49[ ]    d. 50 and above [ ]
3. Name of Institution .....
4. Number of years as instructor.....

**PART II**

**COMPUTER KNOWLEDGE**

5. Did you have any computer knowledge before becoming a Lecturer?  
a. Yes [ ]                      b. No [ ]
6. If yes how will you rate your computer knowledge then?  
a. Basic [ ]                      b. Average [ ]                      c. Good [ ]                      d. Very good [ ]
7. How will you rate your computer knowledge now?  
a. Still the same                      [ ]  
b. Improved a bit                      [ ]  
c. Improved                      [ ]  
d. Extremely Improved                      [ ]
8. Have you ever participated in any ICT training organised by any department in your institution?  
a. In all Modules [ ]                      b. Few of the modules [ ]                      c. Never [ ]

**PART III**

**AVAILABILITY OF TEACHING AND LEARNING TECHNOLOGIES**

9. Do you have a computer of your own?  
a. Yes [ ]                      b. No [ ]
10. If yes, Did you acquire it yourself or by the institution  
a. Self                      [ ]  
b. Institution                      [ ]  
c. Others (Please specify).....



16. How familiar/good are you with the following frequently used software

Softwares	Excellent	Good	Average	Poor	Very Poor
Word processors (Ms Word, Word Perfect etc.)					
Spreadsheet and statistical packages (Ms Excel, SPSS, Epi-info, etc)					
Presentation (powerpoint etc)					
Database management system (Ms Access, Oracle etc)					
Programming Language					
Internet Surfing/browsing					
Internet Design					

17. Do you enjoy using ICT to teach?

- a. Yes [ ]    b. No [ ]

18. Do you use ICT facilities in your lecture

- a. Yes [ ]    b. No [ ]

19. If yes, Please indicate if the following ICT facilities are available in your lecture halls

- a. Computers [ ]  
 b. Projectors [ ]  
 c. Internet Connection [ ]  
 d. TV/VCD/DVD/VCR [ ]  
 e. Others (Please specify) [ ]

20. Do you apply any of the above facilities during teaching

- a. Some of them [ ]  
 b. All of them [ ]  
 c. None of them [ ]

21. In the application of the facilities in question 19 above, do you operate it yourself or through the help of someone?
- a. Self [ ]
  - b. Teaching Assistant [ ]
  - c. Anyone with knowledge in ICT [ ]
  - d. ICT experts in the institution [ ]

#### **PART IV**

#### **ICT INTEGRATION IN TEACHING AND LEARNING**

22. Do you use the internet to access information concerning your course
- a. Yes [ ]
  - b. No [ ]
23. How often do you use the internet
- a. Daily [ ]
  - b. Twice a week [ ]
  - c. Monthly [ ]
  - d. Never [ ]
24. Do you give assignments that require the use of ICT?
- a. Yes [ ]
  - b. No [ ]
25. Do you have any form of online interaction with your students?
- a. Yes [ ]
  - b. No [ ]
26. If yes, please indicate .....

27. What other purposes do you use the internet for?

- a. Email [ ]
- b. Facebook [ ]
- c. Skype [ ]
- d. Journal subscription [ ]
- e. News group [ ]
- f. Blogging [ ]
- g. Browsing [ ]
- h. Look for lecture notes [ ]
- i. Research purposes [ ]
- j. Others (please specify) [ ]

28. What learning management system do you use for teaching and learning in your institution?

- a. Moodle. [ ]
- b. ATutor [ ]
- c. Canvas [ ]
- d. Sakai [ ]
- e. WebCT [ ]
- f. ILIAS [ ]
- g. Opigno [ ]
- h. OpenOLAT [ ]
- i. Others (please specify) .....

## **PART V**

### **CHALLENGES TO ICT INTEGRATION IN TEACHING AND LEARNING**

29. What are some of the problems you face in the use of ICT during teaching and learning?

- a. Power fluctuation [ ]
- b. Virus attack [ ]
- c. System breakdown [ ]
- d. Lack of Maintenance [ ]
- e. Low internet speed [ ]
- e. Others (please specify).....

30. Is the use of ICT in teaching and learning adversely affected by the following?

	Not Affected	Partially Affected	Affected	Adversely Affected
Insufficient number of computers				
Insufficient number of internet connected computers				
Insufficient Internet bandwidth or speed				
Insufficient number of interactive whiteboards				
School computers out of date and/or needing repair				
Lack of adequate skills of teachers				
Insufficient technical support for teachers				
Insufficient pedagogical support for teachers				

Lack of adequate content/material for teaching				
Too difficult to integrate ICT use into the curriculum				
Lack of pedagogical models on how to use ICT for learning.				
Pressure to prepare students for exams and tests				
Most teachers are not in favour of the use of ICT at school				
No or unclear benefit on the use of ICT for teaching				
Using ICT in teaching and learning is not an evaluative goal in our institution				

PART VII

31. Any comments or recommendations to ICT integration in teaching and learning.

.....

.....

.....

THANK YOU.

**APPENDIX II: QUESTIONNAIRE FOR STUDENTS**

UNIVERSITY OF GHANA, LEGON

DEPARTMENT OF INFORMATION STUDIES

Dear Sir/Madam,

I am investigating on **ICT application in Teaching and Learning in the Tertiary institution: A Study of University for Development Studies and Tamale Technical University**, in order to write my thesis for an M.Phil degree. I will entreat you to spare some moment completing the questions to help me achieve this objective. Please be assured that all responses will be treated confidentially.

Please answer the questions by ticking or providing an appropriate answer.

**PART I**

**DEMOGRAPHIC DATA**

1. Gender      a. Male [   ]      b. Female[   ]
2. Age      a. 20 – 29 [   ]      b. 30 – 39 [   ]      c. 40 – 49 [   ]      d. 50 and above [   ]
3. Name of Institution      .....

**PART II**

**COMPUTER KNOWLEDGE**

4. Did you have any computer knowledge before coming to the University?  
b. Yes [ ]                      b. No [ ]
5. If yes how will you rate your computer knowledge then?  
b. Basic [ ]                      b. Average [ ]                      c. Good [ ]                      d. Very good [ ]
6. How will you rate your computer knowledge now?  
e. Still the same                      [ ]  
f. Improved a bit                      [ ]  
g. Improved                      [ ]  
h. Extremely Improved                      [ ]
7. Have you ever participated in any ICT training organised by the ICT directorate or the Library?  
b. In all Modules [ ]                      b. Few of the modules [ ]                      c. Never [ ]

**PART III**

**AVAILABILITY OF TEACHING AND LEARNING TECHNOLOGIES**

8. Do you have a computer of your own?  
b. Yes [ ]                      b. No [ ]
9. If yes, did you acquire it yourself or by the institution  
d. Self                      [ ]  
e. Institution                      [ ]  
f. Others (Please specify) .....



15. How familiar/good are you with the following frequently used softwares

Softwares	Excellent	Good	Average	Poor	Very Poor
Word processors (Ms Word, Word Perfect etc.)					
Spreadsheet and statistical packages (Ms Excel, SPSS, Epi-info, etc)					
Presentation (powerpoint etc)					
Database management system (Ms Access, Oracle etc)					
Programming Language					
Internet Surfing/browsing					
Internet Design					

16. Do you like your lecturer to use ICT during teaching?

- b. Yes [ ]    b. No [ ]

17. Are ICT facilities used in your lecture halls

- b. Yes [ ]    b. No [ ]

18. Please indicate if the following ICT facilities are available in your lecture halls

- a. Computers [ ]  
 b. Projectors [ ]  
 c. Internet Connection [ ]  
 d. TV/VCD/DVD/VCR [ ]  
 e. Others (Please specify).....

19. Do your lecturers apply any of the above facilities during teaching

- d. Some of them [ ]  
 e. All of them [ ]

f. None of them [ ]

20. In the application of the facilities in question 18, do you operate the facility yourself or through the help of someone?

e. Self [ ]

f. Friends [ ]

g. Anyone with knowledge in ICT [ ]

h. ICT experts in the institution [ ]

i. Others (please specify) .....

#### **PART IV**

#### **ICT INTEGRATION IN TEACHING AND LEARNING**

21. Do you use the internet to access information concerning your course

b. Yes [ ] b. No [ ]

22. How often do you use the internet

b. Daily [ ] b. Twice a week [ ] c. Monthly [ ] d. Never [ ]

23. Do you have any form of online interaction with your lecturer?

b. Yes [ ] b. No [ ]

24. If yes, please indicate .....

25. What other purposes do you use the internet for?

a. Email [ ]

b. Facebook [ ]

- c. Skype [ ]
- d. Journal subscription [ ]
- e. News group [ ]
- f. Blogging [ ]
- g. Browsing [ ]
- h. Look for lecture notes [ ]
- i. Research purposes [ ]
- j. Tutorials on YouTube [ ]
- k. Others (please specify) [ ]

26. Which of the following learning management systems are you aware of?

- a. Moodle. [ ]
- b. ATutor [ ]
- c. Canvas [ ]
- d. Sakai [ ]
- e. WebCT [ ]
- f. ILIAS [ ]
- g. Opigno [ ]
- h. OpenOLAT [ ]
- i. Others (please specify) .....

27. Which of the above Learning Management Systems is used in your institution?

**PART V**

**CHALLENGES TO ICT INTEGRATION IN TEACHING AND LEARNING**

28. What are some of the problems you face in the use of ICT during Teaching and Learning?

- a. Power fluctuation [ ]
- b. Virus attack [ ]
- c. System breakdown [ ]
- d. Lack of Maintenance [ ]
- e. Others (please specify).....

29. Please indicate from not affected to adversely affected how the use of ICT in teaching and learning is affected by the following?

	<b>Not Affected</b>	<b>Partially Affected</b>	<b>Affected</b>	<b>Adversely Affected</b>
Insufficient number of computers				
Insufficient number of internet connected computers				
Insufficient Internet bandwidth or speed				
Insufficient number of interactive whiteboards				
School computers are out of date and/or needing repair				
Lack of adequate skills of teachers				
Lack of pedagogical models on how to use ICT for learning.				
Most teachers are not in favour of the use of ICT at school				
No or unclear benefit on the use of ICT for teaching and learning				

Using ICT in teaching and learning is not an evaluative goal in our institution				
---	--	--	--	--

**PART VII**

30. Any comment or recommendations to ICT integration in teaching and learning

.....

.....

.....

.....

.....

**THANK YOU.**

### **APPENDIX III: INTERVIEW GUIDE**

#### **MANAGEMENT AND ICT PERSONNEL OF UDS AND TaTU**

1. Introduction of Research Topic to respondent
2. Brief explanation of research purpose and objectives to respondent
3. Reason for the interview explained to respondent
4. Ethical considerations
5. Interview questions
  - What is the role of management /ICT directorate in enhancing the use of ICT in teaching and learning
  - What are some of the challenges that hinder the smooth performance of your roles

**APPENDIX IV: LETTER OF INTRODUCTION**



**UNIVERSITY OF GHANA**  
DEPARTMENT OF INFORMATION STUDIES  
SCHOOL OF INFORMATION AND COMMUNICATION STUDIES

October 18, 2018

Ref. No.:.....

**TO WHOM IT MAY CONCERN**

Dear Sir/Madam,

**INTRODUCTORY LETTER**

I write to introduce to you Ms. Rejoice Akusika Ofori, an M. Phil student of the Department of Information Studies, University of Ghana, Legon.

She is researching on the topic "**ICT application in teaching and learning in tertiary institutions: A study of University for Developing Studies and Tamale Technical University**".

Please assist her with the necessary information that will be needed to undertake the research.

Thank you.

Yours faithfully



**Dr. Emmanuel Adjei**  
Head of Department



**COLLEGE OF EDUCATION**

• Tel: +233 (0) 303 937 957

P. O. Box LG 60, Legon, Accra, Ghana.  
• Email: [dislegon@ug.edu.gh](mailto:dislegon@ug.edu.gh)

• Website: [www.coe.ug.edu.gh](http://www.coe.ug.edu.gh)