UNIVERSITY FOR DEVELOPMENT STUDIES, TAMALE.

UNIVERSITY FOR DEVELOPMENT STUDIES

USING IN - SERVICE TRAINING TO IMPROVE TEACHERS' SKILLS TOWARDS

THE USE OF ICT TO TEACH AT ST PETER'S JHS, TAMALE

ABIBA ASOMA

2018

UNIVERSITY FOR DEVELOPMENT STUDIES TAMALE

FACULTY OF EDUCATION

USING IN- SERVICE TRAINING TO IMPROVE TEACHERS SKILLS TOWARDS THE USE OF ICT TO TEACH AT ST PETER'S JHS, TAMALE.

BY

ASOMA ABIBA (B.Ed Basic Education)

(UDS/MTD/0097/16)

DISSERTATION SUBMITTED TO THE DEPARTMENT OF EDUCATIONAL FOUNDATION, FACULTY OF EDUCATION, UNIVERSITY FOR DEVELOPMENT STUDIES, IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF A MASTER OF EDUCATION DEGREE IN TRAINING AND DEVELOPMENT

APRIL, 2018

DECLARATIONS

CANDIDATE'S DECLARATION

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

Signature: ………………………….……… Date…………………………….

Candidate's Name: Asoma Abiba

SUPERVISOR'S DECLARATION

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

Signature: ……………..……………… Date ………………………………

Supervisor's Name: Rev. Fr. Dr. Thomas Asante

i

ABSTRACT

The purpose of this study is to empirically investigate the attitude of teachers at St Peter's JHS towards the use of ICT, to explain these attitudes and to capture what teachers think can be done to improve their attitudes towards the use of ICT for teaching and learning processes. Using purposive sampling techniques, a sample of 14 was selected. The study takes the form of a survey that makes use of an open ended questionnaire for data collection.

The resulting data are analyzed using SPSS version 21, to obtain F values, P values, and degree of freedom, and post hoc analysis is performed using the Turkey test. Furthermore, the technique of content analysis is deployed to analyse the open-ended questionnaire items. The results indicate that teachers at St Peter's JHS have positive attitudes towards the use of ICT. They also showed that teachers perceive ICT as being very productive in teaching and learning, and as making the process easier. However, many respondents feel that technical support resources are lacking in the schools, school management do not view ICT as a priority, and sufficient ICT training has not been provided, leading to teachers' lack of expertise in using ICT, all of which are prominent factors hindering teachers' readiness and confidence in using new technology in teaching/learning process. For the consistent use of ICT by teachers, it is recommended among other priorities that teacher training and professional development oriented policies should support ICT-related teaching models that encourage students to play an active role in learning activities. In addition, emphasis must be placed on the pedagogy underpinning the use of ICTs in the teaching and learning process. It is hoped that results of this study can be used in shaping innovative practices in the Ghana Educational System.

ACKNOWLEDGEMENT

I am most grateful to God Almighty for the wisdom and strength given to me to undertake this task. I wish to register my gratitude to the following people whose encouragement and support made the writing of this research a success. First and foremost, I am grateful to my parents Mr. Bukari Asoma and Mrs Adisah Asoma for their financial and spiritual support. For without them my dream would not have become a reality.

My sincere gratitude also goes to my supervisor Rev. Fr. Dr Asante Thomas for his guidance, assistance, invaluable suggestion and for taking the pain in looking through this research.

I also express my heartfelt gratitude to Madam Joyce Kipo my head teacher, Sadia Asoma, Abu Asoma my siblings, Mr and Mrs Cosmas Alhassan Hassan my in laws and my colleague teachers who encourage me directly and indirectly to make this research a reality.

DEDICATION

This piece of work is dedicated to Jehovah God, My dear husband Mr. Ishmael Hassan and beloved children Nicholas Hassan and Cecilia Hassan through whose guidance and direction this research becomes a reality.

UNIVERSITY FOR DEVELOPMENT STUDIES

TABLE OF CONTENTS

LIST OF FIGURES

CHAPTER ONE

INTRODUCTION

1.0 Chapter Overview

During the past few years, the world has witnessed a phenomenal growth in communication techn ology, computer network and information technology. Development of new broadband communication services and convergence of telecommunication with computers have created numerous possibilities to use a variety of new technology tools for teaching and learning system. The integration of computers and communications offer unprecedented opportunities to the educational systems with the capacity to integrate, enhance and interact with each other over a wide geographical distance in a meaningful way to achieve learning objectives. The growth of these communication and computer systems, their ease of use, the power and diversity of information transfer allow teachers and students to have access to a world beyond the classroom(Muijs, and Reynold, 2010).

This chapter starts with an Overview, followed by the background of the study, Perceived Problem, Problem Diagnosis, Evidence of the Problem, Statement of Problem, General Objective of the Study, Specific Objective of the Study, Research Questions, Significance of the Study, Scope of the Study, and Organization of the Study.

1.1 Background of the Study

Globally, many governments and institutions are continually becoming aware of the importance teachers play in the implementation of ICTs in teaching and learning. The Kingdom of Saudi Arabia for instance, has shown a great interest in improving the whole educational system, especially in terms of using ICT (Ministry of Education, 2007). Although this interest has been translated into the primary stage and has been largely ignored. More surprisingly, primary

1

teachers are still required to integrate technology into their teaching despite the fact that they have not been prepared for their new roles in such a technology rich environment.

The governments in Africa and lots of other countries are emphasizing on teacher development as the key in implementing ICT in teaching and learning hence improving the standards of education (Hennessey, etal, 2010). The teacher factor is an important part the Kenya government has paid attention to, while implementing ICTs in teaching and learning. Indeed, as noted by Keengwe, (2007); Rockman, (2004); and Allen, (2001) among many other reasons for the lethargy in the uptake of ICTs in teaching, is the negative teacher attitudes towards technology which stands out as one of the main reasons. This literature points out that just like in earlier attempts of integrating ICT in teaching and learning, the process would be bound to fail if teachers are not put in the lime light. Teacher training and support essentially becomes the epicenter of ICT integration hence an important component that needs to be given attention if ICT integration is to be realized. Indeed, literature has prove beyond any reasonable doubt that when used appropriately by teachers, ICTs can have positive impact on the way teachers teach and the way learners learn thus improving pedagogy (Hennessey et al 2010). Suffice it to say that teaching is increasingly becoming a more challenging profession where knowledge is rapidly increasing and technology changing enormously. This therefore demands that teachers have to learn how to use these new technologies in their teaching. Although integrating ICTs in teaching and learning is yet to be fully achieved in teacher training institutions, teachers who are already in the profession face a bigger challenge because they are expected to learn on the job. It is probably due to this reason that the Ghana Government took up the issue of teacher training and support as very important in its attempt to integrate ICTs in education. Unlike in the earlier failed attempts, teacher training and support was given prominence.

Ghana is an interesting case for research on integration of ICT. Because of ICT impart on the country. Ghana's efforts to use ICT in education began to receive governments' attention only recently (Ghana ICT4AD Policy, 2003). The integration of ICT into Ghana's educational system was formally introduced as part of educational reforms which began in September 2007 as part of the government's initiative to improve the quality of teaching and learning in the nation's schools. One major requirement of the 2007 educational reform was to ensure that all students in pre-tertiary institutions in Ghana acquire basic ICT literacy skills (including internet use) and apply these not only in their studies but also in a variety of ways in their everyday life activities (CRDD, 2007a, 2007b, & 2007c). These efforts notwithstanding, Ghana's recent participation in the latest international ICT development index revealed that the country ranked on different measures between 100th and 140th out of 154 countries surveyed (International Telecommunication Union, 2009). Clearly, this is an indication that Ghana, like many other African countries, lags behind integration of ICT in teacher education. Important questions such as "What can teachers do with ICTs to promote integration of technology in curriculum or to extend instructional methods?" and "What can teachers do with ICTs to improve students' outcomes?" still remain. For Ghana to be able to fully integrate ICT into teaching and learning, a situational analysis of the different contexts and challenges that exist within her educational institutions regarding ICT use is a necessary first step to explore. Most importantly, stakeholders and decision makers must be aware of what situation exists within educational institutions as they relate to the "readiness" of teachers including the availability of ICT facilities and skilled human resources that will support the achievement of teaching and learning with ICT. This study has a focus in this direction. The study provides arguments to better understand Ghana's

educational institutions readiness of pedagogical integration of ICT to improve the quality of teaching and learning in the educational system.

Northern Region, on the reality of contemporary technology usage by teachers at Tamale, shows that teachers' use of several technologies including the Internet, Intranet, and interactive video is very low. Alotaibi (2011) conducted a study to determine the extent of the use of educational technology by female teachers and findings indicate that participants rarely use educational technology. The research evidence shows that teachers from all stages, including Junior High School teachers, lack most of the basic skills of using ICT in teaching. In particular, the importance of opportunities to be trained is highlighted by the research.

St Peter's Junior High School, it is for these reasons the researcher thinks positive skills of teachers towards the use of ICT to teach at St Peter's Junior High School is one of the best ways to enhance effective teaching and learning. Teachers can be helped through appropriate actions to develop more positive attitudes towards the use of ICT for teaching and learning purposes.

1.2 Perceived Problem

The teachers at St Peter's JHS are expected to develop positive attitude towards the use of ICT in order to ensure effective teaching and learning. It is therefore expected that teachers should be able to integrate ICT in their teaching and learning however pupils at St Peter's JHS are not an exception. The problem was first perceived when in the first encounter with the teachers; a number of them could not integrate ICT in teaching. Only 15% of the teachers had a positive attitude towards the use of ICT for teaching. The inability of the teachers to integrate ICT in their teaching was because of the challenges some of them always encounter. If nothing is done about this sad phenomenon, the future of the teachers is quite bleak. Teachers' positive perceptions of

the potential benefits of ICT use do not necessarily lead to its adoption in daily practice or the improvement of teaching and learning. Teachers have varying perceptions about their effectiveness when using ICT in the classroom, which can subsequently impact on how much they use technologies in the classroom. On a related note, Bingimlas (2010) reported that teachers who are confident in ICT use agree that new technologies help them teach and would like to use them more in the future. An extensive research review by Balanskat et al (2006) found that teachers' practice 'is not changing much when they use ICT', but it also reported that teachers with highly positive perceptions of ICT impact will use ICT in a more 'project-oriented, collaborative and experimental way' than other teachers. A majority of teachers perceive ICT to offer advantages to classroom learning but many also struggle to see specific benefits and methods for use.

Teachers differed on whether they feel ICT makes their jobs easier or adds to their workloads. Nearly half of teachers participating in the netbook survey agreed that using netbooks would increase their workload (EU Schoolnet 2010). Bingimlas (2009) suggest that one of the major reasons teachers do not use ICT significantly in lessons is due to time limitations in their job. However, Becta's (2008) survey found that across sectors a small amount of time was saved by using some technologies, particularly online resources and interactive whiteboards. Balanskat et al (2006) identified lesson planning as an area where ICT helped teachers work more efficiently, particularly through its ability to support collaboration and resource sharing.

1.3 Problem Diagnoses

The challenges teachers always encounter during the integration of ICT in their teaching and learning can be sorted out when the major possible sources are tackled. The teacher as one of such source can be diagnosed for finding possible solution by data gathering through: interview, questionnaires and lesson observation of the teacher. The degree of the teacher's inspiration and their confidence in integrating ICT I teaching and learning and the challenges they encounter in the use of ICT to tech was diagnosed through questionnaires, observation and interviews.

Before designing in-service ICT training for teachers, it was considered necessary to explore their knowledge and skill levels, and how they currently use ICT in classrooms. Despite the efforts made by educational bodies towards in-service training modern technology, most of these courses have not had the desired influence. The reasons for this lack of success are varied. Firstly, the training has been delivered as "one-size fits all", and has not been related to the trainees' specific needs. For example, Edmondson (2003) believes that in the teacher training field, teachers' needs should be identified prior to designing the training package. The other factor that decreases the usefulness of the ICT training programs is that the training focuses solely on technological skills. According to Jones (2004), inappropriate training styles that lack pedagogical aspects are likely to be unsuccessful, and cannot guarantee high levels of ICT use by teachers. In contrast however, Preston, et el (2000), asserted the need for training in some specific ICT skills, especially those needed to solve technical problems and to understand the basic workings of the technology.

1.4 Evidence of the Problem

The teachers were not able to integrate ICT in their teaching and learning. Teachers' at St Peters JHS are 14 and only 15% were capable of using ICT to teach. The abysmal performance of student in class exercise, class test, and quizzes. Above all, consistent failure in the final examination of the pupils (BECE) revealed evidence of the problem in question.

Also teachers' lack of confidence and knowledge in the use of ICT to teach are clear evidence of the unfortunate problem.

The performance of the student at the end of their final examination has always been poor, thus why the researcher think the attitude of teachers towards the use of ICT to teach can assist to improve the performance. Several factors have been pointed out in literature as barriers to ICT integration in teaching and learning. These barriers include but are not limited to; in appropriate software, lack of time for training and the use of ICTs, lack of technical support, lack of competence in ICT usage, lack of follow-up for new skills, lack of differentiated training programs, and technical faults with ICT equipment. Literature indicates that teachers are already burdened people and when they are confronted with factors such as these, they tend to avoid integration all together so that they are not burdened further (Hew & Brush, 2007).

Teachers have been pointed out in literature as an important component in the integration of ICT in teaching and learning. They are expected to adopt and use ICTs appropriately in their teaching hence implement the changes expected in pedagogy. However, as Dawes (2004) noted, this potential may not easily be realized because problems arise when teachers are expected to implement changes in circumstances. Some studies have further shown that successful implementation of ICT depends mostly upon staff competence in the integration of ICT into

7

instruction and learning. Research reveals several obstacles that teachers face in the course of implementing ICT integration. Studies by Korte and Husing (2007), Oldfield (2010), Blanknskat et al (2006) and Becta (2008) have tried to bring to the fore these contrasting perceptions of teachers and even revealed that despite the continuous hype of the advantages of ICTs in teaching and learning, there is still a small group of teachers who do not see any considerable benefit to learners while using ICTs. However, without proper guidance and taking into account the teachers own theories about teaching and learning which are recipes for integration, the much desired change will most likely be limited (Mumtaz, 2000). In addition to this, studies0 show that major impediment is the teacher's reluctance to abandon their existing pedagogy which Rodgers (2002) viewed as an obstacle to teacher development in classroom use of ICT than even limited resources. To this end and as purported by Bingimlas (2009), the importance of ICTs in the future of education cannot be underrated, therefore identifying the possible obstacles to the integration of these technologies in schools would be an important step in improving the quality of teaching and learning. However, these difficulties most of which affect teachers, continue to be encountered during the process of adopting these technologies (Balanskat, et al (2006).

1.5 Statement of the Problem

One cause of the problem is the lack of basic knowledge in ICT by teachers.

The training on the use of ICT was absent. No importance is attached to the use of ICT to teach, hence affects teaching and learning. There was no sign of teachers showing positive attitude towards the ICT usage.

8

The research found out that teachers do not use ICT to teach because of lack of knowledge, absence of teaching and learning material and a lack of interest.

There has been a rapid change in the role of the teacher in recent years. There are many new changes and challenges that teachers face, and are required to adapt to. Included in this are a more modern and westernized approach from schools; new methods of teaching and learning, an increase in student numbers, and (most importantly) an explosion in the development of teaching with ICT. All of this means teachers need to update their knowledge and skills to develop the educational process in the classroom.

With the advent of a new philosophy towards ICT and its role in education, a wide body of research was developed, to investigating the role of ICT and its effect in developing an interactive education environment. However, many of these studies are limited to investigating the impact of ICT on learners. There is substantially less research which focuses on the role which ICT plays in creating and promoting a more interactive educational environment, as part of teaching and learning. The presence of ICT in the interactive educational environment can help to develop thinking skills and make classrooms an environment for educational growth. ICT also helps students to develop new thinking skills which may transfer to different situations which may require analysis and comprehension skills, and consequently critical skill development (Al Hudhaifi & Al Dughaim, 2005). This again was a motivation for the study; to investigate the role of ICT in promoting an interactive learning environment.

This research examined the teachers' perceptions about ICT tools for teaching, professional development, administration and personal use. This was based on the assumption that successful

personal use of ICT is likely to motivate the teachers to use ICT in other areas such as in teaching. Therefore, it is experience that makes teachers see the value of the technology they use.

1.6 General Objective of the Study

The main objective of this study is to investigate teachers' attitude   towards the use of ICT in their teachings using in-service training.

1.6.1 Specific Objectives of the Study

1. To investigate teacher's attitude towards the use of ICT in St. Peter's JHS.

2. To examine teachers' level of knowledge on ICT St. Peter's JHS

3. To find out why teachers at St. Peter's JHS do not want to use ICT to teach

Research Questions

The following questions were posed in the study.

1. What are the attitudes of teachers towards the use of ICT at St. Peter's JHS?

2. What are teacher's levels of knowledge on ICT at St. Peter's JHS?

3. What are the obstacles or challenges faced by teachers in using ICT in teaching and learning process at St. Peter's JHS?

1.8 Significance of the Study

The study has the following potential benefits. In the first place, it will inform teachers' readiness to use ICT. Secondly, teachers' experiences in using ICT shade light on proper integration of ICT in teaching and learning, and, in turn, help to determine teachers' professional development needs for proper ICT integration in the classrooms. It will further help to support

policy makers at the Ministry of Education in Ghana and also teachers in developing ICT use within schools. It will provide an opportunity to compare the views of teachers, students, and policy-makers on ICT usage in Ghanaian schools. It will also support educational administrators and policy makers in choosing the appropriate methods of managing changes associated with ICT use in the educational system in Ghana. This will be the first study in St Peter's JHS which takes into consideration the different aspects of the application of ICT in the educational system. Finally, it will inform teacher preparation colleges and technology education curriculum developers on the actual use of ICT in context.

1.9 Scope of study

The study is limited to teachers of St. Peter's JHS in the Tamale metropolis in the Northern region of Ghana. The study is limited to investigate teachers' ability and knowledge towards the use of ICT in their teachings using in- service training.

1.10 Limitations

There are many JHS in almost every community in Tamale but the researcher has limited her study to only teachers at St Peter's JHS. Also the study was only related to the integration of ICT in teaching. The duration for the research work, most researchers are not able to use a very large sample size. Base on this fact the researcher chose only the teachers at St Peter's JHS Financial resources because of transportation to collect data, printing of the research work and the other cost involve. Support from the government and other bodies will be beneficiary to those into research. And since it is an academic institution, the tendencies that teachers may be busy which may delay data collections and information from respondent are highly anticipated, with regard to teachers being busy , the researcher did pre inform the school administration before the actual date of the data collection so as to give the teachers ample time.

1.11 Organization of the Study

This study is presented in five main chapters. The first chapter covers the introduction, background, perceived problem, problem diagnoses, evidence of problem, causes, problem statement, objectives, research question and the relevance of the study. The second chapter review of relevant literature. The third chapter deals with the methodology the study area, sampling procedure, data collection methods and instruments. Presentation of data, analysis and discussion in Chapter four. Chapter five looked at the main findings, interventions and conclusion.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

Just as an individual's knowledge affects his/her attitude toward an object, his/her knowledge is also influenced by his/her attitudes. An individual's knowledge and experience affect his/her attitudes towards a particular object. This chapter is designed to cover the research by improving teachers' attitude towards the use of ICT to teach. It puts forward other educationist views on the integration of ICT which has been reviewed under the following headings: Concept of Information Communication Technology, Integrating ICTs in Education, Brief Background on ICTs in Education in Ghana, Approaches to Teachers' Development, Integrating ICTs in Education, Teacher ICT Skills, Influence of teaching experience on ICT implementation, Factors Promoting/Constraining the Development of ICT Use in Education, Availability of ICT Infrastructure, 4 Professional Development and Training, Resistance to change, Interactive Teaching, Vision, Mission and Overall Policy Goals, Training and Development for Teachers and Approaches to Teachers' Development .

2.2 Concept of Information Communication Technology

ICT is an accepted acronym for the word information communication technology. ICT as described by Scott (2002) encompasses a range of applications, communications and technologies which aid information retrieval and research communication and administration. These include: Internet access, electronic mail, CD-ROMS, telephone, on line databases, library services and fax machines. It has become a global phenomenon of great importance and concern in all aspects of human endeavor, spanning across education, governance, business, labor, market, shares, productivity, trade, agriculture, commerce and others.

2.3 Integrating ICT in Education

Technology is a means for improving education and not an end in itself. Bhasin, (2012) argues that integrating ICT into teaching and learning is not a new concept. The opinion of Wang, (2008)is that, computer integration in the classroom is the application of technology to assist, enhance, and extend student knowledge? However, ICT in education means more than just teaching students how to use computers. Thus, ICT should also be used to promote information literacy, with the capacity to access, use and appraise material from various sources in order to enhance learning events to solve difficulties and to craft awareness. Technology literacy is totally different from being able to integrate technology into teaching to enhance learning. In other words, doing "digitally fluent", means, not only know how to use the technological tools, but how to construct things of significance with those technological tools. Teachers do not only need to learn about technology, but they need to learn how to use technology to enhance their learners understanding and critical thinking skills. Enhancing basic information and communication skills like speaking, reading and writing, should rather be the focus of using ICT in education, but not simply being ICT literate. A wide range of learning technologies should be selected and incorporated into educational programmes and that technology integration should consider learning pedagogy, the pattern of student use of ICT, and the extent of use in teaching and learning programs. Omwenga also says that e-learning is an example of the use of these ICT supported teaching and learning methods whose use in educational institutions is gaining momentum with the passage of time. The opinion of Manzuoli and Cifuentes,(2013) is that teachers acknowledge ICTs as tools for building knowledge mediated by collaborative activities that are relevant for participation in future society and guide towards an authentic problem. Teachers collaborating among themselves are important as it provides the platform to contribute

14

to the pedagogical uses of ICTs in the classroom. Basically when we talk about technology integration in education, we literally and usually mean computer technology. However, we need to remember that the blackboard and chalk are also technologies, as much as charts models and animations, simulations videos are all technologies that can be used to enhance teaching. We can also say that technology is merely a method of doing something. Joy and Ishikaku, (2012) said teacher education is neither mere pedagogy nor acquisition of training qualification. Globalization and shift to a knowledge based economy require that educational institutions develop in the individual the ability to transfer information into knowledge and to apply the knowledge in dynamic cross cultural contexts. Needs, short period, large groups, and inadequate computers for participants, among others. Generally, teachers accept being trained on using technologies through courses, seminars and workshops According to Jung, (2005) most nations have limited resources for teacher training they must adopt cost-effective strategies by making judicious use of resources. Jung further says that a well-designed teacher training program is essential to meet the demand of today's teachers who want to learn how to use ICT effectively for their teaching. This study is to find out about how technology has affected the pedagogical practices of teacher trainers. Majumdar, (2006) says that merely learning ICT skills is not enough but using the ICT skills to improve the teaching and learning is the key for pedagogy-technology integration. But the question is how we can combine these two. As it is, now the situation seems to be left to the discretion of the teacher concerned. Thus an innovative teacher will use images, play video of real time situation or even animate objects to explain critical concepts. Practicing teachers must use whatever knowledge they gained from ICT integration courses. This can be attained by incorporating these practices within the classroom and avoid the risk of losing the acquired knowledge.

2.4 Brief Background on ICTs in Education in Ghana

The efforts to introduce ICTs into the sector by the Ministry (primarily through the GES), its development partners and other private sector agencies cover a period of over ten (10) years. Initiatives have spanned pre-tertiary (both public and private schools) and tertiary. Efforts have largely been geared towards the deployment of ICTs to these facilities via the provision of computers and the establishment of ICT laboratories. Access however is still below the standards and numbers demanded. Though comparatively better, the concerns remain for tertiary level institutions. Additionally, there have been several private sector initiatives to set up Community based ICT centers. These however have been largely confined to urban areas with few available examples of how they have been used to support educational objectives.

In a study carried out to review and assess the ICT in Education Initiatives in Ghana (2005), twenty initiatives were selected and their impact assessed to see what lessons could be learnt. Several positive achievements were noted.

 - Initiatives contributed to a wider number of students and teachers acquiring ICT skills and developing strong interests in ICT and Science;

- Schools involved in the initiatives were motivated to expand the project and/or acquire more ICT equipment; a number of private-public partners, including Parent Teachers Associations (PTAs) and civil society collaborated in the efforts;

- Lessons learnt from initiatives provided good examples for other schools to introduce their own ICT programs.

16

However, the projects themselves faced a number of challenges. At least half of the initiatives had been launched as pilots with none expanded into national initiatives. Implementation challenges include:

- Poor selection of schools without the involvement of GES / MOE resulting in duplication and hence some schools having several parallel initiatives while others (especially those in the remote rural towns) had none

- Lack of policy direction at all levels (schools, districts, and national) for the integration of ICT in education;

- Heavy dependency on external funds, with most initiatives stopped after depletion of initial funding

- Dumping of obsolete and inappropriate equipment as support for the initiatives

- Low levels of ownership at the level of the schools, due to external motivations, and low levels of understanding on the part of recipients about the potentials of ICTs in education

- Lack of trained ICT personnel (including teachers) far below the numbers demanded to support the initiatives with most capacity building efforts one-off with no continuous training planned for.

Additionally, there was the recognition that to ensure success and sustainability, ICT in Education projects should be implemented not necessarily to increase the number of computers, but should instead be based on supporting discrete educational objectives. The lessons learned from the initiatives further highlighted the need for a coordinated, focused and properly managed

approach to the adoption and utilization of ICTs. Such an approach could further improve the accessibility and delivery of quality education and better maximize the impact of ICTs in Education.

2.4.1 Vision, Mission and Overall Policy Goals

The need for a nationally accepted ICT in Education Policy for Ghana is more urgent than ever before. With the increased thrust of the Government in using ICTs as a tool for economic growth and development, almost daily new plans and new initiatives are being implemented. However, it is recognized that in the absence of a national policy and sector wide coordination, such initiatives will continue to happen haphazardly, with increased risks of duplication and wasting of scarce resources that do not adequately address the educational objectives and priorities with the sector. Recognizing that ICTs must serve, rather than drive the implementation of educational strategies, this policy document seeks to provide a clear purpose and rationale for how ICTs will be effectively integrated into the sector, including identifying opportunities, issues, challenges and strategies that will be employed.

The deployment, exploitation and development of ICTs to accelerate the socio-economic development of the nation has been captured in the Ghana ICT for Accelerated Development (ICT4AD) Policy document (2003), with the main mission to "transform Ghana into an information rich knowledge based and technology driven high income economy and society". Already within this document education is seen as a key strategic pillar. Given this context, the overall Vision of the ICT in Education Policy will be to: Use appropriate ICTs to support and align the sector Ministry's policies, objectives and strategies, particularly as it relates to equitable access to education, quality of education, educational management, science and technology and labor market needs. The Mission of this policy will be to:

Articulate the relevance, responsibility and effectiveness of utilizing Information and Communication Technologies (ICTs) in the education sector, with a view to addressing current sector challenges and equipping Ghanaian learners, students, teachers and communities in meeting the national and global demands of the 21st Century.

The fundamental objective of the policy will be to ensure that the Ghanaian education sector provides adequate opportunities for Ghanaians to develop the necessary skills, regardless of the levels of education (formal and non-formal), to benefit fully from the Information Society. Towards this end the overall policy goal will be:

To enable graduates from Ghanaian educational institutions – formal and non-formal - to confidently and creatively use ICT tools and resources to develop requisite skills and knowledge needed to be active participants in the global knowledge economy by 2015.

The policy goals as adapted from the National ICT4AD Policy document will therefore include:

1. Facilitating the deployment, utilization and exploitation within the educational system to improve on educational access and delivery to support teaching and learning from the primary level upwards.

2. Modernize the educational system to improve the quality of education and training at all levels of the educational system and expanding access to education, training and research resources and facilities.

3. To orient all levels of the country's educational system to the teaching and learning of science and technology in order to accelerate the acculturation of science and technology

19

in society and produce a critical mass of requites human resources and a well-informed citizenry.

4. To achieve universal basic education and improve the level of basic and computer literacy in the country.

5. To ensure a population in which all citizens are at least functionally literate and productive.

6. To expand and increase access to secondary and tertiary education.

7. To strengthen science education at all levels and in all aspects of the educational system, especially at the basic and secondary levels.

These policy goals have been adapted and expanded to develop a number of concrete guidelines, objectives and strategies which are grouped into seven (7) thematic areas:

Thematic Area 1: Education Management – Ministry/Agencies and Educational Institutions

Thematic Area 2: Capacity Building

Thematic Area 3: Infrastructure, E-readiness and Equitable Access

Thematic Area 4: Incorporating ICTs into the Curriculum

Thematic Area 5: Content Development

Thematic Area 6: Technical Support, Maintenance and Sustainability

Thematic Area 7: Monitoring and Evaluation

2.5 Training and Development for Teachers

Continuing training and development is necessary to maintain teachers' competencies: for pedagogical and professional portfolio reform, and to learn new skills and approaches. In Saudi Arabia, as elsewhere, there can be entrenched opposition to change. Teachers' ICT training can be of a higher priority than hardware and software availability. Pan (1999) states that planning for integration of ICT in the curriculum has to include teachers' professional development and ICT infrastructure. The quality of the school's ICT equipment is immaterial if teachers do not have the required competencies, and authorities should recognize the value of attaining and retaining appropriate skills (Hasselbring et al. 2000; Ortega, 2000). As a result of pedagogical and technical advances, teachers require access to continuous skill and knowledge opportunities to maintain their positions in the evolving standards in these fields, and this factor is recognized by all capable educational authorities (UNESCO, 2002). For example, authorities in Australia support the professional development of teachers and provide continuous training; the Victorian government offers ICT teacher-training programs in three key areas: ICT skills, curriculum development, and classroom management (Christophersen, 2002). The following sections describe the approaches to teachers' ongoing professional development, and the acquisition of ICT skills is explored. The Ministry's response to teacher development is also presented.

2.6 Approaches to Teachers' Development

There are various approaches to training and development for teachers; all seek to improve the quality of teachers' work outcomes. The US National Council for Accreditation of Teacher Education (2002), reported that professional development includes in-service education, conference attendance, intra- and inter-institutional visitations, fellowships, and work in general education. The literature provides many examples of training and development opportunities for

21

teachers; however, each education authority must craft its own policies and strategies based on sound macroeconomic principles; its history, culture, and geography; its unique competitive advantage; and its development goals (Kozma, 2005). For the purposes of this study, professional development refers to all opportunities teachers can access to improve their skills and knowledge in their portfolio subjects, pedagogy, and technical evolution, including ICT.

Professional development opportunities have significant, positive effects on teachers' self-reported increases in knowledge and skills, and changes in classroom practice (Garet, Porter, Desimone, Birman, & Yoon, 2001).

In this case, Valente (2003), and Higgins and Packard (2004) consider that training should include the potential of ICT to assist in the construction of new knowledge, and an understanding of the role of ICT in the science curriculum. Higgins and Packard nominate a qualified teacher's skills:

• To use ICT confidently and effectively,

• To be familiar with a range of ICT equipment and software,

• To teach ICT to their students as part of their curriculum entitlement, and

• To develop an understanding of ICT and its capability to effectively use technology to support students' learning (p. 22).

Science teachers not only need to possess computer-based skills, they need to develop sound pedagogical knowledge to successfully integrate ICT into the science curriculum (Jones, 2004). The use of ICT in the classroom allows teachers to promote higher-order thinking skills in

students, and the evolving role of teachers as "curriculum developers" refers to the principles of new pedagogy supported by technology. Although ICT can play a key role in instruction, curricula, and practices, the use of ICT as a tool must be based on sound pedagogical principles (Makrakis, 2005).

In 2004 the Saudi Ministry of Education announced a comprehensive education productivity strategy which included ICT implementation (Al-Omran, 2007). The question arises regarding the nature of teachers' ICT skills and this is explored in the following discussion.

2.7 Integrating ICTs in Education

Technology is a means for improving education and not an end in itself. Bhasin, (2012) argues that integrating ICT into teaching and learning is not a new concept. The opinion of Wang, (2008) is that computer integration in the classroom is the application of technology to assist, enhance, and extend student knowledge. However, ICT in education means more than just teaching students how to use computers. Thus, ICT should also be used to promote information literacy, with the capacity to access, use and appraise materials from various sources in order to enhance learning events to solve difficulties and to craft awareness. Technology literacy is totally different from being able to integrate technology into teaching to enhance learning. In other words, doing "digitally fluent" means not only know how to use the technological tools, but how to construct things of significance with those technological tools. Teachers do not only need to learn about technology, but they need to learn how to use technology to enhance their learners understanding and critical thinking skills. Enhancing basic information and communication skills like speaking, reading and writing, should rather be the focus of using ICT in education, but not simply being ICT literate. Omwenga, (2006) as saying that ICT usage in Kenya is limited to computer literacy training just like most developing countries. Omwenga (2006) further contends

that the present ICT curriculum merely deals with „teaching and learning about computers and not how computers can be used to transform the teaching and learning in our schools. A wide range of learning technologies should be selected and incorporated into educational programs and that technology integration should consider learning pedagogy, the pattern of student use of ICT, and the extent of use in teaching and learning programs. Omwenga also says that e-learning is an example of the use of these ICT supported teaching and learning methods whose use in educational institutions is gaining momentum with the passage of time. The opinion of Manzuoli et al, (2013) that teachers acknowledge ICTs as tools for building knowledge mediated by collaborative activities that are relevant for participation in future society and guide towards an authentic problem. Teachers' collaborating among themselves is important as it provides the platform to contribute to the pedagogical uses of ICTs in the classroom. Basically when we talk about technology integration in education, we literally and usually mean computer technology. However, we need to remember that the blackboard and chalk are also technologies, as much as charts models and animations, simulations videos are all technologies that can be used to enhance teaching. We can also say that technology is merely a method of doing something. Joy, et al, (2012) said teacher education is neither mere pedagogy nor acquisition of training qualification. Globalization and shift to a knowledge based economy require that educational institutions develop in the individual the ability to transfer information into knowledge and to apply the knowledge in dynamic cross cultural contexts. Gao, et al, (2010), suggested that teacher preparation provides fundamental experiences for the use of technology. They concluded that most research examined attitudes as well as ability or use of IT, but rarely looked at all three. Gao et al, (2010) further suggested that though most teacher-trainees possess essential ICT knowledge and skills as well as positive attitudes they do not appear to be ready in using ICT in

their teaching. Manzuoli, et al, (2013) perceive some failures such as lack of diversity of the teaching needs, short period, large groups, and inadequate computers for participants, among others. Generally, teachers accept being trained on using technologies through courses, seminars and workshops According to Jung, (2005)most nations have limited resources for teacher training they must adopt cost-effective strategies by making judicious use of resources. Jung further says that a well-designed teacher training program is essential to meet the demand of today's teachers who want to learn how to use ICT effectively for their teaching. This study is to find out about how technology has affected the pedagogical practices of teacher trainers. Majumdar, (2006) says that merely learning ICT skills is not enough but using the ICT skills to improve the teaching and learning is the key for pedagogy-technology integration. But the question is how we can combine these two. As it is now the situation seems to be left to the discretion of the teacher concerned. Thus an innovative teacher will use images, play video of real time situation or even animate objects to explain critical concepts. Practicing teachers must use whatever knowledge they gained from ICT integration courses. This can be attained by incorporating these practices within the classroom and avoid the risk of losing the acquired knowledge.

2.8 Teacher ICT Skills

Teacher skills are becoming more and widely identified as a major factor that affects the quality and efficiency of education and had a direct effect on learner achievement (Cheong & Kim, 2009). The integration of ICT into the science curriculum depends upon the teacher's skills, so the teacher is critical to this end (Means, 1997; Poole, 2000; UNESCO, 2002). The US National Council for Accreditation of Teacher Education (2002, p.56) defines teacher skills as "the ability to use content, professional, and pedagogical knowledge effectively and readily in diverse

teaching settings in a manner that ensures that all students are learning". In another definition, Cheong and Kim define teaching skills as techniques to direct student's learning toward desired behaviors. Finger et al. (1999), explain that teacher skills enable a teacher to assess a class and use this assessment to employ different techniques, style, or tools for the desired result: for example, using projectors to illustrate a process.

Pedagogical research identifies teachers' skills that can significantly improve teaching: an understanding of the subject matter and the knowledge of the manner by which students learn (Darling-Hammond, 1997). More specifically, Cheong & Kim (2009) refer to the skill of teaching as a set of sub-skills, such as communication, technology (including ICT skills), motivation, reinforcement, questioning, and classroom management. ICT skills also refer to familiarity with technologies such as computers, and peripheral equipment including printers, scanners, cameras, and projectors, as well as knowledge of basic technologies' functions, familiarity with installing and using software such as Microsoft Office, and using internet services including sending and receiving e-mail (McDonald, 2004; Semenov, 2005). However, Higgins and Packard (2004) connect teachers' ICT skills with knowledge and motivation to develop teachers' competencies; to improve productivity using ICT, teacher skills and knowledge must be augmented through a deeper regard for ICT potential with the strong development of ICT, teachers are expected to have ICT skills and use ICT effectively to deliver the science curriculum (Pan, 1999). Jones (2003), concurs: ICT is useful for lesson planning and preparation of teaching materials, recording student assessments, and other administrative tasks.

Teacher ICT skills comprise basic and advanced. Hefzallah (2004, p.30), classifies teachers' ICT skills into two categories: the user or basic level, and an advanced competency. At the basic level the user should have an understanding and capability of basic computer software and a favorable

26

attitude towards it. At the advanced level, the user should have a comprehensive knowledge of a broad range of applications, managing computer operations, designing certain educational programs, and publishing via the internet. Hefzallah suggests that to integrate ICT into education, teachers as users of technology must be familiar with at least basic keyboard skills.

Recently, UNESCO (2009) designed a comprehensive approach to teachers' ICT knowledge and applications. The goal of the "ICT Competency Framework for Teachers" (ICT-CFT) project is to improve teachers' practice by considering current practices in pedagogy, curriculum, and school organization. The framework is designed for the professional development of teachers to use ICT skills and resources to improve their teaching, collaborate with colleagues, and contribute to a higher quality education system. The objectives of the project are:

• To develop a common core syllabus (defining various ICT competency skills for teachers) that training providers can use to develop learning materials sharable at a global level;

• To provide a basic set of qualifications that allows teachers to integrate ICT into their teaching; to extend teachers' professional development to advance their skills in pedagogy, collaboration, and school innovation using ICT; and

• To provide a harmonization for different views and vocabulary regarding the uses of ICT in teacher education. The project also includes a mechanism for reviewing and approving the curricula and course offerings of these providers (UNESCO online).

Dimensions of economic theory are used by UNESCO to build its ICT competency framework to improve student outcomes: capital deepening (the use of equipment that is more productive than earlier versions), higher quality labor (a more knowledgeable workforce that is more productive),

and technological innovation: the creation, distribution, and use of new knowledge. These factors, according to UNESCO, are the basis for three complementary approaches that place education policy within an economic approach: to increase teachers' ICT usage by requiring technology skills as part of the curriculum (technology literacy); to add to students' knowledge through using ICT to solve complex, real-world problems (knowledge deepening); and to promote innovation for the benefit of the community (knowledge creation). The UNESCO ICT-CFT project encompasses the three approaches to address countries' varying policy goals; each approach impacts the education system differently: pedagogy, teacher practice and professional development, curriculum and assessment, and school organization and administration (UNESCO 2009).

Teacher professional development is a particularly important component of educational improvement; this is manifest only when training is focused on specific changes to teacher style, and particularly if it is aligned with other changes in the educational system. However, UNESCO cautions in the overuse of ICT; it is intended only as part of a continuum of media used to serve educational goals. Lastly, ethical and legal issues arise with ICT in education, such as ownership of knowledge, and globalization of education in juxtaposition to cultural diversity; in this case, Arab traditions.

This section explored the characteristics of skills acquisition and professional development for teachers, focusing on the requirement to "internalize" ICT so that it becomes inherent in the science classroom delivery for teachers, and highlighting the recent advice from UNESCO. The following section considers aspects of resources, training and motivation which influence the adoption of ICT and its integration into the science curriculum.

2.9 Influence of teaching experience on ICT implementation

Several studies have been conducted that addressed the relationships between selected demographic variables such as teaching experience and usage of computer. One such study was Zidon & Miller (2002) who found weak relationship existed between years of teaching with computer usage. Conversely, in a study of teacher's usage of computers, Martin & Lundstrom (2002) found that almost 60% of the teachers in their study who had under 10 years of teaching experience believed computers in the classroom were essential and hence they use it extensively, while only 25% of teachers with over 20 years of teaching experience shared this belief. Bhattacherjee & Prekumar (2004), demonstrated that people experience plays a vital in their initial acceptance towards a system in question. Research has shown that experience with the use of technology has an influence on intention to use and actual use of information technology (Thompson, 2006). However, some research reported that teachers experience in teaching did not influence their use of computer technology in teaching (Niederhauser & Stoddart, 2001). Gorder (2008) reported that teacher experience is significantly correlated with the actual use of technology. In her study, she revealed that effective use of computer was related to technological comfort levels and the liberty to shape instruction to teacher-perceived student needs. Meta-analysis and review of 81 research studies by Rosen & Maguire (1990), concluded that teachers teaching experience does not eliminate computer phobias and many experienced teachers display some wariness, discomfort and/or mild anxiety in relation to computers. Over the years, computer usage issues related to various subjects taught have been debated in the literature. Though some research reported that teachers experience in teaching did not influence their use of computer technology in teaching (Niederhauser & Stoddart, 2001). Most research showed that teaching experience influences the successful use of ICT in classrooms (Wong & Li, 2008;

29

Giordano, 2007; Hernandez-Ramos, 2005). Nevertheless, Baek, Jong & Kim (2008), claimed that experienced teachers are less ready to integrate ICT into their teaching. Similarly, in United States, the U.S National Centre for Education Statistics, (2000) reported that teachers with less experience in teaching were more likely to integrate computers in their teaching than teachers with more experience in teaching. According to the report, teachers with up to three years teaching experience reported spending 48% of their time utilizing computers, teachers with teaching experience between 4 and 9 years, spend 45% of their time utilizing computers, teachers with experience between 10 and 19 years spend 47% of the time, and finally teachers with more than 20 years teaching experience utilize computers 33% of their time. The reason to this disparity may be that fresh teachers are more experienced in using the technology.

Further, Lau & Sim (2008), conducted a study on the extent of ICT adoption among 250 secondary school teachers in Malaysia. Their findings revealed that older teachers frequently use computer technology in the classrooms more than the younger teachers. The major reason could be that the older teachers having rich experience in teaching, classroom management and also competent in the use of computers can easily integrate ICT into their teaching. The result is in agreement with Russell, Bebell, ODwyer, & OConnor, (2003), who found that new teachers who were highly skilled with technology more than older teachers did not incorporate ICT in their teaching. The researchers cited two reasons: new teachers focus could be on how to use ICT instead of how to incorporate ICT in their teaching. Secondly, new teachers could experience some challenges in their first few years of teaching and spend most of their time in familiarizing themselves with school's curriculum and classroom management. But in a survey of almost 3000 teachers, Russell, O'Dwyer, Bebell & Tao (2007), argued that the quality of ICT integration was related to the years of teacher service. However, Granger, Morbey, Lotherington, Owston &

Wideman (2002) conducted a qualitative survey on factors contributing to teachers" successful implementation of ICT in Canada. They interviewed 60respondents from 12 schools. The findings found no relationship between teachers" teaching experience and experience in the use of ICT implying that teachers" ICT skills and successful implementation is complex and not a clear predictor of ICT integration. Several studies have been conducted that addressed the relationships between selected demographic variables such as teaching experience and subjects taught and usage of computer. The results obtained above showed that there were mixed results on the relationship between teachers" experience and ICT implementation. Some studies showed that there was significant difference between ICT implementation and teachers" experience while other studies showed the opposite. For this reason, the researcher wants to conduct a further research on the same.

2.10 Influence of training in computer usage on ICT Implementation

Professional development of teachers sits at the heart of any successful technology and education program. Teachers" professional development is a key factor to successful integration of computers into classroom teaching. Many school leaders perceive the lack of ICT related knowledge of teachers as one of the main impediments to the realization of their ICT related goals (Pelgrum et al, 2002). One of the pertinent factors contributing to the usage of computer is that teachers need to be computer literate and thus be given appropriate training in computer usage (Ropp, 1999). Different people hold different views about computer literacy. They are those who take a literal interpretation of computer literacy. They regard writing and reading computer programs as the basic skill of a computer-literate person. Training too plays an important role in a teacher's readiness to use computers (Gan, 2001). With regards to the issue of having attended formal computer courses, it was identified through numerous studies that there is

a significant relationship between usage of computers and computer training (Wong et al., 2002; Sia, 2000). Venezky, (2004), found that professional development was one of the most important supportin most schools for ICT integration into teaching as it has the greatest impact on the beliefs and practice of teachers and yet professional development time was not budgeted for in many schools in the study. Baylor & Ritchie (2002), carried out a quantitative study that looked at the factors facilitating teachers" skill, teacher morale, and perceived student learning in technology-using classrooms. They found that professional development has a significant influence on how well ICT is embraced in the classroom. Ghodke (2012), found that as compared to mathematics teachers, science teachers" perceived professional development needs of ICT use in context to teaching and learning is significantly higher. But both mathematics and science teachers ranked professional development needs at the second place. Sandholtz & Reilly (2004), claim that teachers" technology skills are strong determinant of ICT integration, but they are not conditions for effective use of technology in the classroom. They argue that training programs that concentrate on ICT pedagogical training instead of technical issues and effective technical support, help teachers apply technologies in teaching and learning. According to Schaffer & Richardson (2004), when technology is introduced into teacher education programs, the emphasis is often on teaching about technology instead of teaching with technology. Hence, inadequate preparation to use technology is one of the reasons that teachers do not systematically use computers in their classes. Teachers need to be given opportunities to practice using technology during their teacher training programs so that they can see ways in which technology can be used to augment their classroom activities. Teachers" understanding of content knowledge and how to apply technology to support students" learning and attainment are joined to their increase in knowledge level, confidence and attitudes towards technology.

According to (Chen,2008), professional training courses must be designed to identify beliefs about successful teaching, policies for enhanced teaching and learning and syllabus design for teaching purposes. Clearly, it is imperative to allow teacher trainees to apply ICT in their programs when in school in order to be able to use the technology to supplement their teaching activities. Teachers when given time to practice with the technology, learn, share and collaborate with peer, it is likely that they will integrate the technology into their teaching. Training programs for teachers that embrace educational practices and strategies to address beliefs, skills and knowledge improve teachers" awareness and insights in advance, in relation to transformations in classroom activities should be encouraged (Levin &Wadmany, 2008) Training makes a positive difference to those who receive it. Angers & Machtmes (2005), state that, teachers who receive eleven or more hours of curriculum-integration training are five times more likely to say they believe they are much better prepared to integrate technology into their classroom lessons than teachers who received no such training. Teachers receiving more training of either type, but especially of integration training, are more likely to use software to enhance instruction in their classrooms. The empirical findings provided an insight that the variable training in computer usage has a positive impact on Actual Usage of Computer (AUC). The number of computer skills acquired by teachers", its being current, and the number of hours of formal training play an important role in positioning the AUC of teachers" in a higher level. When teachers are being trained the expertise expected increases in competence.

In a study of 400 pre-tertiary teachers, they showed that professional development and the continuing support of good practice are among the greatest determinants of successful ICT integration. They argue that training programs that concentrate on ICT pedagogical training instead of technical issues and effective technical support, help teachers apply technologies in

teaching and learning. Lawless and Pellegrino (2007), claim that if training program is of high quality, the period for training lasts longer, new technologies for teaching and learning are offered, educators are eagerly involved unimportant context activities, teamwork among colleagues is improved and has clear vision for student's attainment. Teachers may adopt and integrate ICT into their teaching when training programs concentrate on subject matter, values and the technology. Similarly, research has shown that teachers require expert in technology to show them the way to integrate ICT to facilitate students" learning (Plair, 2008). Teachers" understanding of content knowledge and how to apply technology to support students" learning and attainment are joined to their increase in knowledge level, confidence and attitudes towards technology. Educators who integrate technology with new teaching practices gained through professional training can transform the performance of the students (Lawless & Pellegrino, 2007).

According to Becta (2004), the issue of training is certainly complex because it is important to consider several components to ensure the effectiveness of the training. These were time for training, pedagogical training, skills training, and an ICT use in initial teacher training.

Similarity, Sicilia (2005), found that teachers want to learn how to use new technologies in their classrooms but the lack of opportunities for professional development obstructed them from integrating technology in certain subjects such as science or maths. Other problematic issues related to professional development in ICT are that training courses are not differentiated to meet the specific learning needs of teachers and the sessions are not regularly updated (Balanskat et al. 2006). Pre-service teacher education can also play a significant role in providing opportunities for experimentation with ICT before using it in classroom teaching (Albirini, 2006). Lack of an ICT focus in initial teacher education is a barrier to teachers' use of what is available in the

classroom during teaching practice (Becta, 2004). Bingimlas (2009), in his research findings noted teachers have a strong desire for the integration of ICT into education but that they encountered many barriers to it. The major barriers were lack of confidence, lack of competence, and lack of access to resources. Since confidence, competence and accessibility have been found to be critical components for technology integration in schools, ICT resources including software and hardware, effective professional development, sufficient time, and technical support need to be provided for teachers. No one component in itself is sufficient to produce good teaching. However, the presence of all components increases the likelihood of excellent integration of ICT in learning and teaching opportunities.

Teachers" professional development is a key factor to successful integration of computers into classroom teaching. ICT related training programs develop teachers" competences in computer use (Bauer & Kenton, 2005).

The book of Turkish Ministry of National Education (MoNE) for the standardization of teachers claims that the teachers have to integrate information and communication technologies with teaching and learning processes. However, integrating technology into teaching cannot be achieved overnight. A meta-analytic review by HixonveBuckenmeyer (2009), summarized these stages. At first stages, the teachers tend to use the technology almost not at all, however later on; they consider the technology as an instrument which necessities to be taught. As the use of technology increases, they tend to perceive it as an instrument to aid the instruction, rather than being a core educational topic (Hixon & Buckenmeyer, 2009). There are voluminous studies regarding the effect of professional development (PD) programs on TI.

Frankoli & Hammond (2007), found that, the PD program induced a positive impact not only on developing the information technology skills of teachers, but also on their familiarity with ICT as a curricular tool to some degree while, it had a very limited impact on the classroom practice. Glazer et al. (2009), found that, while most of the teachers, who entered the PD program, expanded their knowledge, skills, ideas, and their lesson plan repertoire through these learning experiences; only a one-third of them were considered as proficient apprentices at the end of the study. Meanwhile, Yurdakul et al. (2010) also revealed that, the PD program was capable of increasing the technology usage skills, whereas it failed to induce substantial change for the technology integration. Uslue & Bumen (2012). In their research study observed that after professional development (PD) program, the teachers" technology usage for preparation of education and instruction were increased, both in classroom (sub-dimension -4)-and out-classroom (sub-dimension -1) settings. This result is parallel with the studies revealing that the in-service training programs increase the teachers" technology usage for preparation of education and instruction both in-classroom and out-classroom environments (Russell et al., 2007; Van Braak et al., 2004). The teachers who attended the assessed PD program, inclined to motivate their students for using information technologies in a greater degree (sub-dimension -2). Brinkerhoff (2006) stated that, the teachers who attended to the PD programs encouraged their students for technology usage. The increase of technology usage in ITP participant teachers was also transferred to their students, according to consideration of teachers; the students" technology usage was increased (sub-dimension 3). This result is parallel to the Brinkerhoff (2006). In this study it was observed that the TI was increased and that was sustained after a six weeks' period. Lavonenet al. (2006) indicated that the teachers didn't stop using ICT when they started to use it for instruction. Many factors may contribute to these effects. First of all, the long duration of PD

36

program may have contributed to this increase in TI. The related literature implies the ineffectiveness of one-shot PD programs (Sandholtz, 2002). The PD program was scheduled as 30 hours for Web 2.0 course and 60 hours for ITP, a total of 90 hours timetable for five weeks. McGarr & OBrien (2007) stated that the PD programs aimed only to increase the technology usage skills were ineffective for integrating with the technology. At this PD program it was aimed to increase both technology usage skills and also pedagogical skills for TI. During the first week for 30 hours, the teachers were instructed to learn the basic Web 2.0.v. Technologies, which they would be able to use with their students. These activities might have contributed to enhance the teachers" skills and their confidence for using the ICT. Thereafter, the teachers discussed how to use these technologies for instructional purposes during the last 60 hours in the ITP. Glazer et al. (2009) examined which kind of interactions influenced the peer-teacher efforts for integrating the technology in their classrooms and they found; "sharing ideas", "giving and seeking advice", "posing and responding to task based questions" were the most used ones. Correspondingly, during the ITP, the teachers were required to communicate, share documents, and to collaborate via internet with the other teachers and instructor of the course. These interactions may contribute TI level of teachers. Besides, the inscription of lesson plans by the participant teachers on a collaborative, team-work manner, explaining how the teachers would implement these technologies in their classes might have positively affected the TI too. Omurchu (as cited in Karagiorgi & Charalambous, 2006) indicated that the social and collaborative dimension of PD increased the effectiveness of program. Retention tests were conducted six weeks later after completing the PD program. The findings of these tests demonstrated that, the teachers" increased level of integration with the technology as a consequence of the PD program was retained after six weeks. This result is consistent with the studies in the literature (Giordano,

2008; Lavonen et al., 2006), indicates that increment at the level of TI is sustainable. The results obtained above showed that there were mixed results on the relationship between teachers training and ICT implementation. Majority of the studies showed that there was significant difference between ICT implementation and teachers training while few studies showed the opposite. For this reason, the researcher wants to conduct a further research on the same.

2.11 Factors Promoting/Constraining the Development of ICT Use in Education

2.11.1 Existence of National ICT Policies

A large body of research has shown that a rapid integration of ICT into learning environment demands the development of effective ICT policy. Thus, an ICT policy implementation strategy or framework for a nation's education sector is very essential to revolutionizing learning and teaching processes and open new learning opportunities. Unless a specific policy exists and decision makers have a clear strategy in place, it is difficult to integrate ICT effectively and bring about desired improvements in the reach and quality of education (UNESCO, 2007). Latchem & Jung (2010) recommended that countries and institutions have clear visions, strategic plans, commitment, and implementation capability regarding ICT use in education. According to Kozma (2008), strategic policies can provide a rationale, a set of goals, and a vision for how education systems might best introduce and integrate ICT. In the context of globalization as an economic process, researchers identify a deterministic conception of ICT (Bryderup & Kowalski, 2002; Sawchuk, 2008; Shin & Harman, 2009; Tondeur, van Braak, & Valcke, 2007), however researchers describe a gap between rhetoric in government policy and reality of education practice (Cheng, 2009; Kozma, 2008; Selwyn, 1999; Tondeur et al., 2007). The studies emphasize that without de-centralized supportive measures, national policies will not easily result in changes in instructional practices. Tondeur et al. (2007), discusses a way forward as

stressing the responsibilities of local educational institutions to translate the national ICT guidelines in an ICT plan as part of an overall school policy. Walker (1989), has also discussed three preconditions for a successful introduction of new information technologies into an education system:

i.   An appreciation by the government of the financial, resource, and operational requirements and the resulting consequences.

ii. A commitment by government to give time and take responsibility for decision making and implementation strategies.

iii. A commitment to a policy of an integrated support service encompassing teacher and technician training, curriculum, and assessment, together with software and hardware provision.

Walker's conditions buttress Naidoo's (2003), idea which noted that attempts to integrate ICT into the education system entail the leadership of the government and the education ministry, working together with other relevant ministries. Clearly, the literature suggests that leadership must have a clear vision of the mechanism that the government intends to use to implement ICT. This vision then needs to be integrated with national policies, and then effectively communicated and supported at the school level.

2.11.2 Availability of ICT Infrastructure

According to Mumtaz (2000), limited resources within schools are a great impediment to the take-up of technology. For instance, lack of computers and software in classrooms can seriously limit teachers' use of technology. Studies have shown that only a small proportion of the African population has access to computers (Murphy, Anzalone, Bosch, & Moulton, 2002) and 4% has

access to the internet (Resta & Laferrière, 2008). Aguti & Fraser (2006) reiterated that lack of ready access to technologies by teachers is a key barrier to technology integration in most developing countries. Other researchers (Benson & Palaskas, 2006; Snoeyink & Ertmer 2002) have identified resources as an important part of implementation of an innovation. In the study, adequate resources refer to the amount of ICT resources currently available and accessible to the teachers to successfully use in their classrooms when planning and teaching their lessons.

2.11.3 Teacher Preparedness and Willingness

In order to make an implementation succeed, "the people who will ultimately use the innovation must possess sufficient knowledge and skills to do the job" (Ely, 1999). This is especially the case when the innovation involves the use of a certain tool or a technique. Without enough preparation to use the tool or technique, the innovation will die out soon. According to Webb & Cox (2004), one of the reasons for the unenthusiastic response to ICT-based innovation amongst teachers might be that technological knowledge and skills is either absent or lacking in the processes that underpins teachers' planning. This idea has recently been developed by Mishra & Koehler (2006) and Harris, Mishra, & Koehler (2009), who propose that there is a tendency for teachers not to synergize their content and pedagogical knowledge with their technological knowledge, and that this can result in mundane ICT implementation in the classroom. Alongside the need to develop teachers' knowledge and skills, their attitudes towards ICT integration also need to be understood. Christensen & Knezek (2008), indicated that teachers' attitude plays a key role in determining computer use as a learning tool and the likelihood that teachers will effectively use ICT for teaching.

2.11.4 Professional Development and Training

The issue of how ICT is to be covered in pre-service teacher education and in-service teacher professional development has received significant attention. Baylor & Ritchie (2002), have indicated that training has an important influence on how well ICT is embraced in the classroom. A review of the recent teacher education research around ICT shows numerous examples of teacher education programs that have implemented instructional technology in ways that encourage integration (Goktas, Yıldırım, & Yıldırım 2008; Kay, 2006). Most of these approaches have involved providing teachers and teacher candidates with experiences with real educational problems to be solved by technology. Thus, the literatures make it explicit that there seem to be more to teacher preparation than training teachers on how to use tools—it requires appreciation of the complex set of interrelationships between artifacts, users, tools, and practices.

2.11.5 Resistance to Change

Over the years, there have been studies and explorations of the resistance factors that thwart diffusion and implementation efforts. Prominent among those who have journeyed into this puzzling morass are Zaltman & Duncan (1977). These authors define resistance as ". . . any conduct that serves to maintain the status quo in the face of pressure to alter the status quo." A number of studies have indicated that schools are resistant to ICT change. For example, Mumtaz (2000), explained that due to school's resistant to change, institutions give little time to teachers to manage and familiarize themselves with ICT-based innovation and classroom timetabling does not allow time for teaching with ICT. Several studies (Bate, 2010; Dawson & Rakes, 2003; McGarr & Kearney, 2009) also support the claim that leadership promoting change is a key factor when it comes to merging ICT and instruction. The basic argument has been that if we knew what types of resistance exist, we could design strategies to combat them.

UNIVERSITY FOR DEVELOPMENT STUDIES

2.11.6 Interactive Teaching

Different definitions have been introduced regarding "interactivity" as a concept in the study of teaching and learning. In this regard, significant importance is placed on theories of learning, their discussion and the studies based on the language of discourse in the classroom between the teacher and the students (Burns & Myhill, 2004).

Part of the rationale for this study is to highlight interactive teaching as a means of enhancing students" learning. The learning theories discussed by Vygotsky (1972), and Bruner (1986), in relation to the importance of the development of thinking and learning, use the term „interaction to refer to the different exchanges thought to be capable of broadening thinking and enhancing learning. Learners, according to their suggestions, develop understanding inside interactive social situations backed up with knowledge through collaboration with others, who receive knowledge of cultural value and seek new learning (Burns & Myhill, 2004).

In a study that addressed the effects of providing „procedural" opportunities for learning, Cooper & McIntyre (1994), discussed a model involving a continuum, starting from a discourse and extending through interactivity and interactive reaction, to a self-centred learning. According to them "interactive" teaching exists where teachers integrate with their plans as well as with knowing their students, provided that "teachers believe that the correct use of students" inputs will take place only within a framework of specific criteria based on the plans that precede the lesson they intend to provide" (Cooper & McIntyre, 1994: 639).

Interactive learning is achieved through maintaining a balance between direction, command, presentation, explanation, illustration, questions, discussion, exploration, confirmation, profound

thinking, evaluation and summarizing (DFES, 2002). Accordingly, we have to view interactive learning in its entirety, integrating as it does with teaching components inside the classroom.

There is large-scale agreement that the quality and level of interaction between the teacher and the learners is an important component of effective teaching (Kennewell, 2005). Brown et al. (1998) point out that the pattern of classroom organization should not be considered to be the main feature of good learning, but that it is better measured by the quality of interaction between the teacher and the students. Hargreaves et al. (2010), suggest that effective interactive teaching, which is distinguished by constant mutual interaction between the teacher and the learner, involves the exchange of thoughts and not traditional methods of „dictation, response and feedback" which results from a teacher's questions.

Muijs & Reynolds (2010), distinguish interactive learning in terms of the nature and efficacy of the interaction between the teacher and the students. They suggest that interaction enables the teacher to confirm that the learner understands the principles that have been taught. It helps the students to practice and master target skills and clearly highlights the way they think. It also helps the teacher to offer targeted learning support. They have drawn on US studies from the 1980s, which highlight the following as features of interactive learning:

 The use of questions to revise what has been learnt earlier at the start of the lesson and summing up what has been learnt at the end of the lesson.

 Creating a climate where learners are encouraged to answer questions.

The inclusion of strategic and high-level questions, open-ended questions and process-related questions.

- Assessing learners" answers and offering clear feedback, especially when the learner seems hesitant.

- Making learners interested by rephrasing or dividing questions in case there are incorrect or no answers.

- Allowing the learner sufficient time to answer.

- Having incorrect questions answered by other learners rather than the teacher.

- (Muijs & Reynolds, 2010)

- The UK National Literacy Strategy (NLS), in parallel with number strategy in the UK (DFEE, 1998a, 1999), called for a greater emphasis on interactive learning, having been considered one of the factors that lead to success - in conjunction with greater discussion, trust, ambition and learning tempo. It has also pointed out that learning becomes interactive when students" participations are encouraged, expected and enlarged (DFEE, 1998a: 8). Hargreaves et al. (2010, p. 224) defined nine different features of interactive learning based on teachers own interpretations of how to promote interactive learning:

- Students practice.

- Students' practical and effective participation.

- Students expanded participation.

- Cooperative activity.

- The transfer of knowledge and deep work patterns.

- Assessing and enlarging knowledge.

- Meaning exchange and formation.

- Paying attention to thinking and learning skills.

- Paying attention to students' social and emotional needs / skills.

Burns & Myhill (2004), have suggested some important features that interactive lessons offer; Mutual opportunities for discussion, which help children to develop independent voices during discussion; appropriate direction and patternization when the teacher organizes language and skills to think collectively; Environments that stimulate students" participation, and; raising students" level of independence.

Many studies in interactive learning emphasize the shift from high levels of teachers" control to greater self-centered learning on the students" part. It may be useful for future researchers to imagine interaction in teaching regarding interaction and scaffolding nature through dialogue. Kennewell, Tanner, & Beauchamp (2007), for example, expect interactive teaching to include several levels of interaction in order to cope with teaching objectives.

2.12 Can ICT affect Interactive Learning?

Using ICT effectively can lead to a more positive educational ethos in the classroom and in effect a more communicative classroom. Effective use of ICT by the teacher can offer greater interactivity at both a deep and surface level. We will explore the general use of ICT, but also its impact on interactivity within the classroom.

Cox et al. (2007), undertook a review of the research and then concluded that ICT had indeed had a positive effect on attainment in National Curriculum subject areas. They qualified this assertion by stating that it was not just the everyday use of ICT as a tool, but the skilful use of ICT by the teacher, when linked to careful pedagogical strategies enhancing classroom communication. In order to get the best use of ICT teachers have to be aware of ICT"s range and feature as a resource and should be deeply versed in ICT techniques. This conclusion was confirmed by Somekh and Davies (1999) and Sutherland (2005). They assert that the skillful use

of ICT by trained practitioners is absolutely key to higher attainment. ICT offers a range of key features including speed, automation, capacity, range, provisionally and interactivity (Beauchamp (2012).

2.12.1 Speed

Although ICT has offers massive capacity for improving the speed of teaching, it can be detrimental to younger (or less able) children if used too quickly. Learners" needs must be considered at all stages of planning and the pace and timing of the lesson adjusted to learner responses through ICT use when necessary and productive.

2.12.2 Automation

The development of materials, in terms of scale, creativity and choice was far more difficult before the advent of ICT - as was planning, recording and assessment of pupil progress. ICT has indeed become an integral educational aid for teachers and school staff.

2.12.3 Capacity

Linked to automation is storage capacity. ICT has offers high levels of increased storage capacity. Even small devices have huge memories which store great amounts of data. Some data networks are not even „wired connections" and as cloud storage can be accessed from anywhere, access to many sites is made easy and swift. ICT makes for an especially bright future when linked to innovative and creative pedagogies.

2.12.4 Range

There is now a wide variety of media easily accessed and available so that lessons can be ICT based. However, ICT should partner and complement traditional modes of teaching such as „Big Books and other materials, not just replace them.

2.12.5 Provisionality

Provisionality appears to have two components; temporariness and inventiveness. Lessons can be changed at will, at teachable moments, and content easily effaced as with Interactive Whiteboard (IWB) use. On traditional white or black boards writing was difficult to erase: this is not the case with IWBs. Things can be quickly relocated, deleted, or rearranged so speedily both remotely and in physical locations. Pedagogic materials can be created or destroyed at immense speed. The process of learning is seen to be more important than the product, but both are integrated during skillful use of ICT in the classroom.

It seems there is a common assumption that ICT, as a tool, provides learners with interactive experiences. The introductory programme for training teachers to use ICT, in use in the UK, explains a number of the merits provided by ICT tools and sources, which teachers have to understand they can benefit from - namely speed, spontaneity, understanding, specialization and interactivity (DfEE, 1998a). These characteristics give ICT its distinctive features as a learning tool compared to other tools and sources (Kennewell et al., 2008). It is possible that the embedding of ICT into teacher training programmes explains why the use of the ICT is perceptively more interactive to teachers.

ICT provides a number of advantages, both essential and combined, which contribute to broaden and designate the procedures used inside the classroom (Kennewell, 2007). The merits of speed and repetition for ICT are utilized when learners are able to see quick sequences for a specific phenomenon, which could help their understanding of the concept. This has actually been observed, for example, while students learn the method of building a reflected picture in mathematics. Here, they can circle the corners of the shape and then notice its effect on the reflected picture, while the teacher focuses their attention on the shape sides that have remained

unchanged. In this instance, the use of ICT helps them to build reflected pictures manually (Beauchamp & Kennewell, 2008).

According to Smith et al. (2005), teachers have provided the following reasons for their use of the interactive whiteboard:

A. Flexibility and multi-functionality.

B. Presentation of multimedia and the use of the different senses.

C. Saving the task and printing it out.

D. Interactivity.

E. Lesson preparation and saving.

F. Teaching ICT.

G. Interactivity and interchange.

Pedagogic beliefs significantly impact levels of interaction and communication. Traditional, transmission based models of teaching are inherently less reliant upon interactivity than constructivist modes, but interactivity must be promoted. Although there is no complete agreement on a full definition, interactivity has been defined as the ability of ICT to respond contingently to a pre-defined set of response (Beauchamp, 2012).

Teachers get bored quickly with providing negative or positive feedback across all lessons. Computers never tire in their feedback or in summative assessment, yet they cannot provide the detailed and individual levels of feedback that teachers can.

Interactivity is depicted by Hargreaves et al. (2010), as being of two types; the first is a gimmicky or surface form. This type can entertain but it is not necessarily educational in

48

function. It contrasts with deep interactivity which engages student's comprehension and promotes a deeper level of response. The surface type relates to factual recall type learning. The deeper type promotes greater thinking skills when coupled with dialogical teaching.

Smith et al. (2005), also argue two forms of interactivity, a technical form and a pedagogical one. They make the point that research shows that the pedagogic mode is the more important of the two. Pedagogies are shown to be more important than usefulness in ICT use.

Teaching has been to this point delineated as a socio-cultural activity, contextualized in a setting and orchestrated and organized by the teacher. It could be argued that teacher's pedagogical beliefs around interactivity can create strategies to facilitate higher attainment.

Interactivity as a concept may prove elusive to define, but Burns & Myhill (2004), provide a list of possible criteria being: reciprocal opportunities, guidance and modeling by teachers, provision of a setting or learning environment and lastly facilitation of autonomous learning. These authors provide a more open context for ICT use and partner it with skills of teacher guidance and communication.

In interactive teaching the role of the teacher is to support students in every aspect of their learning. However, their effort, interaction and participation play an important role in the acquisition and comprehension of knowledge. Consequently, they become ready to implement the method of learning constantly while they are at work. This is because in their practical life they will encounter problems other than the ones they encountered in their academic life, and so they will be ready to learn without any body's help. In effect, this is very important in today's job market, for the worker or employee to be educated, and if it is not so, he will not be useful for the employer. If he does not go beyond what he has achieved in his academic study, in the

49

medium term he will lag behind society and scientific advancements. However, Unal & Hakki Ozturk (2012) outlined the following barriers that may affect the ICT integration within classrooms: Lack of ICT Equipment in Classrooms, Lack of the ICT-Based Teaching Resources, Teachers Beliefs and Practices.

Learning Theories and Implication for ICT

In the 20th and 21st centuries, many scholars attempted to define teaching and learning. These definitions became theories of teaching and learning, created to try and clarify the meaning of both. Learning theories provide us with conceptual frameworks of interpretation for the act of learning, and show us where to look for solutions to practical problems. Teaching methods are in the main based on theories of learning. The most important learning theories are Behaviorism and Constructivism. These two approaches are based on two main schools of psychology that have influenced learning theory. They have different perspectives on learning, different perspectives on teaching styles, and different approaches to pedagogy and evaluation.

Constructivist learning theory has been used to study the impact of ICT on teaching and learning. This learning theory contributes to understanding both the construction of and relationship between curricula and events. It also provides direction for research and implementation.

2.12.6 Constructivist Principles

Learning theories based on mannerist and knowledge theories dominated the 20th century. Their principles have contributed to the enhancement of organized teaching practice through which the teacher transmits information and knowledge to students through methods similar to lecturing. Mannerist and knowledge directions placed little emphasis on students" input and their contributions in the teaching and learning process.

Generally, the following principles are drawn from the constructionist approach (Brooks & Brooks, 1999; Kanuka & Anderson, 1999):

- Learning is an active process through which the learner constructs meaning.

- There must be previous experience and knowledge for learning new things.

- Individuals learn for the sake of learning - learning constitutes the meaning and its systems.

- Motivation is regarded essential for learning.

- Learning practice is considered important for active learning. Practical training activities have to be emphasized.

- Learning represents a social activity, as our interaction with others is extremely important.

- Language is an important component of the learning process.

- Language is regarded as context-bound. Our learning is tied to what we know and believe in. It is also tied to our previous judgments and fears.

- Learning is not instant. It occurs over a period of time.

2.12.7 Constructivism and Constructionism

Partly in reaction to didactic approaches such as behaviorism and programmed instruction, constructivists have argued that learning is an active, contextualized process of constructing knowledge rather than acquiring it. This theoretical stance actively opposes traditionalist, didactic, transmissions of knowledge. Seymour Papert and Idit Harel in their book Situating Constructionism (1991), use the terms constructivism and construction almost interchangeably, but use Constructionism as it applies to Learning Theory.

Constructionism--the N word as opposed to the V word--shares constructivism's connotation of learning as "building knowledge structures" irrespective of the circumstances of the learning. Theorists like Edith Ackerman (2001), also see a smooth transition between constructivism and constructionism, between Piaget (1969), and Papers, seeing constructionism largely as a more situated learning theory, especially valuable in cybernetics and more socially contested than Paget's earlier work. She states:

Papers constructionism, in other words, is both more situated more pragmatic than Paget's constructivism [or Vygotskys socioconstructivism] Constructivism asserts that learning is an active, constructive process. The learner is an information constructor. The learner actively constructs or creates his/her own subjective representations of objective reality. New information is linked to prior knowledge, existing schemata always activated (Ackerman, 2001).

2.12.8 Constructive Classrooms

Constructivist theory emphasizes the importance of experience and learning based on experiments. Students play a pivotal role in the learning process. The teacher's role appears in directing and supporting students to construct meaning and understand situations.

Practitioners and scientists have claimed that constructionism cannot be implemented in a traditional knowledge environment. They suppose that constructionism goes beyond formal learning which relates to student's previous experiences.

During the learning process, students" activities are considered important and basic for constructing knowledge. Meaningful learning occurs when there is collaboration among learners, teachers, and specialists in this domain. Activities are not organized officially inside constructionist classrooms through timetables or plans that students are required to follow.

52

Students actively help in planning and organizing the activities within the classroom. This contributes to stimulating and encouraging them to think.

2.12.9 Criticisms of Constructionist Theory

Despite its progressive ideas about the nature of learning, constructionism evokes a number of criticisms. Fears surrounding its principles and applications are centered on the following (Roblyer & Edwards, 2000):

Permitting learning skill – Despite constructionist's condemnation of formal tests and objective assessments, schools need sometimes to authenticate the basic skills which the students have learnt. Previous knowledge – a lot of students lack the previous skills which enable them to deal with the complicated problems and solving them according to what constructionist strategies require. Selecting the most effective teaching – it is difficult for students to choose for themselves the methods through which they will learn to solve problems. Specifying suitable topics for constructionist methods – sometimes tension occurs when choosing appropriate topics for a particular event and when covering one topic deeply is preferred to talking in elaboration on many topics. Skill transfer to practical situations – fears also arise over the ease of transferring problem solving skills that were learnt in practical situations inside the school to problems which students have to solve in real life.

2.13 The application of ICT in a Constructivist Approach

Constructivism argues that learning is interactive and argues for the autonomy and active participation of the student. The learner is an information constructor and actively builds his/her own subjective representations of reality. New information is related to previous knowledge in terms of schema development.

Constructivism as a term covers a huge theoretical area. Constructivist learning theorists range from the individual cognitive and personal constructivism of Piaget, to the social constructivism of Vygotsky. There are many other types of constructivism but there are certain ideas that all constructivists have in common. Taber (2006), describes them as being:

1. The active construction of knowledge by the learner - knowledge is not passively received from the outside. Here the theory is vastly different from behaviorism, which defines learning as an externally modified behavior. Learning according to constructivists is therefore something the learner does, not something that the learner is compelled to do.

2. Learners have prior knowledge so they come to the learning situation with ideas about many things. These ideas are called schemas and teachers have to take them into consideration and make teaching relevant to these conceptual structures.

3. Learners haves their own individual ideas about reality and generate their own meaning structures to cope with everyday living.

4. Their ideas often contradict or clash with accepted scientific ideas or with school curricula and are culturally or socially conditioned.

5. Knowledge is described by these theorists as conceptual structures in the brain and it is possible to describe and to model them.

6. Instructional Design and teaching has to take the learner's prior knowledge into account if the educators want to achieve their educational aims and objectives.

7.   Knowledge is both personal and individual and at the same time has a social dimension. Learners construct their conceptual schemas by interacting with the social world, in social settings and within cultural and linguistic contexts.

2.14 ICT and Constructionist Theory

The use of ICT enables opportunities for learning environments and practices that require interaction among individuals, co-operation with chances to experiencing learning, and the principles which constructionism supports. Many educational establishments, especially at a post-secondary school level, work on supporting integrating technology into teaching and learning. Their research used small group discussions and their presentations after the research produced various interpretations of the subject matter.

According to Gance (2002), it is not always true to suppose that because technology facilitates student focused learning, constructionist strategies centered on learners are used to play a central role in their learning when ICT is utilized. At most times the use of software and the internet do not agree with the constructionist philosophy. For example, it could be argued that "a course about the internet individually directed towards learners does not emphasized cooperation, interaction or the software which is meant for training and which in practice can implement the constructionist pattern" Gance (2002:14). Additionally, Gance (2002), points out the flaws associated with some aspects of using ICT, notably in areas such as e-learning or subject-specific software. These methods are associated with short-answer or multiple choice testing. Constructionism invites students to show their understanding in more profound ways, to explain or confirm their knowledge through assembling the information extracted previously in the manner of a new conclusion or solution design. Such short answers do not allow this. The

present short tests based on technology, despite being a great improvement in programming technology, are not considered an improvement in the teaching process.

Technology may represent an important tool for facilitating and enhancing the implementation of the constructionist pattern; however, it is not the only method to be used as an example for constructionism. The use of only ICT to create a teaching environment that draws on constructionist principles will not give the required effect. Indeed, it may have a reverse effect through weakening constructionist practices (Gance, 2002).

2.15 Use of ICT in teaching and learning

2.15.1 Effectiveness of ICT on the role of teachers

Apparently, teachers' acceptance for new technologies seems to be controversial. Whilst some have effectively integrated ICT tools into the classroom, others have been cautious in their acceptance, and some have simply rejected these technologies. Of course, the role of the teacher in terms of using ICT must change so as to enable them cope with the recent developments.

Literature reviews in this field are important not only to teachers but also to policy makers who undertake supporting teachers in implementing ICT inside the classrooms. In this respect, Beauchamp (2008), found that teachers need to draw upon large volumes of suitable resources that they can draw on for specific targets and adjust to meet the requirements of the students. However, students need to have a level of ICT skills in order to deal with technology, and teachers should help the students with important tasks rather than waiting for the students to „push computer buttons in response to easy questions from the teachers". Accordingly, this means that the teacher has to be pro-active and confident with the technology themselves.

In order to clarify the teacher's role in implementing ICT in the classroom, some researchers considered the teacher's competencies related to ICT, for example, Nico, Ruttena & Wouter (2012), demonstrated that the use of computer simulations while teaching in the classroom will not be successful unless teachers have the necessary skills and information to implement them effectively. In addition, they reported that if teachers don't have the skills, the potential learning from computer simulations will remain out of reach. As an alternative, they may be used as demonstration experiments or be totally controlled by the teacher. In other words, the role of the teacher should focus on founding a pedagogical framework necessary for implementing computer simulations during teaching science.

Some researchers investigated the difficulties that teachers may encounter while implementing ICT. They revealed that the difficulties in the use of ICT are related to the weakness of a teacher's knowledge about what technologies are available and how they can be used in the educational process in the classroom. In addition, teachers should know how to use ICT in relevant ways to help them in the delivery of the curriculum (Morrisa, 2011).

As solution for this problem, it is necessary that teachers need to feel confident in their skills to assist student learning with technology, to incorporate technology into their classrooms. Therefore, this needs to become a more qualified development to increase a teacher's skill (Ward & Parr, 2010).

Other research has focused on the advantages that teachers gain from implementing ICT. For example, Hennessy et al., (2007), argues that teachers will benefit from the available technology in supporting students to build links between scientific theory and empirical evidence.

By adopting different approach, Greene (2008), found that there is lack of curriculum specific ICT resources. He asserts that teachers and students have good general ICT skills, although they do not get the same advantage from using online resources. Moreover, Greene found that teachers need to have the appropriate training on how to use ICT in teaching and learning. Nevertheless, teachers need to make the shift from traditional to the interactive pedagogies in a non-ICT context before being able to be familiar with the and their students. Ultimately, they noted that the use of ICT supported shared cognition, articulation, collective evaluation and reframing of student's ideas, and the structuring of new facts for students.

In the research article by Kennewell (2005), he found in his study of schools in Wales that teachers have evolved considerably and successfully in both course content and pedagogy through both individual and cooperative integration of ICT into their teaching methods. His findings support the idea that the teacher is the leader of the learning process in the classroom.

More studies continued on addressing the effect of teacher's attitudes towards ICT on students' learning. For example, Sangràa & Mercedes (2010), investigated four different schools and they noted that there is a favorable opinion from a large group of teachers regarding the use of ICT in education. Furthermore, they suggest that it is very useful for students and has helped in the development of learning processes such as attention visualization and response mechanism-application learning and also the understanding and transmission of information to facilitate knowledge. However, they have also found some negatives such as interaction skills of expression and communication skills that suggest that not all teachers are wholly embracing ICT. As conclusion, the teacher's attitude is vital in the educational process and the lack of interest shown by some teachers has an adverse effect upon the educational process in the classroom.

By considering the features related to teacher's skills in ICT, Figg & Jaipal-Jamani (2011), found that ICT pedagogical skills are important for teaching with ICT, across all topic areas. Particular features of teacher actions linked to the planning of ICT enhanced lessons across topics were recognized. Hence, features of good planning included: (a) Content centric goals for lessons, (b) Choice of technology-enhanced activity, (c) Differentiation strategies, and (d) Sequencing of activities. While implementation features included: (a) The fact that teachers need to become confident in using ICT in their daily teaching, (b) Knowledge of specific classroom management techniques for teaching with technology, and (c) Modeling strategies.

In other words, all these features are unique in how they are expressed by the teacher's actions in the classroom during ICT supported lessons. For example, all teachers should include margins for varied student learning when they propose their lessons plans. Teachers also need to have effective experience with ICT to support teaching – if the teacher has greater technical skills, it will be reflected on students.

Again, with regards to the contradictions in teachers' perspectives towards ICT, Handal (2011), examined the usage of ICT with secondary mathematics teachers in Australia. He notes that there are contradictions between teachers; some of them believe that ICT is beneficial in learning and teaching in the General Mathematics course but not suitable in the other Mathematics courses (Mathematics "2-Unit", Extension 1 and Extension 2). Moreover, there are two reasons for this contradiction: the first one being that the teachers found ICT detrimental to learning and the second reason is that there is misalignment between assessment and classroom practice. This result is consistent with what was described at the start of this section above.

In order to examine the usefulness of ICT in education, evidence needs to be examined from across the globe. However, there is diversity of opinion; some studies suggest that instruction in ICT is useful, with Liao (2004), suggesting "it is positive over traditional instruction in Taiwan". This Taiwanese study was supported by a Chinese study (Zhou, Hu, &Gao, 2010) from Shaanxi Normal University. Nevertheless, the second study examined only chemistry teaching, whereas Liaos subject area is not defined. This could indicate that ICT is less suitable, in some subject areas. This approach raises questions as to what precisely ICT suits the various subject areas, if such problem ambiguities are resolved by a fixed, global scale of optimal answers.

The studies of integrated holistic school curriculum have shown that, unlike the studies concerned with some subject areas, the question of ICT use across the whole school curriculum is very important (Ward & Parr, 2010). The study of Ward and Parr, situated in New Zealand, suggested two hypotheses. Firstly, the core academic subjects and their teaching are often sacrosanct in schools. Furthermore, the subjects are often qualification focused which reflects upon the school, therefore, they suggest that schools are unwilling to innovate with change of practice or the use of computers. Secondly, they suggest that even where there is an "overall school policy" that this may be interpreted differently at departmental level and with each individual teacher: According to this view, "This would seem to support the view that schools are complex, adaptive systems within which the adoption of any innovation is likely to follow unpredictable diffusion trajectories" (Ward & Parr, 2010).

Some studies addressed that the teacher is a key to the organization and orchestration of ICT in the classroom since both components have an enormous impact upon how a student learns (Sang et al., 2010) and can influence the students" perception of ICT in the classroom. Furthermore, this source raises the argument that teachers" attitudes should be challenged (Livingston & Rae

60

2006). Similarly, Condie (2005), supports the view of Sang et al. by using the analogy of either paddling at the water's edge or actually swimming. Hence, this evidence seems to suggest that the teachers' input is essential when examining the use of ICT in the classroom. Sang et al. (2010) take this a step further by suggesting that wading at the edge is not enough and reflects upon teaching competency.

However, one specific pattern of ICT-based studies has recently received a tremendous amount of attention from educational professionals and researchers. For example, the study of Al Khateeb (2000), was conducted to identify the attitudes of teachers in Irbid Governorate, in Jordan, towards instructional technology in relation to some independent variables such as gender, specialization and years of experience. The study sample consisted of 139 teachers (male and female) in public schools located in Irbid Governorate. The researcher used a questionnaire comprising 40 items, allocated equally into positive and negative attitudes, during the academic year 1998/1999. The results indicated the presence of positive attitudes among teachers within the study population regarding instructional technology. The results also showed that there are significant differences between teachers' trends toward instructional technology and the scientific qualification, in favor of those who are holding an undergraduate degree (BA) over those holding a College diploma (two years of study). Furthermore, the results indicated that there are no significant differences regarding the attitudes of teachers towards instructional technology between gender, specialization and experience.

To sum up, the findings in this study provide a new understanding of how teachers perceive instructional technology and what factors influence their views toward such technology. Furthermore, it appears that many variables may influence their views but not all. However, this study has only examined the teachers' attitudes, ignoring student's views.

With regards to ICT-based studies, Al Suba'ie (2002), in his major study, aimed to identify the attitudes of students and teachers on the use of ICT in teaching social studies. The researcher developed a questionnaire - one of the questions addressed by the study was: What are the attitudes of the social studies' teachers and their students toward implementing ICT as an educational means for teaching social studies? Ultimately, the results indicated that teachers and students had positive attitudes toward the usage of ICT in social studies lessons.

Unlike the Al Khateeb study, Al Suba'ie considered the students" views in his study in addition to the views of teachers regarding the usage of ICT in teaching and learning. He was also specific in addressing content related to the social sciences. However, his findings could not show any improvement related to academic achievement, at least in social studies, or any other cognitive or behavioral improvement associated with the ICT use.

CHAPTER THREE:

METHODOLOGY

3.0 Introduction

This chapter comprises of research design, population, sample and sampling technique, instruments, data collection instrument as well as data collection procedure, Situational Analysis (pre intervention), Intervention, Post intervention, data Analysis and Presentation, Data Quality and Ethical Issues.

3.1. Research design

This study employed action research design. The study was concerned with the attitude of teacher's towards the use of ICT in St Peter's JHS at Tamale in Ghana. It is intended to show the relationship between teachers training on ICT and integration of ICT in teaching and learning. This study covered only teachers at St Peter's JHS.

In a similar vein to the enhancement of the professional disposition of teachers, action research encourages teachers to become continuous learners within their classrooms and schools (Mills, 2011). Because of the professional, reflective stance required by practitioners engaged in action research sequence, teachers are further encouraged to "examine the dynamics of their classrooms, ponder on the actions and interactions of students, validate and challenge existing practices, and take risks in the process" (Mills, p. 46). These specific actions are similar to those regularly exercised by teachers on a daily basis; using a systematic, strategic action research plan provides those daily actions with increased structure, focus, and methodological rigor.

3.2. Population

The population of the study was 14 teachers teaching at St Peters JHS in Tamale which made up of 9 males and 5 females. Most of the teachers are first degree holders out of a total number of 14 teachers only one holds a masters degree, 12 hold a bachelor degree and the remaining one holds a diploma. 50% of the teachers are from the ages 26 – 35, 21% of the age 36- 45 the same percentage have ages from 46- 55, 7.1 % are above the age 55. Most the teachers have more than 10 years teaching experience. All the teachers in the study own personal computers. This target population was chosen because it's made up of trained teachers who were implementing the same curriculum, and employed and remunerated by the same employer that is, Ghana Education Service. This target population was appropriate because it meant that the respondents were working under more or less same environment and influenced by same fact.

3.3. Sample and Sampling Technique

The sample comprised of 14 teachers teaching in St Peter's JHS in Tamale, which is the total number of teachers in the school. The sample was found to have the following characteristics; they were employed by the same employer, they all teaching in public schools and had a form of basic training in ICT.

3.4. Data Collection Instruments

Questionnaire with both close ended and open ended items were used. The questionnaire had a total of 14 items, 3 items were on personal information of respondents, 2 items were on training needs assessment,4 items were on modes of training, 3 items were on ICT infrastructure available in schools, 1 item on challenges of ICT integration, and 1 item on Solutions to ICT integration challenges. The items on challenges and solutions to ICT integration were open-ended questions and the rest were closed- ended. Questionnaire method of collecting data was

64

chosen for this research because all the respondents were literate hence there was no difficulty in filling the questionnaire. Questionnaires are also most suitable for collecting a lot of data when time is limited. This research was mainly concerned with variables that cannot be directly observed like training, such information is best collected by questionnaire.

3.5. Data Collection Procedure

Data was collected using qualitative and quantitative, and from a target population of estimated 14 teachers in the school. Data was collected using Questionnaire, interview and observation. Questionnaires were administered to teachers who had already undergone at least basic training in ICT. Questions were mainly closed- ended with only two open-ended questions. The questionnaires were personally administered to the respondents by the researcher since the sample size was small.

3.6.1 Situational Analysis (Pre-intervention)

Pre-testing is necessary especially when the study is complex and sample is large and where resources (money and Time) are available, that is according to Mugenda and Mugenda (2003). This study was neither complex nor having a large sample hence it would be uneconomical to pilot the study. Instead five questionnaires were being given to five teachers to fill so as to check for any weakness in the questions in terms of ambiguity or any other error. There were no major error but minor errors were rectified.

3.6.2 Intervention.

There was a comprehensive three day workshop for all the teachers on the integration of ICT by RLG. Because of the government flagship "RLG" programme, all GES teachers have had some

hands-on professional training to develop their expertise in the use of ICT in their teaching, as a result all teachers at St Peter's JHS benefited.

3.6.3 Post Intervention

Data was collected after the intervention to find out if the implementation was successful. The training impacted on their bearing in class with the use of ICT tools.

There was improvement in the performance of pupils.

3.6.4 Data Processing and Analysis

Data was analysed SPSS software version 22. The data was appropriately coded for easy analysis. For instance, Male and female participants were coded '0' and '1' respectively. Similarly responses that demanded yes and no were respectively coded as '0' and '1'. Having checked that all data was correctly entered I analysed it using frequencies and percentages.

3.6.5 Data Quality and Ethical Issues

The validity of a research instrument refers to the extent to which it measures what it is supposed to measure (Gronlund, 1988). In this study the instrument was subjected to face validity and content validity tests. Face validity merely establishes that the tool seems as appropriate way to find what is being measured (Amin, 2005). To ensure face validity of the instrument, the researcher gave the questionnaire to teachers who were included in the sample to read through and make corrections and suggestions on the clarity of items and response options and fitness or alignment to the research questions. After making the necessary corrections, the questionnaire was considered to have attained face validity. On the other hand content validity focuses upon the extent to which the content of an instrument corresponds to the theoretical concept it is designed to measure. To evaluate the content validity of the instrument the researcher scrutinized

the questionnaire, checked the relevance of items to the objectives of the study. This was confirmed by the researcher's supervisor.

CHAPTER FOUR

RESULTS AND DISCUSSION OF PRE AND POST INTERVENTION STRATEGIES

4.0 Introduction.

Data was analyzed using the Statistical Package for the Social Sciences (SPSS for Windows), version 22. Furthermore, the technique of content analysis was used to analyses the open-ended response. Categories for the analysis of the open-ended responses were derived from the review of related literature. The analysis was done in two parts. The first part contains the analysis of demographic background information provided by the subjects and the second part deals with the analysis of data aimed at answering each of the research questions. In addition, a sample of the comments made by the teachers, in their own words, has been included

4.1 Demographic Characteristics of Respondents

Socio-demographic characteristics such gender, age range, academic qualification, years of teaching experience, level of computer training and access to a computer where obtained. Results are presented in Table 4.1.

TABLE 4.1 SOCIO DEMOGRAPHIC CHARACTERISTICS OF RESPONDENTS

Variable	Components	Frequency	%
Teacher gender	Male	9	64.3
	Female	5	35.7
Total		14	100
Levels of	Master's degree	1	7.1

education	Bachelor	12	85.7
	Diploma/HND	1	7.1
Total		14	100
Teachers' Age	26-35	**7**	50.0
	36-45	3	21.4
	46-55	3	21.4
	56 and above	1	7.1
Total		14	100
Duration of Teaching(years)	3-5	6	42.9
	10 or more	8	57.1

Source: Field survey 2017

From the Table 4.1 majority of the respondents where males representing 64.3%, whiles only 35.7% of the remaining respondents are females. So the research revealed that more males participated in the study than their female counterpart. The table above shows that most of the teachers in the school are first degree holders. Out of a total number of 14 teachers 1 holds masters, 12 hold a bachelors degree and the remaining one is a diploma holder. The age distribution table above shows the age distribution of the teachers in the school. From the table above, it is evident that 50% of the teachers are from age 26 to 35, 21.% are of the ages 36 to 45 and the same percentage have ages from 46-55. 7.1% are above age 55.The aim of this objective is to determine how long the teachers in the school have served and also determine how much information they can give relating to the subject in question. The table above shows that most of

the teachers have more ten years of teaching experience. This means they would be able to give the researcher some good responds since they are experienced in the field.

4.2 PRESENTATION OF RESULTS DATA

TABLE   4.2 DO YOU OWN A PERSONAL COMPUTER

Responses	frequency	%
Yes	14	100
No	0	0
Total	**14**	**100**

Source: Field survey 2017

All the teachers in the study revealed they owned personal computers. Some bought by themselves whiles others benefitted from the flagship RLG nationwide free laptop distribution programme by the government

TABLE 4.3 IS IT CONVENIENT FOR YOUR USE IN TEACHING?

Responses	frequency	%
Yes	5	35.7
No	9	64.3
Total	**14**	**100**

Source: Field survey 2017

When teachers were asked whether is convenient for them to use ICT in teaching, majority (64.3%) respondent no to the question, whiles 35.7% agreed is convenient for their usage. Even though all the respondents according to the study own personal computers, they still do not find it convenient using ICT tools in teaching

TABLE 4.4 HAVE YOU PARTICIPATED IN ANY PROFESSIONAL DEVELOPMENT PROGRAMME IN ICT

Responses	Frequency	Percent
YES	14	100.0

Source: Field survey 2017

The study revealed that because of the government flagship "RLG" programme, all GES teachers have had some hands-on professional training to develop their expertise in the use of ICT in their teaching. The training has impacted on their bearing in class with the use of ICT tools.

TABLE 4.5 DOES YOUR DEPARTMENT HAVE A POLICY TO SUSTAIN ICT?

Responses	Frequency	Percent
YES	14	100.0

Source: Field survey 2017

The study indicated that Ghana Education Service have rolled out a policy on ICT. This policy is to offer some efficacy training to all teachers on some regular basis and to empower them to integrate ICT into their teaching and learning. Base on this, all the respondents agreed that there is a policy guideline to sustain ICT in the teaching and learning fraternity

71

TABLE 4.6 KNOWLEDGE ON FINDING INFORMATION ONLINE FOR TEACHING

Responses	frequency	%
Excellent	2	14.3
Good	2	14.3
Satisfactory	6	42.9
Learning	3	21.4
Poor	1	7.1
Total 14 100		

Source: Field survey 2017

The study sought to find out the various ways teacher apply ICT knowledge in gathering information for their daily teaching, majority of them, which is about 42.9% revealed that they can apply ICT knowledge satisfactorily in their teaching, whiles a minority of about 7.1% indicated they are very poor in the application of ICT in finding information online for teaching.

TABLE 4.7 USING ICT IN COMMUNICATING WITH COLLEAGUES

Responses	frequency	%
Excellent	1	7.1
Good	4	28.6
Satisfactory	6	42.9

Learning	3	21.4
Total 1	**4**	**100**

Source: Field survey 2017

All the teachers own mobile phones and laptop computers according to the study, majority representing 42.9% confirmed that are can use ICT to communicate with colleagues to share ideas in several areas of teaching. 7.1 percent of the respondents revealed they are excellent when it comes to the use of ICT in communicating with colleagues and friends alike

TABLE 4.8 USING IT TO PREPARE NOTES FOR TEACHING

Responses	**frequency**	**%**
Excellent	1	7.1
Good	4	28.6
Satisfactory	8	57.1
Learning	1	7.1
Total	**14**	**100**

Source: Field survey 2017

In finding out whether teachers use ICT to seek information to help them prepare adequate and appropriate notes for teaching, 57.1% representing majority said they are satisfied with their ability to use ICT in preparing their lesson notes. Whiles 7.1% of the respondents are at the learner's stage in the use of ICT in preparing their lesson notes. They can barely use their phones or laptops to seek more information, or prepare slides to facilitate their teaching in class. Some of the actual words of the participants have been quoted in seeking answers to their level of knowledge and ability to apply ICT in their teaching "It gives me the opportunity to have useful

and current information on the subject matter" "It helps me to better update the material to give students and also helps them to be better exposed to recent happening around the world. In fact, to match with changing times" "It is less stressful, clean (no dirt) students do most of the work themselves, many more examples can be projected from CDs and Encarta etc".

"ICT provides fast and sure means of getting information on a new topic. It provides demonstrations that help in the understanding of some concepts".

"It is more current in new knowledge than textbooks because new discoveries are fed into it for exploitation than textbooks. The laptop for instance provides a very portable parcel of knowledge to carry along. It is easy in recording and analyzing statistics".

TABLE 4.9 NO IMPORTANCE IS ATTACHED TO ICT USE IN TEACHING

Responses	frequency	%
Strongly Agree	8	57.1
Agreed	3	21.4
Uncertain	2	14.3
Disagreed	1	7.1
Total	**14 100**	

Source: Field survey 2017

Majority of the respondents representing 57.1% lamented that GES and their school do not attach any importance to IT education. They provide them with laptops and some professional training, but computer laboratories are not provided for them to teach the students. Lessons are taught abstractly and teachers do not have the capacity to practicalize lesson even if they wish to do so.

Minority of about 7.1% however do not agree with the assertion that no importance is attached to IT education. The training sessions too are not regular and concepts are taught in a one-day rushed in-service training workshops which do not solve the problems of the ordinary teacher.

TABLE 4.10 LACK OF MOTIVATION AFFECTS THE USE OF ICT IN TEACHING

Responses	frequency	%
Strongly Agree	4	28.6
Agreed	10	71.4
Total	**14**	**100**

Source: Field survey 2017

The study revealed that all the respondents at different levels agreed unanimously that teachers are not motivated to use ICT to teach. They lack the zeal in applying ICT skills in their teaching resulting mainly from the fact that they are not adequately empowered to do that.

TABLE 4.11 LACK OF ICT KNOWLEDGE FOR TEACHERS

Responses	frequency	%
Strongly Agree	1	7.1
Agreed	2	14.3
Uncertain	2	14.3
Disagreed	5	35.7
Strongly disagreed	4	28.6
Total	**14**	**100**

75

Majority of the respondents representing 35.7% disagreed to the assertion that teachers lack adequate knowledge in the use of ICT in teaching. The respondents revealed that since teachers are given laptops and intermittent training on ICT, they are adequately empowered to integrate ICT in their teaching. However, 7.1% of the respondents strongly agreed that teachers still lack knowledge in ICT following the lazy nature of the implementation of the ICT policy in the schools. It does not place them in any better position to be able to integrate ICT in their teaching

TABLE 4.12 NO ACCESS TO ICT EQUIPMENT

Responses	frequency	%
Strongly Agree	5	35.7
Agreed	6	42.9
Uncertain	3	21.4
Total	**14**	**100**

Source: Field survey 2017

The study revealed that 42.9% representing majority of the respondents agreed there are no ICT equipment in the schools to work with. Teachers do not have access to these resources to be able to teach adequately. But 21.4% of the respondents are uncertain as to whether the resources are available or not.

TABLE 4.13 LACK OF TRAINING AFFECTS ICT USE IN TEACHING

Responses	frequency	%
Disagreed	4	28.6
Strongly Disagreed	10	71.4
Total	**14**	**100**

Source: Field survey 2017

The research sought to find out whether lack of training affects the use of ICT by teachers in their teaching and learning. All the respondents at different levels disagreed strongly to the assertion. They believe teachers are trained on how to integrate ICT in their teaching and learning, so they should be able to do so

TABLE 4.14 NO RELATED TASK INCENTIVES AFFECTS THE USE OF ICT IN TEACHING

Responses	frequency	%
Strongly agreed	8	57.1
Agreed	6	42.9
Total	**14**	**100**

Source: Field survey 2017

Unanimously, all the respondents in the study at different levels strongly agreed that teacher's inability and laziness to apply ICT in their teaching is as a result of the lack of incentives. GES do not allocate some incentives for teachers who try to integrate ICT into their teaching; this

demotivates them in this regard, so they stick to the traditional forms of teaching in their various classrooms.

4.3 DISCUSSION

Overall, the participants showed positive attitudes towards the computer. The overall positive level of computer attitudes could be attributed to the availability and accessibility to computers given to the teachers during the free nationwide distribution period.

In 1997, an initiative implemented by Singapore's Ministry of Education called the *Master Plan for IT in Education* (Master plan) ensured that all students would be given access to an IT-enriched environment in schools, starting at the primary level (MOE, 1997). This is similar to the module in Ghana where the government is committed to furnishing all schools with computers and making ICT the centre of education. Apart from increasing the use of computers in schools, this initiative has also contributed towards increasing home computer ownership among the students, which could have promoted greater opportunities with Computers and related technologies, especially the Internet. Chronologically, the participants of this study would have benefited from the goals of the *module* in ways that may have shaped their computer attitudes in a positive direction.

In part, using computers more frequently and developing a variety of computer related skills and techniques increases one's knowledge of the computer as a whole. This widens one's learning horizon and potential that in turn promotes a positive feeling towards the computer (Houtz &Gupta, 2001). The result of this study shows that years of computer usage is positively correlated with level of computer confidence. While this may seem obvious, it is important that

the length of computer use is associated with the successful use of the computer in order that positive feelings can be fostered (Huang & Liaw, 2005).

Otherwise, a prolonged unsuccessful period of computer use may serve as a barrier instead of facilitating further usage of the computer (Lim & Khine, 2006).

4.3 Challenges Hindering the Effective Implementation of Programme

Over the past 25 years, alongside a series of national and local programs for the development of ICT in education, there have been research studies of the uptake of ICT in education. These include studies of the effects of teacher training (Cox, Rhodes & Hall 1988), levels of resources (Cox, 1993), teachers' pedagogies and practices (Watson, 1993), and teachers attitudes (Woodrow, 1990).Passey and Samways (1997), also made this assertion in their research paper. Many of these studies have shown that in spite of teacher training programs, an increase in ICT resources and the requirements of national curricula there has been a disappointingly slow uptake of ICT in schools by the majority of teachers. Some of the reasons for this lack of widespread uptake of ICT are discussed in more detail below.

Understanding the need for change

In a study of projects to promote educational changes in America, Canada and the UK, Fullan (1991), found that one of the most fundamental problems in education reform is that people do not have a clear and coherent sense of the reasons for educational change, what it is and how to proceed. Thus there is much faddism, superficiality, confusion, failure of a change programs, unwarranted and misdirected resistance and misunderstood reform. They maintain that teachers who resist change are not rejecting the need for change but they are often the people who are expected to lead developments when they lack the necessary education in the management of

79

change and are given insufficient long term opportunities to make sense of the new technologies for themselves.

Questioning professional practice

There are many studies which have shown that teachers are "not given to questioning their professional practice" (Underwood, 1997). Once they have finished their initial training they do not expect to need much further training therefore do not take the initiative to improve their practice and learn new skills. Desforges (1995), in a literature review of the shift from novice to expert teachers, found that "many teachers are perfectly well satisfied with their practices and are unlikely to question prevailing educational processes" (Feiman-Nemser & Buchanan (1985) in Desforges (1995)). In order for teachers to make changes to their professional practice, according to Desforges "a considerable effort is necessary to create the possibilities of restructuring knowledge (about teaching and learning) in the face of experience. In regard to old knowledge we can speculate that the impact of new experience (e.g. using ICT) will be severely attenuated if it is in conflict with teachers' basic ontological categories, e.g. their beliefs about the nature of their job or the nature of childhood". Therefore if teachers see no need to change or question their current professional practice they may not accept the use of ICT in their teaching

Pedagogical practice versus technical skills

Previous studies (Cox et al, 1988, Cox, 1994) have shown that until recently the majority of courses offered in the UK to train teachers in the uses of ICT have focused on the technical aspects of ICT with little training about the pedagogical practices required and how to incorporate ICT in the curriculum. In many ICT professional development courses, teachers are not often taught how to revise their pedagogical practices, how to replace other traditional lessons without depleting the curriculum coverage and so on. This means that after teachers had

80

attended a course they still did not know how to use ICT for teaching pupils, They only knew how to run certain software packages and to fix the printer. There were many such courses offered all-round the UK which had very little long term impact on the uptake of ICT in schools.

Support from the whole school

Much research by Fullan (1991), and others has shown that the most effective way to bring about the adoption of an innovation in schools is to engage the whole school in a democratic process of planning change. This means that all the teachers are involved in the decision to adopt ICT in the school and are supportive of any individual teacher going on a course and willing to learn from their new knowledge and skills when they return. If the school, and particularly the head teacher, are not committed to adopting change and particularly ICT, then if one teacher goes on a course, the rest of the school sets up antibodies to any new ideas which the unfortunate teacher brings back into the school. The last thing the other teachers will then do is to change their practice.

Losing control of the learning

The majority of teacher's first priority is to maintain order in the classroom and to have a controlled learning environment. Any suggestion of adopting very innovative teaching techniques such as using ICT is therefore seen as threatening this orderly pattern and therefore not desirable. There is a genuine fear amongst many teachers about ICT and skepticism of its value to their pupils.

Inadequate resources

Even if the above problems are overcome there is often a difficulty for teachers who have had some training to be able to use ICT because there are insufficient ICT resources in the school or there is not enough time to review then and plan lessons incorporating their use.

In spite of the problems listed above and many others, some positive things have been learnt from previous experiences of different initiatives and training programs. Where schools have had the backing of the head teacher and there is a long term policy for the school to integrate ICT into the teaching and have been successful in gradually developing the use of ICT in different areas. Projects in which individual teachers have been given portable computers to develop their own personal ICT skills have shown that, teachers then start to use them in their teaching as well. (NCET, 1994).Teachers who have gone on longer courses, spread over a year have had the time to practice in between sessions back in schools and have had the time to assimilate enough expertise and knowledge to be able to continue to use them within their curriculum. (Cox, Rhodes & Hall, 1988).More recently, studies of teachers who belong to an Internet network of supporting teachers, such as the Miranda Net, have shown that the support enables them to use them in their teaching even if few other teachers in the school are doing so (Preston, 1999).

Lessons from the past have shown us that there are effective as well as ineffective strategies for providing professional development for teachers which will lead to their successful integration of ICT in their teaching. The next section discusses some of the specific skills which teachers need to have to make the best use of ICT in the classroom.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.0 Introduction

Teachers are change agents in schools. They are key drivers who play crucial roles in technology integration in the schools and classrooms. It is important for them to possess positive attitudes towards the use of ICT since attitudes have been found to be linked to usage and intention to use, ICT in teaching and learning situations. Teachers positive attitudes in the current study have a special significance given the limitations characterizing the current status of ICT in Cameroon schools: insufficient computer resources and teachers" lack of computer competence. Since positive attitudes toward ICT usually foretell future computer use, policy-makers can make use of teachers positive attitudes toward ICT to better prepare them for incorporating ICT in their teaching practices. Training therefore, should be offered to teachers on a continuous, rather than a one-off basis so that their ICT knowledge is upgraded over time. It is indeed hoped that the benefits from the use of ICT can be fully realized and optimized in teaching. Teachers should also be given the opportunity and encouraged to reflect on, and make decisions about their own ICT development needs on on-going basis.

5.1 Summary

Information and communication technology (ICT) has the potential to transform teaching and learning processes. However, most countries face challenges in measuring the impact of investments in infrastructure, massive roll-outs of teacher training initiatives, and usage in the classroom. The lack of a comprehensive set of indicators can partly explain current challenges. Moreover, there is a growing recognition that added focus is needed to measure teacher training and usage holistically within a systems perspective whereby indicators are not viewed in

83

isolation but reflect a complex pattern of how teachers are prepared and how teaching activities with pupils, in and out schools and the classroom are executed (Partnership on Measuring ICT for Development, 2010).

This study has been developed to help strengthen the conceptual framework of ICT in education with specific reference to the importance of collecting data relevant to teacher training in relation to ICT and its usage in the classroom.

More specifically, this study attempts to asses current indicator gaps in teacher professional development and training by asking basic questions, including who is being trained in the use of ICTs, where and how teachers are trained, what kind of ICT training is provided and based on which certification standards, and finally, when and for how long are teachers trained? Based on an analysis of these issues, additional indicators are suggested. This study also examines teacher usage of ICT in delivering instruction and makes a case for including cross-cutting elements that point to teachers' usage of ICT-enhanced pedagogy, digital curriculum and assessment, ICT in education policy, ICT infrastructure, and ICT used for administrative and organizational purposes. The teaching of basic computer skills and computing is also addressed.

5.2. CONCLUSION

Education at all levels in Ghana faces a lot of problems, among them shortage of basic instructional resources such as textbooks, and teacher-cantered instructional approaches, among others. The use of ICT has the potential to help solve the problems. However, for schools to maximize the benefits of ICT requires, among other things, that teachers possess positive ICT attitudes. This study has contributed to knowledge which can be used to inform policy, practices as well as future research in the area of ICT use. It has empirically captured, from the perspective

of teachers, reasons for negative and positive attitudes in the use of ICT by teachers. Furthermore, teachers have also suggested what needs to be done to build and nurture positive attitudes among their colleagues. It is hoped that the findings will be used to cause reflections and adoptions of actions to increase the number of teachers who adopt the use of ICT with the likelihood of making teaching and learning more student than teacher cantered.

5.3. RECOMMENDATIONS

The findings lead to recommendations for policy, practice and further research.

Recommendation for policy makers:

The government needs to adopt and implement policies that enhance the acquisition and use of ICT by teachers in St Peter's JHS.

- Provision of support to teachers. Support can take many forms, such as computer and its accessories, scholarships, exchanger, visits for ICT learning etc. Besides the adoption and implementation of enabling policies, teachers need to be trained on how to use ICT. Such training should be continuous because we live in a rapidly changing world and ICTs are rapidly changing.

- Actions should be built into policies that encourage teachers to use ICT more – and more effectively. Policies in this area should include measures raising the confidence levels of teachers (sufficient on-site support, appropriate in-service and initial teacher training in ICT and rewarding the use of ICT (such as appraisal schemes, making good ICT use part of career paths, or time benefits for teachers engaged in ICT related projects).

- Integration of the ICT strategy into the school's overall strategies. If the ICT strategy is integrated into the school's overall strategy ICT has the greatest potential to act as a

catalyst for change. Furthermore this overall strategy needs to be developed and evaluated by all school actors and not only by the head teacher in collaboration with the ICT coordinator, thus establishing a culture of collaboration and commitment and making it more likely that the policy is actually solving a problem that teachers and students are facing. There is need for greater cooperation between all stakeholders in order to take away wrong expectations, unnecessary fears and manage doubts.

Recommendation for practice:

Professional training (both in-service and pre-service) should be provided for teachers by researcher to equip them with the required skills for ICT-integrated teaching and learning. The parents, NGOs, industrial sector, ICT producing companies, all employers of labor, and the international community must not leave the job of making schools ICT-integrated to the government, but rather all hands must be on deck to ensure the technological change.

Efforts such as improving teachers' skills towards the use of ICT to teach must also be made by the teachers to relieve the fear of students in using a computer. They should be encouraged to feel comfortable in using computers and be guided to realize the advantage of such use.

Recommendation for further research:

This study investigated the attitudes of teachers. There is need for more studies involving larger samples from different parts of the country and other stakeholders (for example, school administrators, students, among others). Research involving the use of designs other than action is also encouraged.

REFERENCES

Aguti, J. N., & Fraser, W. J. (2006).Integration of Information Communication Technologies in the Distance Education Programme, Makerere University, Uganda. Turkish Online Journal of Distance Education, 7(3), 89-104.

Allen R. (2001). Technology and learning: How schools map routes to technology's Promised Land. ASCD Curriculum Update, 1-3, 6-8.

Alkanani, T. Y. (2012). The reality and the barriers of using educational technology in teaching social subjects in intermediate stage in boys schools in Al-Qunfoda province. Master dissertation, Umm Al-Qura University. [Arabic]

Alotaibi, W. S. A. (2011). The reality of the usage of educational technology in teaching science curricula in teaching science curricula in secondary stage as perceived by female teachers in Haiel city. Master dissertation, Umm Al-Qura University. [Arabic]

Al-Omran, H. (2007). Learning resource centres in Saudi Arabia: A study of the reality with a plan for an ideal centre.

Bhasin, B. (2012). Integration of information and communication technologies in enhancing teaching and learning. Contemporary Educational Technology, 3(2), 130-140. doi:324

Becta.(2004). A review of the research literature on barriers to the uptake of ICT by teachers. Retrieved June 10, 2017, from

http://partners.becta.org.uk/page_documents/research/barriers.pdf

Baylor, A. L., & Ritchie, D. (2002). What factors facilitate teacher skill, teacher morale, and perceived student learning in technology-using classrooms? Computers & Education, 39, 395414.

Bate, F. (2010). A bridge too far? Exploring beginning teachers' use of ICT in Australian schools. Australian Journal of Educational Technology, 26(27), 1042-1061.

Baek, Y.G., Jong, J., & Kim, B. (2008). What makes teachers use of technology in the classroom? Exploring the factors affecting facilitation of technology with a Korean sample. Computers and Education, vol.50, no. 8, pp. 224-234.

Bingimlas, K. A. (2010). Evaluating the Quality of Science Teachers' Practices in ICT-Supported Learning and Teaching Environment in Saudi Primary Schools. PhD thesis, RMIT University.

Balanskat, A., Blamire, R., &Kefala, S. (2006). A review of studies of ICT impact on schools in Europe: European Schoolnet.

Benson, R., & Palaskas, T. (2006).Introducing a new learning management system: An institutional case study. Australasian Journal of Educational Technology, 22(4), 548-567.

Bhasin, B. (2012). Integration of information and communication technologies in enhancing teaching and learning. Contemporary Educational Technology, 3(2), 130-140. doi:324

Brown, M., Askew, M., Baker, D., Denvir, H. and Millett, A. (1998) 'Is the National Numeracy Strategy research-based?', British Journal of Education Studies, vol. 46, pp. 362-385.

Burns, C. and Myhill, D. (2004) 'Interactive or Inactive? A consideration of the nature of interaction in whole class teaching', Cambridge Journal of Education, vol. 34, no. 1, pp. 35-49CRDD—Curriculum Research and Development Division (2007a).Teaching Syllabus for Information and Communications Technology (Core): Senior High School. Accra, Ghana: Ministry of Education Science and Sports.

CRDD—Curriculum Research and Development Division (2007b).Teaching Syllabus for Information and Communications Technology (Core): Junior High School. Accra, Ghana: Ministry of Education Science and Sports. CRDD—Curriculum Research and Development

Cheong, D., & Kim, B. (2009).A simulation for improving teachers' motivational skills. In D.

Garet, M., Porter, A., Desimone, L., Birman, B., & Yoon, K. (2001). What makes professional development effective? Results from a national sample of teachers. American Educational Research Journal, 38(4), 915-945.

Christensen, R., & Knezek, G. (2008). Self-report measures and findings for information technology attitudes and competencies. In J. Voogt & G. Knezek (Eds.), International handbook of information technology in primary and secondary education (pp. 349–366). New York, NY: Springer.

Cooper, P. and McIntyre, D. (1994) 'Patterns of Interaction Between Teachers' and Student' Classroom Thinking and Their Implications for the Provision of Learning Opportunities.', in Teaching and Teacher Education, London, UK: Routledge.

Cox, M.J. and Marshall, G. (2007) 'Effects of ICT: Do we know what we should know?', Education and Information Technologies, vol. 12, no. 2, June, pp. 59-70.

Dawson, C., & Rakes, G. C. (2003).The influence of principals' technology training on the integration of technology into schools. Journal of Research on Technology in Education, 36, 29-49

DfES (2002) Framework for teaching ICT capability, London, UK: DfES.

Gibson & Y. Baek (Eds.), Digital simulations for improving education: Learning through artificial teaching environments (pp. 227-248). Hershey, PA: Information Science Reference.

Darling-Hammond, L. (1997). The right to learn: A blueprint for creating schools that work. San Francisco, CA: Jossey-Bass.

Dawes, L. (2004). Talk and learning in classroom science. International Journal of Science Education, 26(6), 677-695.

Division (2007c).Teaching Syllabus for Information and Communications Technology (Core): Primary School. Accra, Ghana: Ministry of Education Science and Sports.

Edmondson, A. (2003). What Styles of Computer Training Enhance Teachers' Competence and Confidence to Use ICT?. Retrieved June 25, 2017, from http://www.becta.org.uk/research/reports/docs/cpd_edmondson.pdf

Ely, D. P. (1999).Conditions that facilitate the implementation of educational technology innovations. Educational Technology, 39, 23-27.

Finger, G., Russell, N., & Russell, G. (1999, December). Information technology and Australian teachers: Real time: Computers, change and schooling. National sample study of the information technology skills of Australian school students. Paper presented at the Annual Conference of the Australian Association for Research in Education, Melbourne, Vic.

Ghana Government.(2003). The Ghana ICT for accelerated development (ICT4AD) Draft policy. Ministry of Communication. Accra: Ghana Government. Retrieved August 22, 2017, from http://www.ict.gov.gh

Gao, P., Tan, S. C., Wong, F. L., Choy, D., & Wang, L. (2010). Nurturing pre-service teachers understanding of technology-enhanced pedagogy through reflection. In C. Steel, M. Keppell, P. Gerbic, & S. Housego (Ed.), Curriculum, technology & transformation for an unknown future. Proceedings ascilite Sydney 2010, (pp. 353-363). Retrieved July 16, 2014, http://ascilite.org.au/conferences/ sydney10/procs/Gao-full.pdf

Giordano, V. (2007). A professional development model to promote internet integration into P-12teachers' practice: A mixed method study. Computers in the schools, vol. 24, no.3/4, pp. 111-123

Gorder, L. M. (2008). A study of teacher perceptions of instructional technology integration in the classroom. Delta Pi Epsilon Journal, vol. 50, no. 2, pp. 63-76.

Harris, J., Mishra, P., & Koehler, A. M. (2009). Teachers' Technological Pedagogical Content Knowledge and Learning Activity Types: Curriculum-based Technology Integration Reframed. Research on Technology in Education, 41(4), 393–416.

Hargreaves, L., Moyles, J., Merry, R., Paterson, F., Pell, A. and Esarte-Sarries, V. (2010) 'How do primary school teachers define and implement 'interactive teaching' in the National Literacy Strategy in England', Research Papers in Education, vol. 18, no. 1, pp. 217-236.

Hennessy S., Harrison D., Wamakote L. (2010) Teacher Factors Influencing Classroom Use of ICT in Sub-Saharan Africa. Itupale Online Journal of African Studies 2, 39-54.

Hefzallah, I.M. (2004). The new educational technologies and learning: Empowering teachers to teach and students to learn in the information age (2nd ed.). Springfield: IL: Charles C Thomas.

Hernandez-Ramos, P. (2005). If not here, where? Understanding teachers use of technology in Silicon valley schools. .Journal of Research on Technology in education, vol. 38, no. 1, pp.39-64.

Hew, K. F., & Brush, T. (2007). Integrating technology into K-12 teaching and learning: current knowledge gaps and recommendations for future research. Educational Technology Research and Development, vol. 55, pp. 223-253.

Higgins, S., & Packard, N. (2004).Meeting the standards in primary ICT. New York, NY: Routledge Falmer.

International Telecommunication Union (2009). Measuring the information society—The ICT development index. Geneva, Switzerland: International Telecommunication Union.

Jones, A. (2004). A review of the research literature on barriers to the uptake of ICT by teachers. British Educational Communications and Technology Agency (Becta).

Jones, A. (2003). ICT and future teachers: Are we preparing for e-learning? In C. Dowling & K-W. Lai (Eds.).Information and communication technology and the teacher of the future. Dordrecht, Netherlands: Kluwer.

Joy, N., & Ishikaku, E. C. (2012). Integration of Information and Communication Technology (ICT) in Teacher Education for Capacity Building. Journal of Education and Practice, 3(10), 68-74. Retrieved August 11, 2014, from www.iiste.org

Jung, I. (2005). ICT pedagogy integration in teacher training: application cases worldwide. Educational Technology & Society, 8(2), 94-101.

Kanuka, H. and Anderson, T. (1999) 'Using Constructivism in Technology-Mediated Learning: constructing order out of the chaos in the literature', In Radical Pedagogy, vol. 1, no. 2, p. 11.

Kay, R. H. (2006). Evaluating strategies used to incorporate technology into pre-service education: a review of the literature. Journal of Research on Technology in Education, 38, 383-408.

Keengwe J. (2007). Faculty integration of technology into instruction and students' perceptions of computer technology to improve students learning. Journal of Information Technology Education 6(1),169-180.

Kozma, R. (2005). National policies that connect ICT-based education: Reform to economic and social development. Interdisciplinary Journal on Humans in ICT Environments, 1(2), 117-156.

Martin, W., &Lundstrom, R. (2002).Examining the role of teachers experience as a factor for the integration of computers in schools. Journal of Computing in Teacher Education, 18(4), 18-23.

Kennewell, S. (2005) 'Interactive teaching with interactive technology', World Conference on Computers in Education, Stellenbosch, SA.

Makrakis, V. (2005, October). Training teachers for new roles in the new era: Experiences from the United Arab Emirates ICT program. In A. Jimoyiannis (Ed.) Proceedings of the 3rd Panhellenic Conference 'Didactics of informatics', University of Peloponnese, Korinthos, Greece

McDonald, D.S. (2004). Computer literacy skills for computer information systems majors: A case study. Journal of Information Systems Education, 15(1), 19-33.

McGarr, O., & Kearney, G. (2009).The role of the teaching principal in promoting ICT use in small primary schools in Ireland. Technology, Pedagogy and Education, 18(1), 87-102.

Manzuoli, C. H., & Cifuentes, Y. S. (2013). Computing education competence in Higher Education: challenges for teachers. American Journal of Educational Research, 1(9), 406-412. doi:10.12691/ education-1-9-9.

Majumdar, S. (2006).Emerging trends in ICT for education &training. Retrieved August 31, 2017

Ministry of Education Science and Sports (MOESS). (2007). Teaching syllabus for mathematics. Accra, Ghana: Ministry of Education.

Mishra, P., & Koehler, M. J. (2006). Technological pedagogical content knowledge: a framework for integrating technology in teacher knowledge. Teachers College Record, 108(6), 10171054.

Muijs, D. and Reynold, D. (2010) Effective Teaching: Evidence and Practice, 3rd edition, London, UK: Sage Publications Ltd.

Mumtaz, S.(2000). Factors affecting teachers' use of information and communications technology: A review of the literature. Journal of Information Technology for Teacher Education, 9(3), 319–342.

Murphy, P., Anzalone, S., Bosch, A., & Moulton, J. (2002).Enhancing learning opportunities in Africa: Distance Education and Information and Communication Technologies for Learning. Africa region human development working paper series. Washington DC: The World Bank.

Niederhauser, D.S. &Stoddart, T. (2001).Teachers' instructional perspectives and use of educational software. Teaching and teacher education, vol. 17, pp.15-31.

Papert, S. & Harel, I. (1991).Situating Constructionism. Constructionism, Ablex Publishing Corporation: 193-206. Retrieved from

http://www.papert.org/articles/SituatingConstructionism.html.

Pan, A. (1999, February–March). Effective approaches to teach computer applications to teachers. Paper presented at the tenth Society for Information Technology & Teacher Education international conference, San Antonio.

Pelgrum, W. J., Law, N. (2003). ICT in Education around the world: trends, problems and prospects. UNESCO-International institute for educational planning.

Preston, C., Cox, M. J., & Cox, K. M. J. (2000). Teachers as innovators: An evaluation of the motivation of teachers to use information and communications technologies. Croydon: King's College London and Miranda net.

Resta, P., & Laferrière, T. (2008). Issues and challenges related to digital equity. In J. Voogt, & G. Knezek (Eds.), International handbook of information technology in primary and secondary education (pp. 765–778). New York, NY: Springer

Rockman I. F. (2004).Integrating information literacy into the higher education curriculum: Practical models of transformation. San Francisco, CA: Jossey-Bass

Rosen, L.D. & Maguire, P.D. (1990) Myths and realities of computer phobia: A meta-analysis. Anxiety Research, 3, 175-191.

Ropp, M .M . (1999). Exploring individual characteristics associated with Learning to use computers in preserve teacher preparation. Journal of Research on Computing in Education,31(4), 402-423.

Semenov, A. (2005). Information and communication technologies in schools: A handbook for teachers, or how ICT can create new, open learning environments. Paris, France: United Nations Educational, Scientific and Cultural Organization.

United Nations Education Science and Cultural Organization (UNESCO) (2009).UNESCO ICT competency framework for teachers.

Valente, J. A. (2003). In-service teacher development using ICT: First step in lifelong learning. In C. Dowling & K-W. Lai (Eds.), Information and communication technology and teacher of the future. London, England: Kluwer Academic.

Wang, Q. (2008). A generic model for guiding the integration of ICT into teaching and learning. Innovations in Education and Teaching International, 45(4), 411–419. doi:10.1080/14703290802377307

Walker, D. (1989). Introducing informatics into education at the national level. Higher Education Policy, 2(4), 41–45.

Webb, M., & Cox, M. (2004). A review of pedagogy rated to information and communications technology. Technology, Pedagogy and Education, 13(3), 235-286.

Wong, S. L. Kamariah, A .B .Ramlah, H., &Rohani, A.T. (2002). Malaysian in-service teachers: An assessment of their IT preparedness. Proceedings in the International Conference on Computers in education (ICCE), Auckland: University of Massey.

Wong, E.M.L. & Li, S.C. (2008). Framing ICT implementation in a context of educational change: a multilevel analysis. School effectiveness and school improvement, 19(1), 9-10

APPENDICES

Questionnaire which was answer by teachers at St peter's JHS.

UNIVERSITY FOR DEVELOPMENT STUDIES, TAMALE

QUESTIONNAIRE

Dear Respondent,

This research is part of second Degree being conducted as part of the requirement for the award of Master of Education TRAINING AND DEVELOPMENT DEGREE. The study is based on a selected sample in St. Peter's JHS, so your participation is important. The outcome of this study will improve upon teacher's attitude towards the use of ICT to teach in St. Peter's JHS. Participation in this study is voluntary, and all who participate will remain anonymous. Your name is not needed. All information offered will be treated confidentially, and the results will be presented in such a way that no individuals may be recognized

Section A: Respondent's Background Information

1. Sex?

a) Male [ ]   b) Female [ ]

2. What is your highest level of education?

a) PHD [ ]   b) Master's Degree [ ]   c) Bachelor's Degree [ ]   d) Diploma/HND [ ]

e) Others (Specify) [ ]

3. Age bracket

98

a) 18-25 [ ]   b) 26-35 [ ]   c) 36-45 [ ]   d) 46-55 [ ]   e) 56+ [ ]

4. Duration of teaching with the institution

a) Below 2 years [ ]   b) 3 – 5 years [ ]   c) 6 - 10 years [ ]   d) Above 10 years [ ]

5a Do you have a computer laboratory in your school?   YES [ ]   NO [ ]

b. If yes, how many computers are there in the laboratory? ....

c. If yes, how many of the computers are in good use? ....

6a Are any of the computers connected to internet?   YES [ ]   NO [ ]

b. If yes, how many……………………

7 Do you own a computer?   YES [ ]   NO [ ]

8 Do you have projector(s) in the ICT laboratory?   YES [ ]   NO [ ]

9 Do specialized software for teaching installed on the lab computers?

YES [ ]   NO [ ]

10 Have you participated in professional development courses related to the integration of ICT in teaching and learning?   YES [ ]   NO [ ]

B. Teachers technology usage

11 Do you use computers to do the following activities? Please tick.

	I use Computers	Yes	No
11.1	to find information or on internet for teaching		
11.2	to communicate with colleagues and students		
11.3	to prepare teaching notes/materials using MS word		
11.4	to create spreadsheets (MS Excel)		
11.5	to create database (MS Access)		
11.6	to make presentations (PowerPoint)		
11.7	to send email		
11.8	to attach files to an email message		
11.9	to investigate the nature of graphs of functions		
11.10	to draw graphs of grouped data		
11.11	to draw graphs of logarithmic functions		
11.12	to draw graphs of trigonometric functions and find their solutions		
11.13	to draw scatter diagram for bivariate distributions		
	I use calculators		
11.15	to express recurring decimals as common fractions		
11.16	to calculate the mean, median and standard deviation		

11.17	to determine the depreciation of an item over a period of time		

C. Teachers Technology Usage

12a How often do you use technology in the following areas? Please, rate your frequency of use:

Everyday =1 Once a week =2 Once a month =3 Once a term=4 Never =5

	I use Computers	Response Rating				
		1	2	3	4	5
12.1	to find information on internet for teaching					
12.2	to communicate with colleagues and students					
12.3	to prepare teaching notes/materials using MS word					
12.4	to create spreadsheets (MS Excel)					
12.5	to create database (MS Access)					
12.6	to make presentations (PowerPoint)					
12.7	to send email					
12.8	to attach files to an email message					

12b. How often do you use technology when teaching? Please, rate your frequency of use:

Everyday =1, Once a week =2, Once a month =3, Once a term =4 or Never =5

UNIVERSITY FOR DEVELOPMENT STUDIES

	I use Computers	Response Rating				
		1	2	3	4	5
1	to investigate the nature of graphs of functions					
2	to draw graphs of grouped data					
3	to draw graphs of logarithmic functions					
4	to draw graphs of trigonometric functions and find their solutions					
5	to draw scatter diagram for bivariate distributions					
	I use Calculators					
7	to express recurring decimals as common fractions					
8	to calculate the mean, median and standard deviation					
9	to determine the depreciation of an item over a period of time					

13 What kind of technological equipment is available in the classrooms you use	In no class-room I use	In some classrooms	In all classrooms	Upon request
Personal computers	☐	☐	☐	☐
Interactive whiteboards	☐	☐	☐	☐
Video conferencing systems	☐	☐	☐	☐
Audio equipment (including software)	☐	☐	☐	☐
Digital photo cameras (including editing software)	☐	☐	☐	☐
Digital video cameras (including editing software)	☐	☐	☐	☐
Mobile phones	☐	☐	☐	☐
Projection system	☐	☐	☐	☐
Other (please specify below)	☐	☐	☐	☐

Pedagogical use of ICT

14. Does your academic department have a policy to foster and sustain ICT-based innovations in course teaching? Yes/No

15. Have you ever been engaged personally in a project aimed at using ICT in new and innovative ways as a teacher or teacher trainer? Yes/No

16. Comments:

17. Is there support available for teacher trainers regarding pedagogical use of ICT at your institution? Yes/No (The following shows up only if the answer to the preceding question is "Yes")

18. How would you rate the quality of the pedagogical ICT support? Poor/Mediocre/Good/Very good

19 To what extent do you think the use of technology described below is important for a student teacher to acquire?	Less important at all	Little important	Quite important	Very important
a) Use of technology for communicating and/or networking….	☐	☐	☐	☐
…….with their pupils	☐	☐	☐	☐
…with parents	☐	☐	☐	☐
...with school management and educational administrations	☐	☐	☐	☐
b) Use of technology for student teachers' own development and learning	☐	☐	☐	☐
c) Use of technology as a management tool…	☐	☐	☐	☐
…for organizing their work and keep records	☐	☐	☐	☐
…for preparing lessons	☐	☐	☐	☐
…for finding digital learning resources	☐	☐	☐	☐
…for designing and producing their own digital learning resources	☐	☐	☐	☐
d) Student teachers' future integration of technology…	☐	☐	☐	☐

…to facilitate teaching specific concepts or skills	☐	☐	☐	☐
…to support various student learning styles and to personalize learning	☐	☐	☐	☐
...to facilitate teaching pupils with disabilities (cognitive, physical, behavioral)	☐	☐	☐	☐
…to support activities that facilitate higher-order thinking	☐	☐	☐	☐
…to support creativity	☐	☐	☐	☐
…to foster pupils' ability to use technology in their own learning	☐	☐	☐	☐
Other (please specify below):	☐	☐	☐	☐

20. Do you teach the use of the technological devices below to student teachers?	Never	Periodically	In about half of my classes In	In every class
Personal computers	☐	☐	☐	☐
Interactive whiteboards	☐	☐	☐	☐
Video conferencing systems	☐	☐	☐	☐
Learning Management Systems/VLE (WebCT, Moodle etc.)	☐	☐	☐	☐
Audio equipment (including software)	☐	☐	☐	☐
Digital photo cameras (including editing software)	☐	☐	☐	☐
Digital video cameras (including editing	☐	☐	☐	☐

software)				
Mobile phones	☐	☐	☐	☐
Projection system	☐	☐	☐	☐
Other (please specify below)	☐	☐	☐	☐

Please, rate your agreement to the statement below: Strongly agree =1, Agree =2, Uncertain =3,

Disagree =4 Strongly Disagree =5

21. Factors that affects the use of ICT by teachers in St. Peter's JHS	Strongly agreed	Agreed	Uncertain	Disagreed	Strongly Disagreed
No importance is attached to the use of ICT in teaching					
Little importance					
Lack of motivation to use ICT in teaching					
Lack of ICT information for teachers to use					
No access to technological equipment					
Unreliability of equipment					
No quality ICT equipment					
Lack of training/courses in pedagogical use of ICT					
No pedagogical ICT-support (e.g. "hotline")					
No technological hands-on training/courses					

106

No technological support (e.g. "hotline")					
No policies on using ICT across curriculum					
Lack of time to prepare, explore and develop					
No task related incentives (salary, promotion)					
Other (please specify)					

D. Ability to use technology.

22 How would you rate your ability in using computers?

Excellent (Advanced) =1, Good (Proficient) =2, Satisfactory (Progressing) =3, Learning (Needs improvement) =4, Poor (Can't use it)

	Rate your Ability to do the following using Computers	Response Rating				
		1	2	3	4	5
1	finding information or on internet for teaching					
2	communicating with colleagues and students					
3	preparing teaching notes/materials using MS word					
4	creating spreadsheets (MS Excel)					
5	creating database (MS Access)					
	making presentations (PowerPoint)					
7	sending email					
8	attaching files to an email message					
9	investigating the nature of graphs of functions					
10	drawing graphs of grouped data					
11	drawing graphs of logarithmic functions					
12	drawing graphs of trigonometric functions and finding their solutions					
13	drawing scatter diagram for bivariate					

	distributions					
	How would you rate your ability to do the following using calculators					
15	expressing recurring decimals as common fractions					
16	calculating the mean, median and standard deviation					
17	determining the depreciation of an item over a period of time					

23 Give two reasons why you think using ICT in classroom would be beneficial to teachers.

(i)……………………………………………………………………………………..

(ii) …………………………………………………………………………………

24 Give two reasons why you think using ICT in classroom would be beneficial to students.

(i)……………………………………………………………………………………..

(ii)…………………………………………………………………………………