UNIVERSITY OF EDUCATION, WINNEBA

AN EXPLORATORY STUDY OF INFORMATION COMMUNICATION TECHNOLOGY INTEGRATION LEADERSHIP IN THREE SENIOR HIGH SCHOOLS IN THE CENTRAL REGION, GHANA

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SEPTEMBER, 2018

DECLARATION

Student's Declaration

I, Anna Koomson, declare that this Thesis, with the exception of quotations and references contained in published works which have all been identified and duly acknowledged, is entirely my own original work, and it has not been submitted, either in part or whole, for any other degree elsewhere.

SIGNATURE:………………………………………………

DATE:………………………………………………………...

Supervisors' Declaration

I hereby declare that the preparation and presentation of this work was supervised in accordance with the guidelines for supervision of Thesis as laid down by the University of Education, Winneba.
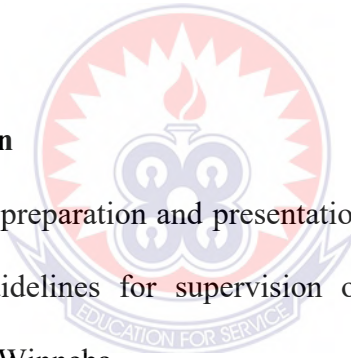
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NAME OF CO-SUPERVISOR:…………………………………………………..

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DEDICATION

I dedicate this thesis to the Almighty God, whose abundant mercy, grace, guidance and wisdom enabled me to complete it, and to all stakeholders in the Ghanaian educational sector.

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ABBREVIATIONS

ASH	Assistant School Head
GES	Ghana Education Service
GIFEC	Ghana Investment fund for Electronic Communication
HOD	Head of Department
ICT	Information and Communication Technology
ICT4AD	ICT for Accelerated Development
ISTE	International Standards for Technology in Education
IT	Information Technology
PTA	Parent Teacher Association
SH	School Head
SPSS	Statistical Package for Social Scientists
TLM	Teaching and Learning Materials
UN	United Nations
WASSCE	West Africa Senior Schools Certificate Examinations

ABSTRACT

This study explored various dimensions of ICT integration from a leadership perspective in three public Senior High Schools in the Central Region of Ghana. An embedded mixed method design was adopted, with a dominant qualitative strand and supportive quantitative strand. Following the distributed leadership model, interview data were collected from 12 leaders who were purposively sampled from the three schools to explore their perceptions of and strategies for leading ICT integration, challenges, and support systems for effective ICT integration. For the quantitative strand, 230 teachers were randomly sampled from the three schools to respond to a 14-item questionnaire that sought to determine their perceptions of ICT integration in teaching and learning and independent samples and One-Way ANOVA tests were used to analyse how gender and age influenced these perceptions. The major finding from this study is that the school leaders admit that they are digital immigrants, yet they appreciate the importance of ICTs to teaching and learning. Moreover, they have not been exposed to professional training to equip them with skills to successfully lead ICT integration in their schools. As a result, the support they provide for ICT is management oriented. Moreover, results from the survey showed that male and female teachers differ significantly in their perceptions of ICT integration, with males having more favourable perceptions than females. Age differences on the other hand were not found to predict the teachers' perceptions of ICT integration. In conclusion, results from the study have been presented to inform educational stakeholders on how to equip school leaders for effective ICT leadership.
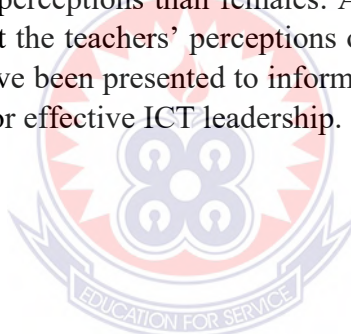
CHAPTER ONE

INTRODUCTION

1.0 Background to the study

Leadership is a crucial element in the success of every organisation. In education, transformational and innovative leadership is important for schools to achieve desirable outcomes. No school can successfully turn around its failure trajectory and achieve all-round and sustainable achievements without good leadership (Anderson & Dexter, 2005). In the 21st Century, where there has been tremendous growth in the use of ICTs, which has made pervasive impacts on society and our daily lives (Yuen, Law & Wong, 2003), there is an urgent need for innovative leadership in educational institutions to ensure that ICTs are integrated into schools in a way that will help them reap the resultant benefits. Children of today are exposed to a wide range of knowledge and information right from birth because they are growing up in an information age (Meenaksi, 2013). Moreover, according to the International Standards for ICT in education (ISTE) (2000), traditional educational practices do not provide students with all the necessary skills for economic survival in today's workplace anymore since 'students today must apply strategies for solving problems using appropriate tools for learning, collaborating and communicating' in the 21st Century.

According to Danner and Pessu (2013) cited in Bates & Sangra (2011), it is envisaged that, technological literacy will soon become a functional requirement for people's work, social and even personal lives. That is to say that, contemporary students will need technological skills to live successfully in the present knowledge economy. This and other reasons justify the need for ICT integration in education, yet this cannot be achieved without appropriate leadership at all levels in the educational sub-sector.

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As a country, Ghana recognises the importance of technology to the development of the nation. The Ghana ICT for Accelerated Development Policy (ICT4AD) presents Ghana's vision for the information age. The policy document admits that for Ghana to move her industrially weak, subsistence agriculture based economy towards an information and knowledge based economy, she will need to develop and implement comprehensive and integrated ICT-led socio-economic development policies, strategies and plans (Republic of Ghana, 2003). Economic development, according to Bates and Sangra (2011), has been and will continue to be strongly linked to the ability of education systems to adapt to the demands of knowledge-based societies. Tondeur, Van Braak and Valcke (2007) also admit that education remains the central means by which the objectives of national ICT policies can be pursued and attained with the expectation that other sectors will eventually benefit indirectly from education. Consequently, in line with the ICT for Accelerated Development Policy, Ghana has also adopted an ICT in Education Policy which provides a guide by which technology can be exploited in an efficient and coordinated effort to support the educational sector's own goals and objectives. Specifically, the policy stresses the need for the integration of ICT in all aspects of the curriculum (Ministry of Education, 2008).

Consequently, the nature of national policies introduced in Ghana since the beginning of 2017 suggests that the country is gradually embracing the digital revolution. The digital property addressing system, paperless port system, digital SSNIT system and the introduction of e-registration of businesses by the Registrar Generals Department are some of the major policies that the government rolled out in 2017 alone as part of efforts to mainstream ICT into the public sector (Manifesto for Election, 2016). The Vice President of Ghana, Dr. Mahamadu Bawumia made a remarkable statement in a

public event: *'I think we should look at this time as a digital time for Ghana because we want to transform this economy by making more time for critical areas and a lot of it has to do with digital technology…lack of tech-savvy citizens will drive the economy backwards'* (GhanaWeb, September 13, 2017).

In view of this remark, according to the human capital theory, knowledge and skills that individuals possess which helps them to increase their value in the labour market is acquired through education and training. Consequently, if Ghana is going to produce citizens who are technologically savvy to drive the digital economy, there is the need to not only deploy computers and other ICT tools into schools nor teach ICT as a subject but also integrate them into teaching and learning. Students learn best about technology when it is integrated into the entire curriculum, especially teaching and learning, and as Bates and Sangra (2011) opine, in the 21st Century, studying without technology is like learning to dive without water. According to Bill Gates, owner of Microsoft Corporation, quoted in Gunter and Gunter (2015),

> In all areas of the curriculum, teachers must teach an information-based inquiry process to meet the demands of the information age. This is the challenge for the world's most important profession, and meeting this challenge will be impossible unless educators are willing to join the revolution and embrace the new technology tools available.

Invariably, national educational curricula are planned around national plans, policies, goals and objectives because doing this enables citizens to be trained to adapt to prevailing economic and national situations (Bray, 1992). Tondeur et al. (2007) report that in many countries, information and communication technology has a clear impact on the development of educational curricula. Also, many countries now regard the understanding and mastery of the basic skills and concepts of ICT as part of the core of education in addition to reading, writing and numeracy (Meenakshi, 2013). In this

information age, where many countries are moving their economies to align with the digital revolution, information literacy is seen as an essential element in education. This, coupled with the undeniable reality of today's students being inseparably hooked to technology in their daily lives (Prensky, 2005) is the primary reason justifying the call for ICT integration in today's classrooms. However, successful ICT integration cannot be achieved without appropriate strategic planning and leadership. At the national policy level, there must be technology plans and policies that specify exactly what governments hope to achieve with ICT integration, and this must be clearly disseminated to the lower levels of educational management (Meenakshi, 2013; Anderson & Dexter, 2005). These policies should be 'well defined missions that describe technology's place in education' (Bennet, 1996, cited in Flanagan & Jacobsen, 2003). In Ghana, the Ministry of Education (MOE) is the statutory and highest organisation that is responsible for making policies for the educational sector. At the pre-tertiary level, the Ghana Education Service (GES) exists to implement the policies of the MOE, and the Curriculum Research and Development Division (CRDD) of the Ghana Education Service is responsible for the development and design of curricula for pre-tertiary education (Republic of Ghana, 2004). These; the MOE, GES and CRDD constitute educational leadership at the planning level.

Notwithstanding elaborate ICT integration policies that educational planners may formulate, according to Anderson and Dexter (2005), the success of technology initiatives in schools depends more on innovative technology leadership by the school head than on other variables like expenditure and infrastructure. Therefore, strategic decision making at the planning level will not automatically result in ICT integration in teaching and learning without appropriate technology leadership at the school level. Literature on ICT integration recognises the crucial role of school leadership in

ensuring effective ICT integration (Schiller, 2003; Davies, 2010; Flanagan & Jacobsen, 2003; Keiyoro et al., 2016; Mojgan et al., 2008).

The school head, as a technology leader, is an essential success factor in successful ICT integration. In the words of Anderson and Dexter (2005), 'all of the literature on leadership and technology acknowledges either explicitly or implicitly that school leaders should provide administrative oversight for education technology.' Principals are supposed to develop competencies in and use ICTs in their personal tasks, ensure that teachers receive learning opportunities through in-service training and develop ICT integration policies for their schools (Flanagan & Jacobsen, 2003; Anderson & Dexter, 2005; Tondeur et al., 2007).

1.1 Statement of the Problem

The government of Ghana has shown its commitment to a comprehensive programme of deployment, utilisation and exploitation of ICTs within the educational system from primary school upwards (Ministry of Education, 2008). A survey by the Ministry of Education on the e-Readiness of Second Cycle Institutions in Ghana reports that out of five hundred and one (501) schools that responded to the question of availability or otherwise of computers in their schools, four hundred and ninety four (494), representing 98.5% had computers, while only seven (7) schools representing 1.5% had no computers (Ministry of Education, 2009). Commendable attempts have, no doubt been made at making ICT infrastructure, especially computers available in many Senior High Schools in the country. Notwithstanding this massive computer presence, there is little evidence of integration of technology into teaching and learning in most of the Senior High Schools in the country (Ministry of Education, 2009). Closely related to this, the end of a National Council Meeting by

the Graduate Teachers' Association of Ghana (NAGRAT) (2018, February), one of the concerns raised in a communique copied to the Ministry of Education was displeasure with the current paper-based method of lesson notes preparation which they described as 'unproductive and colonial'. The association declared its plans to, as part of efforts to 'give full effect to ICT integration in education,' encourage teachers to prepare 'Updated Lesson Notes' which employed the use of ICT tools (NAGRAT, 2018).

These two instances seem to depict a slowness in the pace of ICT integration in Senior High Schools across the country, which may be a leadership challenge as teachers seem to be hindered in their willingness to integrate ICTs into their lessons, according to the statement issued by the National Graduate Teachers' Association. Educational leaders are key facilitators in efforts to integrate ICTs in schools (Dawson and Rakes, 2003). They are expected to spearhead all changes in their schools, including reforms that are technological in nature (Keiyoro, Gichovi & Ngunjiri, 2016). Consequently, ICT integration in any school will hardly be successful without the support of school leadership. Therefore, unless the ICT abilities and capabilities of Ghanaian Senior High School leadership is critically investigated and addressed, the nation can be sure to reap little or no profits from the initiatives and/or policies that are formulated to ensure the integration of ICTs into teaching and learning in schools. Interestingly, not much attention has been given to the study of technology leadership by educational leaders in Ghanaian educational research hence little is known about how these leaders manage their roles in this capacity. Most studies on ICT in Ghanaian education have focused on computer use in schools and the equity concern (e.g. Mfum-Mensah, 2003), assessments of the ICT situation in schools (e.g. Adebi-Caesar, 2012), students' perceptions of ICT integration (e.g. Tagoe, 2012) and

challenges associated with teaching and learning ICT (e.g. Opoku-Peprah, 2016). A study that explores the nature of ICT leadership in Ghanaian Senior High Schools is needed to understand how school leaders support ICT integration within the context of the educational characteristics prevailing in the country.

1.2 Purpose of the Study

The purpose of the study was to explore various dimensions of ICT integration from a leadership perspective in three public Senior High Schools in the Central Region.

1.3 Objectives

The study sought to:

1. explore the school leaders' perceptions about ICT integration into teaching and learning.

2. identify strategies used by the school leaders to facilitate ICT integration into teaching and learning.

3. explore challenges faced by the school leaders in the implementation of ICT integration policy

4. identify support systems that could be put in place for effective ICT integration leadership

5. determine the relationship between gender, age and teachers' perceptions of ICT integration

1.4 Research questions

The following research questions were formulated to guide the study:

1. What perceptions do the school leaders of the three schools have about ICT integration into teaching and learning?

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2. What strategies do the school leaders use to facilitate ICT integration into teaching and learning?

3. What challenges do the school leaders face in the implementation of the ICT integration policy?

4. What support systems can be put in place for effective ICT integration leadership?

1.5 Hypotheses

H_01: Male and female teachers do not differ in their perceptions of ICT integration

H_11: Male and female teachers differ in their perceptions of ICT integration

H_02: Teachers' age groupings do not predict their perceptions of ICT integration

H_12: Teachers' age groupings predict their perceptions of ICT integration
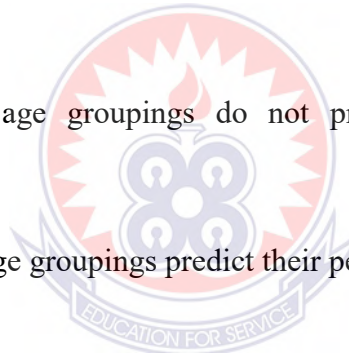
1.6 Significance of the Study

The findings from this study will bring awareness into how ICT leadership works in specific contexts in Ghanaian Senior High Schools. This will help educational policymakers like the Ministry of Education and Ghana Education Service to gain insight into how their school ICT initiatives and policies react with school leadership characteristics in their bid to achieve the goal of producing citizens who are technologically savvy to function in Ghana's emerging knowledge-based, digital economy. The study will further help to know school heads and other educational leaders' professional development needs when it comes to ICT integration and the training packages that will be useful for meeting these needs. Finally, the study will

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be a useful addition to the Ghanaian literature on school educational technology leadership.

1.7 The Context of the Selected Schools (Delimitations)

The study was carried out in three Senior High Schools within the Gomoa West, Gomoa East and Mfantseman districts in the Central Region of Ghana. Also, for the qualitative phase, leadership was studied from three levels; head masters, assistant school heads in charge of academics and heads of the Integrated Science departments in the three schools. (In all three schools, the ICT departments were subsumed under the Integrated Science Department). The following is a brief description of the three participating schools and their ICT condition at the time of data collection. These brief descriptions are a synthesis of information gathered from the researcher's informal observation, reflective field notes, and information culled from the respondents during the interviews.
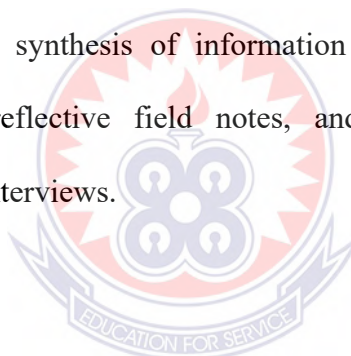
School 1

The school falls under Option 1 of the GES classification of Senior High Schools in the country. The building of the school block was a community project financed by the United Nations High Commission on Refugees (UNHCR) and commissioned in February 2013. In relation to the other two schools involved in the study, this was a relatively small school. Organisation of leadership in the school followed the GES structure outlined above, except that there was one assistant headmaster instead of the three. The school had a student population of about four hundred and fifty (450) and teaching staff strength of forty seven (47). The headmaster of the school held a Bachelor Degree in Social Studies and was in his mid-fifties. There was one room which had been assigned as a computer laboratory and was used for this purpose.

There were about twenty computers in the lab at the time of the research. The room also housed a projector which belonged to the school and was used by the staff when there was the need. There were two ICT teachers who were responsible for the management of the ICT lab and teaching of ICT which was a core subject in the school. Apart from the computer lab which served as a meeting place for students when they had ICT lessons, ICTs were used for mostly administrative purposes. The headmaster had a desktop computer in his office. Other administrative staff like the assistant head, secretary and school accountant also had desktop computers which they used in their day to day activities. Apart from these, no ICT tools, either for the purposes of academic or administration were identified.

School 2

The school was established in the year 1953 as one of the public Senior High Schools in the country during the regime of the first President of Ghana, Dr. Kwame Nkrumah. It had a student population of two thousand and twelve (2012) students and teaching staff strength of eighty seven (87) at the time of the study. The headmaster of the school held a Master of Philosophy (MPhil) certificate in Social Studies from one of the universities in the country and was in his mid-fifties as well. He was supported in his administration by three assistant heads: administration, academic and domestic. At the entrance of the administration block of the school, one readily spotted a notice that read: 'Use of mobile phones by students in this school is not allowed – by administration.' Littered around the school compound were about six community phone booths that students had the freedom to use for making phone calls. A siren system had also been installed which served as a timer for school activities. The school also had a large room which was used as a computer laboratory. There were about 40 workable computers in the lab.

School 3

This is an all-girls Senior High School in one of the districts in the Central Region. The school was also founded by the first president of Ghana in the year 1960 as part of its plans to promote girls' education. At the time of the research, the school had a student population of about two thousand and five hundred (2,500) girls and teaching staff strength of 105. The headmistress was in her fifties, and held a Master's Degree in Educational Administration. She was assisted by three assistant heads; two males for administration and academic affairs and a female for domestic affairs. The school had two computer rooms; a main ICT laboratory which was fully furnished and that housed about forty desktop computers and other IT equipment. The other was a smaller room which served as a practical room for students offering ICT as an elective subject. Apart from the use of computers for administrative purposes by the administrative staff of the school, a few telephone booths were littered on the school's compound. There was also a school siren system that had been programmed to serve as a timer for teaching, learning and other co-curricular activities.

1.8 Definition of Key Terms

Information Communication Technologies (ICTs): Any of the various set of technological tools that may be used to create, process, store, exchange or disseminate information. Examples include computers, mobile phones, radio, television, telephones and the internet.

School head: The headmaster in a Ghanaian Senior High School. This includes both male and female heads. Where the word 'principal' is used in this report, it refers to the school head.

Information Communication Technology (ICT) integration: The use of various hardware and software components of technology together with each subject-related area of curriculum to enhance learning; the use of ICT tools to accompany teaching and learning.

ICT leadership/ICT integration leadership: The kind of support school heads provide to ensure the success of ICT integration in their schools.

1.9 Organisation of the Study

This study is presented in five chapters. This first chapter focused on the background of the problem resulting in the study, statement of the problem, purpose of the study, objectives and research questions, the context of the selected schools and definitions of certain key terms. The rest of the chapters are organised as follows: Chapter Two reviews literature relevant to the study, including areas such as knowledge and competencies of school heads on ICT integration, cases and trends in ICT integration leadership across the globe, challenges in the implementation of ICT integration and support systems in the implementation of ICT integration into teaching and learning. Chapter Three discusses the methodology employed for the study while Chapter Four presents, analyses and discusses the major findings of the study. Finally, Chapter Five concludes the study with a summary of the findings, conclusions and recommendations to educational policy makers.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

The purpose of this study was to explore ICT leadership in selected Senior High Schools in Ghana. This chapter contains a review of literature under relevant themes related to this objective. The first three sections provide an overview of the subject; i.e. background to the concept of ICT integration, conceptual and empirical justifications for ICT integration and the place of the school head in successful ICT integration. The remaining sections of the chapter present a review of relevant empirical literature under themes related to the research questions.

2.1 Concept of ICT Integration

ICT integration is a qualitative concept perceived by different people according to their own experiences and usage of computer technology and other ICT devices (Moeller & Reitzes, 2011). It refers to the use of ICTs as teaching aids instead of teaching ICT as a subject. According to Gunter and Gunter (2015), ICT integration is a means of enhancing learning through the use of hardware and software components of computer technology together with each subject-related area of curriculum. ICT integration is considered superior to the traditional teaching of ICT as a subject (otherwise called ICT in education) because research has proven that technology facilitates learning, improves students' ability to retain information/knowledge and increases their motivation to learn independently (Meenakshi, 2013; Tondeur et al., 2007). Also, the rewards from computers and other related technologies are best realised when they are integrated into subject contents and placed at the point of instruction. This helps to ensure realistic learning, which involves instructional

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activities that demonstrate real-life connections by associating the concept being taught with real-life experiences or events (Gunter & Gunter, 2015). Just as what content is included in the curriculum is planned, technology also needs to be deliberately planned and integrated into the curriculum for best results. ICT integration may also be seen as a measure of the extent of integration of technology into the curriculum and into teaching practices. It is based on estimates of the percentage of teachers who are actually incorporating technology into various types of teaching activities (Anderson & Dexter, 2005). The practice is referred to mostly as ICT integration in the literature, implying the incorporation of ICTs and digital devices in teaching and learning. In other contexts, it is conveniently referred to as curriculum integration (e.g. ISTE 2000); that is, curriculum integration of digital technology into teaching and learning. Curriculum integration depicts using technology not for its own sake but for the delivery of curriculum content and it portrays a better picture of the practice as one that interweaves educational technology skills and relevant curriculum content, not just technological skills in isolation (ISTE, 2000). On the other hand, ICT integration may refer broadly to the use of ICTs both in instruction, administration and management. As a somewhat complex process, ICT integration requires distinct knowledge about technology, distinct knowledge about the content of curriculum coupled with appropriate pedagogical skills.

Even though the importance of ICT in education is acknowledged by my educators today, in many educational institutions, there has been an overemphasis on technology, that is, the modern digital devices and equipment like computers, overhead projectors and mobile phones (Roblyer & Doering, 2014). Mishra and Koehler (2009) admit that in education, there has been the tendency to look only at the technology and not how it is used. Most pre-service and in-service training

courses designed for educational professionals emphasise proficiency in various technological tools without training on how to incorporate them into the teaching of individualised subject contents. However, isolated knowledge of these devices and how they function does not automatically lead to their integration into teaching and learning. Mastering the integration of technology into the curriculum is not an easy endeavour, hence the need for concerted efforts to assist teachers master the skill (Gunter & Gunter, 2015).

2.2 Rationale for ICT Integration in Education

This generation and future generations may need to go to the attics of grandparents and visit museums to see examples of pen and ink writing on paper! – Robertson, Webb and Fluck, 2007.

The call to integrate ICT into education, especially teaching and learning is a timely one that requires urgent action by all educational stakeholders. However, a consideration of the huge amounts of funds that need to be invested for the acquisition and installation of educational technology infrastructure and software in the face of limited government revenue and ever-increasing expenditure budget justifies the concern and question; 'Why use ICT in education when we have done without it for several years?' Are there positive educational outcomes that are directly produced by ICT integration?

Using technology for the delivery of curriculum contents is an innovation that should be planned and executed at the formative levels of education. Meenakshi (2013) for example asserts that, in primary education where young minds are enlightened to accept new ideas, show creativity, develop critical thinking skills and absorb

surrounding information in order to make informed decisions in later stages in their lives, ICT integration becomes most important.

In Ghana, Basic Education enrolment nearly doubled from around 3.5 million pupils in the 1999/2000 academic year to nearly 7 million pupils in the 2010/2011 academic year due to the implementation of the Free Compulsory Universal Basic Education (FCUBE) policy by the Ghanaian government in 2006. In September 2017, the government also introduced the Free Senior High School policy. Due to increases in completion rate at the basic level, the free SHS policy, in the near future, is expected to give opportunity for many basic school leavers to gain entrance into second cycle education. In fact, in the first term of the 2017/2018 academic year, enrolment into first year of Senior High School was 424,092 students, representing an increase of approximately 63% in first-year enrolment over that of 2014/2015 academic year's 260,210 students according to Ministry of Education's EMIS (2015). It can be estimated that, secondary education is going to be the primary tool for enriching human capital in the country in the next few years because, considering the fact that a large percentage of the Ghanaian population lives at subsistence levels, only few families can afford to pay for their wards to pursue tertiary education. Therefore, building the capacity of Senior High students through ICT integration is an imperative that will enable the majority of young people who will be unable to enrol in tertiary institutions to possess basic technology literacy that can enable them to cope in a society that is becoming increasingly digitalised.

For students who will be eligible and can afford to enrol in tertiary education, the challenge could be that the capacity of the tertiary institutions have not yet been increased to absorb the large numbers of second cycle graduates that will emerge in a

few years' time. ICT integration could enable majority of these prospective students to enrol in and cope with distance tertiary education programmes which are the next best options for increasing access to tertiary education in the face of limited infrastructural capacity.

During periods of educational expansion like the one that Ghana is currently undergoing as a result of interventions within the educational sector, improving the quality of education remains a critical issue (Meenakshi, 2013). Giving proper attention to ICT integration in second cycle educational institutions is essential in Ghana at this time because it will promote technology literacy of majority of the citizens thereby making them effectively useful in the information age.

The world is becoming increasingly digitalised and requires citizens who are technologically savvy to drive the digital revolution (ISTE, 2000). In Ghana, a number of policies introduced in 2017 shows the government's commitment to formalise the national economy through digital technology. Lack of citizens who are technologically savvy will hinder and impede economic growth. ICT integration has direct benefits for several aspects of education and the economy including the following:

2.2.1 Teaching and learning

There is enough research evidence that supports the case for ICT integration in education by stressing the benefits of technology and digital-assisted instruction for teaching and learning in all levels of education. The tradition of memory-based instruction that has permeated education for years is replaced by instruction that stimulates thinking and creativity; skills that are necessary for meeting the challenges of the 21st century economy (Ministry of Education, 2008). Saba (2009) summarised

the benefits of technology in K-12 education and found evidence in literature to support eight benefits of ICT in education. They are the claims that technology:

- improves students achievement on tests

- improves the quality of student work

- benefits students with special needs

- benefits at-risk students

- improves attitudes towards learning

- provides individualised learning

- acts as a catalyst for change

- prepares students for the future

Even though its effect on specific areas of education is contentious and more research is needed to understand the complex links between ICTs, learning and student achievement (Roblyer, 2003), generally, technology has a positive impact on learning (Punie, Zinnbauer & Cabrera, 2006; Meenakshi, 2013). Technology improves student learning and achievement, proves beneficial for students with special needs, makes potentially disruptive students more cooperative towards learning and improves students' general attitude to class work (Saba, 2009). Students who have exposure to computers usually perform better in school than those who have little or no experience in operating computers. The OECD's PISA 2003 assessment of educational performance of 15-year old students showed that regular computer users performed better in key school subjects compared to those students who have limited computer experience or those that lacked confidence in their ability to perform basic computer functions (Punie et al., 2006). Furthermore, computers have especially been found to improve students' learning and performance in Mathematics (Punie et al., 2006; Saba, 2009).

Technology offers students intrinsic motivation to learn and expands the learning experience (Moeller & Reitzes, 2011; Roblyer, 2003). Learning can and does take place then in the absence of the teacher because it becomes more learner-centred. According to Robertson, Webb and Fluck (2007), the main change in the way teaching occurs as a result of the introduction of technology is that the learning agenda is taken from the hand of the teacher and firmly put into the hands of the student. Young people today are growing up in a digital world where everything is driven by technology. Instruction that does not incorporate technology does not motivate children to learn (Gunter & Gunter, 2015; Prensky, 2005 Moeller & Reitzes, 2011). There is the need for educational institutions to adapt to the requirements of the knowledge society and to the way today's digital generation of students learn by using technologies intuitively in their everyday lives because when the formal learning environment in the classroom is radically different form the 'play' environment outside the classroom, students lose motivation to study in the classroom setting (Punie et al., 2006). Contrariwise, when students are given the opportunity to explore with ICTs right from the classroom, learning becomes more exciting and less of a task. Digitalised learning exposes students to a wide range of information and knowledge, especially from internet, from which students learn a wide variety of things.

2.2.2 Life in the knowledge economy

As technology continually becomes ubiquitous in our daily lives, so does its potential of becoming a necessity for a successful life and work in the global economy increase every day (Saba, 2009). In many parts of the world today, proficiency in the use of computers and a diversity of software packages is considered a basic life skill alongside reading, writing and numeracy (Meenakshi, 2013). Instruction in ICT is

therefore essential to prepare students for the world of work in the digital world. A recent survey of over 1,000 high school teachers, IT staff and students in the United States reports that only 8 percent of teachers fully integrate technology in the classroom and hence not surprisingly, only 43 percent of students are reported to feel prepared to use technology as they look ahead to higher education or later in their work life (Moeller & Reitzes, 2011). In many other parts of the world, especially developing countries, the situation is similar and sometimes worse, with many students leaving school without the knowledge and skills they need for success in further education or the workplace.

These benefits of education calls for educational policy makers in Ghana to formulate policies that will help schools make rigorous use of technology while at the same time meeting the goals of the curriculum (Ng, Miao & Lee, 2010).

2.3 School Leadership in ICT Integration

Leadership is a crucial factor in the success of every organisation. Principals are crucial for ensuring effectiveness in all areas of school operations; academics, school-community relations, discipline, infrastructural development, staff development, etc. With transformational leadership, even failing schools can successfully turn around their failure trajectory. The nature of the leadership provided by school heads always has an important influence on the effectiveness of schools. Principals are supposed to be leaders in various dimensions of school work in order to effectively support teachers. This plays out prominently in the area of instruction. One major concern for all educational institutions is to ensure efficiency in students' outcome by improving the quality of teaching and learning.

Even though the integration of technology in teaching and learning is the direct task of the teacher at the point of instruction, it will become unrealised if teachers are not supported within the school environment through the influence of school heads on staff motivation, commitment and supportive working conditions (Leithwood, Harris & Hopkins, 2008). Since students are admitted into a school and not to the teacher, it is the school system, led by the school head, which has the responsibility of ensuring all round success including authentic learning through ICT integration. (Robertson et al, 2007). In this regard, several researchers have identified the unique role of principals as technology leaders and made compelling cases for the importance of their leadership to successful technology reforms (Schiller, 2003; Anderson & Dexter, 2005; Davies, 2010; Klempin & Karp, 2015; Keiyoro et al., 2016).

Technology leadership is essential for the successful integration of ICT in schools more than other related variables like infrastructure and the availability of ICT strategic plans (Anderson & Dexter, 2005; Mojgan et al., 2008). This is because the presence of ICT infrastructure like computers in themselves do not guarantee their integration in teaching and learning (Schiller, 2003). This could explain why irrespective of the Ghana governments' attempt to deploy computers and other ICT devices into schools, very few teachers effectively integrate them into their instruction (Ministry of Education, 2009). Technology leadership can have considerable impact on the quality of school environments that are supported by technology, and research reports a high correlation between technology leadership and technology outcomes (Davies, 2010). In the present society dominated by ICTs, school leadership must change rapidly to support school technology reforms. Ironically, whereas the task of changing schools and classrooms to reflect a society that has been and continues to be transformed by digital technology is quite overwhelming, school leaders are expected

to assume leadership responsibilities in this unfamiliar area in which many of them have little or no training (Flanagan & Jacobsen, 2003). Several studies that sought to find out the factors that result in the successful implementation of ICT integration in education have identified school leadership as one of the factors that has the most important and impactful influence.

Keiyoro et al. (2016) studied the influence of school leadership on ICT integration in Kenya. Seventy percent of the respondents were of the view that the school leader's capacity in ICT had an influence on the integration of ICT in teaching and learning. Seventy-eight percent felt that commitment to ICT integration on the part of the school head had an influence on its integration. In congruence with the finding of Anderson and Dexter (2005) that technological leadership is a stronger predictor of technology outcomes than expenditure and infrastructure, only thirty-three percent of the respondents had a strong agreement that the possession of an ICT strategic plan had an influence on ICT integration in teaching and learning.

Yee's (2000) study on principals' leadership and ICT integration found that schools that integrate ICTs in the most constructive ways were those schools where the principals believed strongly that technology had the capacity to improve the learning outcomes of students and that these principals did all they could especially in the area of professional development to increase the capacity of teachers to integrate technology in their classrooms.

Raman, Don and Kasim (2014) made similar findings in their study of the relationship between principals' technology leadership and teachers' use of ICTs. They found that the impact that principals have on their teachers' technology use was significant. They conclude from the findings of their study that principals have become role models to

teachers in their daily practice of technology and therefore should be involved in designing and preparing their schools' strategic plan on ICT which should align with national, state and district technology agenda.

Granger, Lotherington, Owston and Wideman (2002) analysed data from qualitative case studies of four Canadian schools on the factors that facilitate successful ICT implementation. Different factors that affect curriculum integration were explored. While there was no single sufficient condition for success with ICT integration, the narratives from the data revealed some conditions that although expressed differently by the respondents, are remarkably consistent across the four schools. Among these factors is 'principals who encourage teachers to engage in their own learning'.

In schools where principals support, encourage and promote ICT use, its integration in teaching and learning is higher than in those schools where this is absent. This finding is confirmed in a number of studies including Hadjithoma-Garstka (2011).

2.4 Perceptions about Educational Technology and ICT Integration

Perceptions are the beliefs and opinions often held by many people and based on how things seem to them; the ability to notice and understand things that are not obvious to other people. This study considers 'perception' from three basic dimensions; an understanding of the concept of ICT integration, personal opinions concerning ICTs and competencies in the use of ICTs. Previous research in educational technology leadership measures the perceptions of school heads in ICTs from all three dimensions. Perception of ICTs and ICT integration is important because an individual's perceptions usually determine their attitudes, and attitudes invariably determine whether ICT integration becomes a reality or otherwise (Rana, 2012).

2.4.1 Some international perceptions about educational technology

Educational technology is a complex concept. Different individuals, educational institutions, organisations and countries have views of technology that reflect their own resources, needs and goals for education as educational technology cannot be defined the same way by everyone. Davies (2010) asserts that educational technology is yet to be defined clearly because for over four decades many changes have occurred in how it is defined 'more as a result of new technologies than because of conceptual reconfiguration'. Depending on their ideals, objectives, goals and expectations regarding technology, educational technology may be perceived as involving media and audio-visual communications, as instructional systems and instructional design, or as vocational training (preparing students directly for the world of work). The following is how some organisations perceive educational technology:

2.4.1.1 International Society for ICT in education

The International Society for ICT in education (ISTE) is perhaps the largest international organisation that supports the integration of ICTs into education. Until 1988, the organisation was called International Council for Computers in Education. Their initial focus was on the use of computer systems to support the delivery of classroom instruction. Today, they focus on all electronic systems and devices that can be used to support education delivery. Their stated definition of educational technology is 'the full range of digital hardware and software used to support teaching and learning across the curriculum'.

2.4.1.2 International Technology and Engineering Educators Association

The association was called American Industrial Arts Association and then International Technology Education Association until the adoption of the current

name in the 1980s. Their initial focus was in manufacturing, printing, wood and metal works. Later, they shifted their focus to technology-related careers and the promotion of technology literacy. In the 21st Century, their focus is on STEM (Science, Technology, Engineering and Mathematics) education and careers. Specifically, they define educational technology as 'problem-based learning using Mathematics, Science and Technology principles'.

2.4.1.3 Association for Education Communications and Technology

Their initial perspective on ICT in education was focused on technology as audio-visual devices and media for library media specialists and librarians. Today, their perspective has widened tremendously, with a focus on using any resource in ways that improve teaching and learning. According to them, 'educational technology is the study and ethical practice of facilitating learning and improving performance by creating, using, and managing appropriate technology processes and resources'.

2.4.2 Principals' perceptions about educational technology

There appear to be few empirical studies that have examined the perceptions of school heads using qualitative approaches. Walsh (n.d) reported the findings from interviews with school principals and other staff in leadership roles in four schools in the UK, three in Australia and two in Singapore. A part of the survey sought to find out the perceptions of these nine school heads on effective integration of ICTs in education. Specifically, the principals' understanding of what the effective integration of ICT meant was explored. The following are his vignettes from six of the respondents:

- ICT is effectively integrated when it is part of your lesson planning just as much as getting the textbooks out of the cupboard

- Effective integration means improving the quality of teaching and learning, not about teaching ICT skills

- Effective integration can be tested in a given lesson if at least one of two things is taking place: a) by the end of the lesson students have developed ICT capabilities b) ICT makes something happen in learning about the subject that couldn't have happened, or couldn't have happened so effectively, otherwise.

- Effective integration occurs when every child has a guaranteed introduction to ICT that subject and secondly when teachers are sharing what they are doing with ICT with other teachers.

- Every curriculum area's development plan has ICT objectives which link with the school's development plan and ICT runs through the school plan like Blackpool does in rock.

- Effective integration of ICT will have taken place when you use it all the time and no one notices.
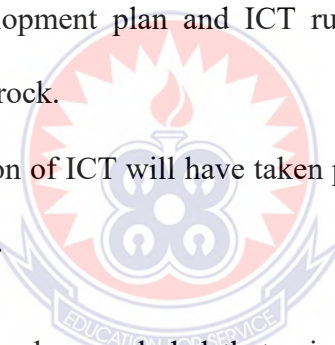
From these findings, it can be concluded that principals in the study area perceive that:

1. ICT integration should be conceived as early as the time of lesson planning, not an afterthought.

2. Integrating ICT has the aim of teaching the content of the school curriculum as a priority. ICT skills are acquired in the process.

3. ICT integration is planned and implemented throughout the school; among all teachers, subjects and classes.

A study of Australian principals by Schiller (2003) found that most principals spend a considerable amount of time using computers. 93.5 percent of 217 principals who

responded to the survey used computers at home and in school and most of them spent a lot of time working on their computers with over fifty (50) percent spending about five (5) hours on their office computers and about sixty (60) percent of principals spending more than three (3) hours on their home computers every week. The perceived competencies of principals according to the responses was grouped into three categories:

- Those competencies which principals perceive themselves to have developed a considerable level of competence and skills like basic word processing, sending email messages and using the WWW search engine.

- Those competencies which majority of principals feel they lack adequate skills and competencies or in which their skills were at the basic level, like creating and using databases, creating PowerPoint presentations and creating WWW pages.

- Those competencies in which there are very wide variations in perceived competencies among principals, example reading and interpreting spreadsheets and databases, using a URL and bookmarking a WWW page.

The variations in perceived competencies in ICT use was reported to be linked to differences in age and gender of principals.

Brockmeier, Sermon and Rake (2005) studied the relationship of principals in Florida with ICT. Two fundamental questions the study sought to answer were whether principals are prepared to facilitate the attainment of technology's promise through the integration of computer technology into the teaching and learning process and what could be said about principals' expertise to use computer technology. Responses to items on a computer technology survey enabled responses to be collected to provide answers to these questions and they revealed that majority of principals (66%

27

who answered to the survey) agreed that they spend a considerable amount of time assisting teachers to integrate computer technology into teaching and learning because they see it as one of their important instructional tasks. Moreover, 84% of the principals agreed that they need professional development to assist teachers to integrate computer technology into the curriculum. On a more specific question of the current state of principals' expertise to use computer technology, the study revealed that principals use specific technology in their work and although they have some level of expertise, there is the need for more training to augment that competence.

In his study of the ICT perceptions of a sample of 320 Iranian principals, Mojgan et al. (2009) found that principals' perceptions of their level of computer use was moderate. Moreover, the survey revealed that principals spent a few times a week working on their computers at home. Cultural perceptions were found to have facilitated the level of computer use by principals because principals did not see computers as a threat to Iranian culture but rather they had a positive perception of the relevance, value and impact of ICT on the society. This finding is consistent with that of Arokiasamy, Kanesan bin Abdullah and Ismail (2014) whose study revealed that the perceptions of Malaysian principals on their level of computer use was moderate. They also spent 'a few times a week' working on their personal computers. Cultural perceptions of principals were found to have a positive and moderate correlation with the level of computer use. As principals perceived computers to be useful, valuable and have positive impact on cultural and school norms, the higher the level of their use by these principals.

Papaioannou and Charalambous (2011) studied the attitudes of Cypriot primary school principals towards ICT and their perceptions of the factors that facilitate or

hinder their ICT integration in their schools. The findings of the study revealed that generally, principals have a positive attitude towards ICTs in that they believe that ICTs can improve teaching and learning. However, these attitudes were found to differ significantly among principals across independent variables: gender, years of service, academic qualification, access to computer and internet connection at home, computer presence at the principal's office, in-service training on ICT integration and computer experience.

Ngiam and Pang (2015) also confirmed a positive and significant relationship between the ICT behaviour of principals and the level of ICT use by teachers. When school heads take actions to manage and lead their schools towards ICT transformation, they encourage their teachers to also use ICT more for teaching and learning and vice versa. The study also found that the level of use of ICTs by teachers was dependent on how opportunities have been created by principals for continuous professional development in ICTs. In Kenya, Keiyoro et al. (2016) report that principals' support for ICT integration is very minimal due to the fact that many of them were computer illiterates and hardly used the internet in their daily activities.

In the Ghanaian literature, it seems that few of the research in education have put the spotlight on technology and its integration in instruction. Moreover, most of these studies have focused on teachers and the general ICT situation in schools. For example, Buabeng-Andoh (2012) explored teachers' skills, perceptions and ICT practices in two hundred and forty one (241) second-cycle institutions and reported that majority of the teachers had positive perceptions about the role of ICTs in transforming teaching and learning. A major finding of the study was that 77.2 percent of the 241 teachers involved in the study perceived themselves to have

moderate competence in the use of the word processor application and use of the computer for communication. On the other hand, majority of the respondents perceived their skills in database to be either zero or low.

The review of empirical studies into ICT integration in schools seems to reveal that whereas principals in the developed countries have an appreciable level of ICT competence, principals and teachers in developing countries including Ghana have relatively low levels of ICT competencies (compare Schiller (2003) and Keiyoro et al., 2016, for example). However, Mojgan et al. (2012) made the finding among Iranian principals that their knowledge and skills in ICT did not correlate positively with their transformational leadership role of inspiring teachers to be committed to the use of ICTs in the classroom. Provision, access and connectivity as well as the competencies of school heads in ICT use do not, in themselves, lead to ICT use in teaching and learning. It is more appropriate to conclude that the ICT competencies of teachers will result directly in whether ICTs are integrated in teaching and learning since teachers are directly at the point of instruction (Tronduer et al., 2006; Wastiau et al., 2013). It is therefore possible for principals to employ innovative strategies to motivate their teachers to integrate ICTs into teaching and learning even though they may lack the basic competencies in technology themselves. Data on ICT integration in Ghanaian second-cycle schools however shows that the pace of ICT integration has been very slow (Ministry of Education, 2009). There appears to be a gap in the literature as to whether school heads understand what ICT integration entails. The researcher believes that this is an important factor that determines whether or not ICT integration is practised in schools and this necessitates a study that explores the understanding of school heads on ICT integration.

From the review of empirical technology leadership literature, principals' perceptions of ICT has been narrowed to quantitative investigations into their competencies, attitudes, practices and perceptions of ICT. This study explores principals' perceptions of ICT integration from a different perspective: principals' understanding of what ICT integration actually entails. How do school heads in Ghana understand ICT integration? The Ministry of Education's e-readiness survey of second cycle institutions (2009) reports that:

> …there seemed to have been some confusion with integration of ICT to support administrative purposes versus integration for teaching and learning purposes. Though the data indicates that the majority of the schools (93.4%) were integrating ICTs, on further discussions and observations it was noted that the primary use of the ICT equipment and tools was to support mainly registration and examination purposes.

 The underlying assumption in this study is that, irrespective of the competence of principals, ICTs will not be integrated into teaching and learning if school leaders' understanding of the concept of ICT integration is flawed. Principals' perceptions and attitudes toward ICTs in education and ICT integration are determined to a large extent by their understanding of the concept.

2.5 Strategies for Leading ICT Integration

2.5.1 Examples of ICT Integration Initiatives

Evidence from research confirms the use of technology by many educational institutions both for administrative and instructional purposes (Krishnaveni & Meenakumari, 2010; Lu, Tsai & Wu, 2015; Mue, 2006; Selwood, 2004). This section presents selected instances of the use of ICTs in education (both administration and in the classroom) and the strategies that were adopted to achieve this. It is important to learn from the experiences of schools which have achieved considerable successes in

integrating ICTs in teaching and learning. According to Flanagan and Jacobsen (2003), knowledge about the successful experiences with ICT integration in different schools can provide important lessons for educational leaders who are anxious to achieve similar results in their own schools. According to them, the seemingly diverse examples of successful practice have five key elements in common. These should characterise any attempt to integrate ICT in education.

1. Student engagement

2. Shared vision

3. Equity of access

4. Professional development

5. Ubiquitous networks

The following is a review of some cases of ICT integration in the literature, first in the international setting, in some African countries and then in Ghana.

A need for ICT literate graduates by other sectors of the economy compelled the USA to put pressure on schools to invest in technology infrastructure between the 1980s and 1990s. Flanagan and Jacobsen (2003) presented a case of successful ICT integration in one school in Alberta, Canada; the Galileo Educational Network. It was a stakeholder-inclusive professional development project that offered intensive, individualised training to teachers to enable them seamlessly integrate ICT in their classrooms. Its main aim was to 'promote innovation in leadership and teaching practices and the organisational structures that support them'. Success of the initiative was measured by the level of engagement of students in authentic learning projects, stakeholder demand and a continued demand for the Galileo services.

Identifying models of good practices and pathways to change in the use of ICT, Yuen, Law and Wong (2003) conducted a multiple case study in seven primary and eleven secondary schools selected from a diverse range of backgrounds and differing forms of ICT use in classrooms in Hong Kong schools. Qualitative analysis of the data collected from the eighteen schools revealed three clusters of characteristics related to the implementation of ICT. The main difference between the three models are; 1) the established vision and values of the school 2) the perceived role and impact of ICT on education and 3) the established culture and reform history of the school.

Model A: Technological adoption model- This case of ICT use was found in five primary and six secondary schools. Emphasis on ICT implementation was on enhancing teaching effectiveness and presenting information in such a way as to stimulate students' interest using good multimedia especially graphics and animation and the management of teachers' technical skills and technical infrastructure. In a few cases, the teachers played the role of producers of ICT-based teaching and learning materials with multimedia and animation. Consequently, 'authoring media' was an important element of staff development in these schools as teachers were expected to use ICT knowledge acquired from training the training to create their own teaching materials.

Model B: The catalytic integration model-The two primary and three secondary schools in this category deliberately integrated ICT into teaching and learning as an integral part of the curriculum. They had educational ideals and orientations, to which pedagogical practices aligned. ICT-led efforts centred more on student-centred efforts. Teachers of all subjects were involved consciously in integrating ICT in the teaching of their respective subject contents.
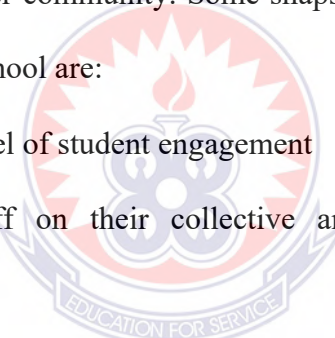
Model C: Cultural innovation model-This model characterised ICT implementation in two secondary schools. School change motivated by ICT did not bring about any serious extra demands on school leadership and teachers because a strong sense of mission and identifiable vision for ICT use that permeated all areas of practice had been built. Technology was integrated seamlessly in the curriculum insomuch that its impact on students' learning outcome was very profound. Even though there was no ICT professional development offered o students in these schools, many of the staff acquired them personally through informal channels. Moreover, ICT was found to be heavily used by students in a variety of extra-curricular activities and highly innovative projects. This model was found moreover to offer more motivation for student-centred learning.

Tondeur et al (2006), in their study of the relationship that must exist between curricula and use of ICT in education, examined the ICT framework that the Flemish government in Belgium had identified and defined for use by teachers for outcomes related to knowledge, skills and attitudes that pupils are expected to achieve at the end of primary school. In response to the changing knowledge economy, i.e. in order to make students relevant to the changing demands of the knowledge economy driven by technology, the government proposed a non-compulsory set of ICT attainment targets which were formulated as ICT policies. The ICT framework was not supposed to be a new ICT subject to be taught in that its focus was not on the teaching of technical skills (Vaderlinde & van Braak, 2011). Rather, it is to serve a catalytic rationale: a catalyst of innovation in teaching and learning. Moreover, its integration was supposed to be cross-curricular and have relevance for all subject areas.

Wastiau et al. (2013) surveyed a sample of schools (school heads, classroom teachers and students) in Europe to investigate their innovative use of ICT. The survey findings were based on 156, 634 questionnaire answers from students, 24, 522 from teachers and 10, 137 from head teachers in 27 countries collected between September and December 2011. The survey findings showed that on average, interactive whiteboards and data projectors were present in approximately one in three classrooms in the European Union. More than 9 out of every ten students were in schools with broadband. The results also revealed that at the European Union (EU) level, on average, between 25 and 35 percent of students in grades 4 and 8, and around 50 percent of students in grade 11 were in schools with fast broadband, i.e. 10 mbps or more and high connectedness. Again, at least some 80 percent of students in grades 4 and 8 were in highly digitally equipped schools with fast broadband and relatively high connectedness in Finland, Denmark, Norway and Sweden. In these countries, almost all students in grade 11 were in highly equipped schools whereas less than 20 percent of students in grade 4 and less than 10 percent in grade 8 were in such schools in around half of the countries surveyed, i.e. Bulgaria, Croatia, Greece, Hungary, Italy, Slovakia, Slovenia, Poland, Romania and Turkey where the situation improved at grade 11. The findings revealed that EU countries are far advanced when it comes to ICT presence in schools.

In Australia, Kent (2014) examined how an ICT-led school reform (specifically the introduction of interactive whiteboards (IWBs) in the Richardson Primary School, Australia, had changed teachers' way of teaching. The focus was on the use of technology to enhance the art of teaching, hence the generic term for the innovation was 'e-teaching'. Basically, the initiative involved the use of interactive whiteboards to stimulate teaching with the hope of improving learning. Technology was used this

way to 'present a concept, explore its implications, place the concept in various contexts, create links with existing knowledge, lead discussions that probe student understanding and allow students to take their learning in personally relevant directions'. Unlike computers that promoted individualised learning, the IWBs, in contrast, enhanced group activity and interactive teaching. According to Kent (2014), '…teachers can use the technology to promote higher order thinking and to lead substantive conversations. The class can take advantage of digital convergence to capture the students' environment and use what is captured as the basis for teaching. Additionally, the IWBs could be connected to the internet in which case the class would, act as a 'digital hub' through which to communicate and share learning experiences with the wider community. Some snapshots of the impact of e-Teaching at Richardson Primary School are:

- Increase in the level of student engagement

- Pride among staff on their collective and personal achievements with technology

- Increase in parent confidence in the school based on observed positive effects on their wards' learning

- Improvement in pupils' standardised test (ACT PIPS 2003) results in literacy.

In Africa, various countries have made different and considerable efforts to integrate ICT in education.

Hare (2007) reports on ICT in education situation in Tanzania. Initiatives to integrate ICT in education began in 2002 and resulted in an ICT in Education policy that emphasises incorporation of ICT into pre-primary, primary, secondary, teacher education and non-formal and adult education. ICT in education in also captured in the three documents that govern the education sector in Tanzania, which all 'emphasis

the need for access to and improved quality of education for all despite the increasing numbers of enrolment': The Education and Training Policy, Primary Education and Development Plan (PEDP) and Secondary Education Development Plan (SEDP). These emphasise, among others, a computer-led information management at all levels. Despite these policy initiatives however, the report indicates that ICT has not been integrated as a medium of instruction but rather finds prominent use in administration.

2.5.2 Strategies by the principal

Leadership is somehow synonymous with running and implementing changes that improve organisations (Hoyle & Wallace, 2005). As technology leaders, principals are supposed to be leaders of various dimensions of technology including learning, student entitlement, capacity building and community and resource management (Flanagan and Jacobsen, 2003). Anderson and Dexter (2005) identified eight technology related attributes and activities that 'emerged' from a survey to find out the best practices reported by the principals and ICT coordinators of schools in the United States. These are:

- Presence of a technology committee, which is an indicator of how the head's vision of technology is shared with other workers and adequate 'resources, coordination and climate' are made available to realise it. A technology committee is a mechanism for allowing staff to understand technology vision of the school and bringing everyone on board to achieve it.

- Principal days, which indicates the number of days that principals spend on technology planning, maintenance and administration.

- Principal e-mail, an indicator of whether the principal modelled the use of technology by using emails to communicate with stakeholders of the school; teachers, administrative staff, students and parents on a regular basis.

- Whether the school has a staff development policy which ensures that teachers are given continuous professional development and training in the use of technology for teaching and learning.

- School technology budget; whether the school has a budget for technology expenditure and which the principal or someone else has discretionary authority.

- District support, whether the district in which the school is supports technology initiatives of the school more than other districts according to the principal's judgement.

- Intellectual property policy, which shows whether in the view of the principal, the school respects intellectual property rights like copyright laws.

- Awareness of social, legal and ethical issues and whether there are policies that 'address issues of equity of access, safety of users and compliance of staff and students with legal and ethical guidelines for technology use'.

The International Society for ICT in education (ISTE) is an international organisation that promotes the use of ICT in education. They describe various standards that are expected of educational stakeholders for effective ICT integration. Their revised standards for administrators cover five dimensions: visionary leadership, digital age culture, excellence in professional practice, systemic improvement and digital citizenship (ISTE, 2018). Under each of these dimensions, there are a number of strategies principals must adopt to ensure success in the use of ICT in the school.

Table 2.1 outlines specific strategies expected of principals under each of the ISTE standards for administrators.

Table 2.1: ISTE standards for administrators

ISTE Standard	Specific strategies for implementation
Visionary leadership	Inspiring and leading development and implementation of a shared vision for the development of comprehensive ICT integration throughout the organisation.
Digital age learning	Creating, promoting and sustaining a dynamic digital age learning culture throughout the school; one that provides a rigorous, relevant and engaging education for all students
Excellence in professional practice	Promoting an environment of professional learning and innovation that empowers teachers, equipping them with the necessary skills that enhances student learning through the integration of contemporary technologies and digital resources.
Systemic improvement	Providing leadership that leads to the use of technology resources to promote continuous improvement of the school as an organisation.
Digital citizenship	Being a role model of, and facilitating proper understanding of the social, ethical and legal issues and responsibilities relating to the use of digital technology

Source: ISTE (2018).

For effective ICT integration, school heads are required to integrate in their technology leadership strategies these technology leadership dimensions.

2.6 Challenges to Successful Implementation of ICT Integration

There is a gap between the level of ICT presence in schools and the extent of their integration in teaching and learning. The fact that efforts being put in place by various governments and stakeholder organisations is yielding limited results suggests that there are factors inhibiting efficient ICT integration. Technology itself and computers

do not bring about ICT integration, and their installation in classrooms will not automatically lead to their use by the teacher (Saba, 2009). A number of factors are responsible for the slow pace of ICT integration in teaching and learning. Two barriers to ICT integration have been identified: first order (external) and second order (internal) barriers. First-order barriers are factors that are external to the teacher but limit the extent of technology use in teaching and learning. They include access to computers and other ICT devices, insufficient time to plan instruction and lack of administrative and technical support. Second order-barriers are intrinsic to the teacher. They include personal attitudes, established classroom practices, perceptions held as a result of cultural and/or other beliefs that may hinder the implementation of ICT integration (Ertmer, 1999). A third third-order barrier to teachers' practice of ICT integration has been conceptualised as the inability of teachers to create dynamic learning environments using their TPACK competencies, thus the 'lack of design thinking by teachers' (Tsai & Chai, 2012).

Roblyer and Doering (2014) address the challenges encountered in the use of technology for teaching and learning. They caution about a number of social, educational, legal/ethical and cultural issues that attention needs to be paid to as teachers and students are exposed to educational technology. Examples include the quality of life concerns, which has to do with the health risks of prolonged ICT use, young people's addiction to ICT devices, plagiarism and academic dishonesty, widening the digital divide, hacking and illegal downloads. To deal with these challenges, they suggest that schools teach these them as part of the required curriculum for students and the professional development for teachers in such a way that students and teachers will be made aware of them and hopefully use technology in ways that limit their negative consequences. Flanagan and Jacobsen (2003)

summarised the barriers to ICT integration into four main themes thus: pedagogy, equity, professional development and leadership. Akbaba-Altun (2006) also grouped these challenges into five (5) main themes namely; infrastructure, personnel, curriculum, administration and supervision. In Ghana, Mangesi (2007) identified such challenges as urban bias, limited skills of teachers and inadequate collaboration between educational policy makers and policy implementers. The challenges identified in the literature are synthesised and discussed under two main themes: infrastructural challenges and human resource challenges.

2.6.1 Infrastructural Challenges

Modern technologies are costly, and an investment in them requires and expenditure of huge amounts of money, first in the purchase of ICT equipment and then in skills training for staff, maintenance of equipment, wiring, ensuring security and others.

In Turkish schools, Akbaba-Altun (2006) noted that infrastructure was the common category that school principals, computer coordinators and supervisors noted as problematic to ICT integration. Infrastructural challenges included concerns about the physical setting of ICT tools, equipment breakdowns and those having to do with security and maintenance. Generally, school buildings constructed several years before the introduction of computers in schools lack features that make them suitable for connecting and using computers and other ICT devices. In many institutions, there are reports of scarcity of computers partly because repairs are often delayed when there is a breakdown and principals and ICT coordinators do not usually have the required knowledge to repair broken down equipment. Opoku-Peprah (2016) in his study of the challenges of ICT use in Senior High Schools in Ghana found that there were limited computers and software, no internet access among others. The predominant challenge reported by most of the respondents in his study was lack of

computer laboratories and limited resources and materials for teaching ICT. Mue (2006) in his study of the challenges faced in the introduction of ICT in education in Kenya confirmed the lack of adequate infrastructure in schools as the major challenge with the incorporation of ICTs in education. Similar findings were made by Albugami and Ahmed (2015) in Saudi Arabian secondary schools where ICT implementation was found to be hindered by lack of space and resources and maintenance challenges.

Closely associated with the infrastructural challenge is the concerns with equity. Equity concerns come about due to unequal access to basic infrastructure in different parts of the same country, among people of different socio-economic statuses, in different schools, among different individuals, age groups, genders, etc. According to Mfum-Mensah (2003), the introduction of ICT in Ghanaian schools is likely to lead to a digital divide between the urban schools who already have access to most educational resources and rural schools who are already impoverished when it comes to resources. This, he opines, is likely to escalate the existing disparities in Ghana's educational system. Flanagan and Jacobsen (2003) assert that, schools in lower socio-economic areas (villages or rural areas) struggle to raise sufficient funds to buy new equipment, and this is sometimes further compounded by instances of irregular power supply to these areas and sometimes outright lack of power supply.

2.6.2 Human Resource Challenges

Successful ICT integration is complex and requires many interrelated variables, perhaps the most important among these being the right personnel to manage the process. Several challenges associated with human resource are found in the literature, including those relating to principal and teachers' professional development, skills gaps and so on.

School heads, as instructional leaders, are expected to support their teachers to integrate ICTs into their lessons. Considering that these leaders are themselves not adequately prepared to effectively take up their roles as technology leaders, the role of challenging, equipping and motivating teachers to use technology in 'authentic ways' in teaching and learning becomes a difficulty (Flanagan & Jacobsen, 2003). The direct result of this, perhaps, is the lack of professional development and training of teachers in ICT integration literacy. Even though ICT integration in teaching and learning is a relatively new domain in education where teachers are expected to exploit, teachers lack basic skills necessary to make this a possibility hence resulting in feelings of discomfort to use computers (Carnoy, 2004). This lack of ICT skills and training is a concern in many countries where efforts are being made to integrate ICT in education (e.g. Albugami & Ahmed, 2015).

Malcom and Godwyll (n.d.) identified lack of resource capacity to provide ICT training and equipment servicing and lack of professional development programs for teachers to upgrade their skills in emerging technologies as apart from other infrastructural issues, some of the challenges confronting successful ICT integration in Ghana.

Another problem identified in the Ministry Of Education's e-Readiness report of 2009 in Ghanaian Second Cycle Institutions is the wide inequality in the distribution of ICT teachers and ICT infrastructure in Ghanaian schools. This problem is further emphasised by Mangesi (2007) and Mfum-Mensah (2003). Schools with more than five ICT teachers were found in the urban areas whereas those in the rural areas had less than three teachers. This consolidates the fact of the challenges associated with attracting teachers into schools in the rural areas of the country (Ministry of

Education, 2009). This situation is likely to widen the gap between urban (have) schools and rural (have-not) schools (Mfum-Mensah, 2003). The lack of policy framework for ICT integration in schools is another challenge to effective Implementation in schools (Mfum-Mensah, 2003).

2.7 Support Systems for ICT Integration

Support systems may be described as interventions that are put in place to overcome and/or limit the challenges to effective ICT integration (Tsai & Chai, 2012). Much of the support for ICT integration in many countries and outlined in literature comes governments and their education ministries mainly in the form of supply of ICT equipment for principals, staff and students. Other forms of support include the design and provision of professional development, pre-service and in-service training packages for schools and technical assistance. Governments also 'set the stage' for ICT integration by identifying what the potentials of ICT are for the country and how these benefits can be realised. One way of doing this is by mainstreaming ICT into the curriculum and setting specific standards to be achieved after each lesson (Tondeur et al., 2007).

Sometimes there is support from parents. In Australia, there is a drive by parents to take their children to schools where ICTs are used, and in some instances, they have actually driven the ICT proposition in schools, willing in some instances to contribute to the cost of providing ICT equipment (Walsh, n.d.).

2.8 Relationships between ICT, Age and Gender

A myriad of researches have investigated the relationships among such variables as age, gender and various technology constructs across diverse work settings; medicine, industry, commerce, education. Findings from these studies have not been conclusive;

while some studies have found significant relationships among age, gender and technology (e.g. Morris, Venkatesh & Ackerman, 2005), others have reported no significant relationships (e.g. Mustafina, 2016). The differences in results from these studies could be attributed to such factors as the skewed composition of males and females in samples used for the studies (e.g. Anderson & Maninger, 2007), setting of the study, differences in methodological and statistical tools employed for analysis and so on.

Among 342 workers who were introduced to a new software, Venkatesh and Morris (2000) investigated gender and age differences associated with different dimensions of computer attitude in adoption of the new technology. For perceived usefulness of the software, men were rated higher than women in deciding to use a new technology. Women, on the other hand, considered the extent to which the new technology was easy to use as more important than their male counterparts.

Developing a scale to measure computer self-efficacy among student computer users, Cassidy and Eachus (2002) among other things, found significant gender differences in self-efficacy in computer use. The study revealed that males had higher self-efficacy scores and were more experienced and familiar a greater number of computer packages than females. Moreover, computer training did not affect gender difference with men continuing to show higher self-efficacy scores than females in both trained and untrained groups. In a similar study assessing age and gender differences in computer use among secondary school students, Colley and Comber (2003) found significant gender differences between the attitudes of boys and girls to computers. Boys were found to be more self-confident, like computers more and unlike girls, show less sex bias concerning the use of computers.

Morris, Venkatesh and Ackerman (2005) extended the theory of planned behaviour to explain age and gender differences in a group of employee's decisions about technology. In addition to providing evidence to support significant differences among males and females in technology adoption, these gender differences were found to be more pronounced with increasing age. That is, older men were strongly influenced by attitude toward using technology in their decision making whereas older women were more balanced in their evaluation and assessment about whether to accept or reject new technologies.

Some studies have found no significant differences between males and females in technology variables (example, Bain & Rice, 2006; Teo, 2008; Mustafina, 2016; Rana, 2012). Bain and Rice (2006) investigated the influence of gender on students' attitudes, perceptions and uses of technology. Gender differences were not found to be significant in determining attitudes, perceptions and uses of computer. Likewise, Teo (2008) in his investigation of pre-teachers' attitudes toward computer use found that they had positive attitudes towards computers. No significant differences in age and gender were found, i.e., both male and female pre-service teachers at all ages were similar in their attitudes toward computers. Mustafina (2016) investigated teachers' attitudes towards technology integration in Kazakhstan. Findings show that teachers possessed positive attitudes towards ICT in school. Nevertheless, age and gender did not have significant effects on these attitudes. Irrespective of age or gender attitudes towards computers are not static, and they tend to be amenable to modifications upon exposure and direct experience with computers (Czaja & Sharit, 1998).

Contrary to Teo (2008), among similar pre-service teachers in another setting, Anderson and Maninger (2007) found significant correlation between gender and

computer intentions. Contrary to many studies that find that males have positive technology attributes, females in this study had better computer access and stronger intentions to use computer software in teaching.

2.9 The Context of Leadership and Management in Ghanaian Senior High Schools

The Ministry of Education is the statutory body that has oversight over the educational system in Ghana. Established under Civil Service Law, PNDCL 327 of 1993, it is the umbrella organisation that initiates policies, undertakes development and planning and monitors and evaluates the efficiency of the educational sector. Under the Ministry are subvented agencies and units that oversee different educational sectors in the country. Senior High Schools in Ghana are under the purview of the Ghana Education Service, which exists to implement the policies of the Ministry of Education at the pre-tertiary level. The Ghana Education Service manages Second Cycle Institutions in the country through its decentralised Education Offices throughout the country. Thus, there is a District Directorate of Education that is in charge of educational administration of all pre-tertiary educational institutions in the district. In each Senior High School, there is a school head who is in charge of administration. The school head is the overall leader of the school and is responsible for making all decisions that will ensure the success of the school. His duties, among other things, include management of school-community relationships, curriculum, instruction and appraisal and physical facilities and educational materials. The academic aspects of their duties are delegated to assistants who act as heads in that aspect. The assistant heads in charge of academic see to it that teaching and learning goes on smoothly in the school. Their duties include subject classification, time table design, allocating teachers to classrooms, vetting the lesson notes of Heads of

Department and seeing to the distribution of books and stationary to teachers and students. Assistant Heads in charge of academic deal directly with teachers in the schools. Directly below these category of leaders are the Heads of Departments. These are usually more mature and experienced teachers who act as leaders to their colleagues in their respective departments. They organise the teachers in their departments, allocate teachers and subjects, vet teachers' lessons notes and organise in-service training and departmental meetings. Heads of Department report directly to the Assistant Heads in charge of academic.

2.10 Summary of Literature Review

The literature review has discussed previous studies relating to various aspects of ICT integration in education both in the African sub-region and internationally. Various perceptions of ICT integration into teaching and learning are held by different international organisations, educational institutions and individuals based on their respective objectives and appreciation of how technology should be incorporated into education. Moreover, various strategies exist as blueprints for successful ICT integration models. In most schools, initiatives for ICT integration come from the government and individual educational leaders have the residual mandate to implement these policies taking into consideration the peculiarities of their school contexts. The review has also revealed that, despite the importance of leadership for successful school achievements, little attention has been given to the study of leadership for ICT integration in Ghanaian schools. There is therefore the need for research to address this gap and this is what the present study seeks to do.

CHAPTER THREE

METHODOLOGY

3.0 Introduction

This chapter explains the methods that were used to conduct the study and the underpinning philosophies. The researcher sought answers to four research questions and two hypotheses in a bid to investigate ICT integration leadership in selected Senior High Schools in Ghana. The chapter presents an overview of the methodology including the research approach, research design, site and sample characteristics, data collection and data analysis procedures, validity and reliability issues and ethical considerations that guided the study.

3.1 Theoretical paradigm and research approach

Philosophical worldviews are abstract and basic set of beliefs that guide the development of a research. Sometimes called paradigms, epistemologies and ontologies, they are broadly conceived research methodologies or alternative knowledge claims (Creswell, 2013; Fraenkel, Wallen & Hyun, 2015). The theoretical paradigm/worldview underlying this study has been set forth in this chapter for the purpose of explaining what the study seeks to discover and how this will be done. Embedded in the philosophical assumptions (ontology, epistemology, axiology and methodology) of mixed methods research (Creswell, 2013), the theoretical perspective/paradigm that underlies the methodology of this study is pragmatism (Creswell, 2014). The pragmatist worldview, which is the philosophical underpinning for mixed method research is based on the assumption that researchers adopt 'what works' to study any particular problem. There is more emphasis on the problem and all practical solutions possible are used to arrive at a solution than on the use of pre-determined methods. According to pragmatists, the problem is more 'important' than

what method is appropriate for studying it (Creswell, 2014; Creswell & Clark, 2011). Pragmatists therefore use multiple methods to collect and analyse their data in ways that enable them to understand the problem at hand from all its possible perspectives. Even though various dissenting views may be found in the literature on the 'best' worldview for mixed methods research, several different authors support pragmatism as the most appropriate worldview for enquiries involving the mixed methods approach (Creswell and Clark, 2011). The basic underlying tenet of pragmatism is that, both qualitative and quantitative methods may be employed in a single research study. The mixed methods approach was adopted for this study because the problem under investigation is underexplored, hence an attempt was made to understand its various dimensions from a qualitative and quantitative standpoint. Throughout this chapter, how this theoretical worldview shaped the research design, methods of data collection, analysis and other methodological choices will be described.

3.2 Research design

According to Creswell (2014), a research design is a type of enquiry within a chosen approach which provides specific guidelines and directions for a research. This study employed an embedded mixed methods case study design to explore the research questions and hypotheses under investigation. In embedded mixed methods designs, researchers collect and analyse both qualitative and quantitative data within a typical qualitative or quantitative framework. The supplementary (qualitative or quantitative) method is added to enhance the quality of the research. Embedded mixed method design is useful when different types of data are required to answer different research questions (Creswell & Clark, 2011). The primary design for this study was the case study design. Case studies 'penetrate situations' and present results in ways that numerical findings from quantitative inquiries do not (Cohen et al., 2007). This design

was used to do an in depth exploration of how ICT integration leadership occurs in three selected Senior High Schools using interview data from three levels of leadership: the school heads, assistant heads in charge of academics and heads of the Integrated Science department (ICT is under the Integrated Science department in all three schools). A quantitative survey involving a random sample of teachers from each school was embedded in the dominant case study design for the purpose of triangulation; i.e., to seek convergence and corroboration between the two data sets. Moreover, results from the quantitative strand of the study helped to enrich the findings, interpretation and conclusions that were made from the study.

3.3 Site Selection and Characteristics

The study was conducted in three Senior High Schools from three selected districts in the Central Region of Ghana: Gomoa West, Gomoa East and Mfantseman districts. The slow pace of ICT integration in the Senior High Schools is an issue of national educational concern as revealed by the 'e-Readiness Assessment Report of Senior High Schools' (Ministry of Education, 2009 p. 8) hence making all the ten regions in the country and all public Senior High Schools typical cases for investigation (Cohen et al., 2007). Since all schools were typical cases, the researcher selected the Central Region on the basis of its geographical convenience. Moreover, within the region, a geographically convenient cluster of three districts: Gomoa West, Gomoa East and Mfantseman districts was selected. Senior High Schools in Ghana are categorised in ascending order of academic performance as Options 1, 2 and 3 and I was interested in getting schools from each of the categories in order to ensure representativeness hence one school from each of the categories was purposively selected.

3.4 Population

The population of this study is the entire group or number of people to which the results of the study may be generalised. Within the three participating schools, sixteen (16) heads, HODs and ICT teachers constituted the population of the qualitative phase of the study. This was made up of the Head, one Assistant Head each for Administration, Academics and Domestic, the HOD of the Science Departments and ICT teachers (NB: In School 1, there was only one Assistant Headmaster).

The population of teachers in the three schools was 232; 105 from School 3, 87 from School 2 and 40 teachers from School 1.

3.5 Sample and Sampling Procedures

Sampling is a way of selecting cases that are best suited for a study because of their ability to help meet research goals, purpose and objectives (VanderStoep & Johnson, 2009). The study adopted a mixed methods approach, hence two broad levels of sampling were employed for the qualitative and quantitative phases. The sample size and sampling strategies for both approaches were based on the population which has been defined for the study in the preceding subsection.

3.5.1 Qualitative sampling

Two levels of sampling were used for the qualitative phase: site level sampling and participant level sampling (Creswell, 2013). First, the critical (case) sampling technique of the purposive sampling strategy was used to select three (3) public Senior High Schools out of the ten (10) schools in the three districts as cases/sites for the study. Fraenkel et al. (2015) assert that critical sampling as a purposive sampling strategy is used to select cases that are considered as enlightening because they are

unusual and/or exceptional. In the selection of the three schools, the following basic criteria were used:

1. Presence of computers and ICT infrastructure; minimum of a computer lab.

2. The present school head had had at least one academic year of experience as head in the school.

The second level of sampling was done to select the participants who served as respondents for the qualitative phase of the study. The size of the sample was twelve (12) respondents, consisting of one person from each of the following three levels of leadership in each school: School Head, Assistant Head for Academics, Head of the Integrated Science department and ICT teacher. These were purposively selected because they are information-rich and hence could provide data that would answer the research questions (Cohen et al., 2007).

3.5.2 Quantitative sampling

 In order to have a sample that would be representative of the entire population of teachers in the three schools, the probability sampling technique was used to select a sample for the quantitative phase of the study. Total population of teachers in the three schools was 232; 40 from School 1, 87 from School 2 and 105 from School 3. According to Krejcie and Morgan (1970), when there is a population of 240, a sample of 148 will be representative of the population and could allow any statistical analysis to be performed. By using proportion and approximating the results, 67, 56 and 26 teachers were needed from Schools 3, 2 and 1 respectively. SPSS software version 20 was then used to select a simple random sample of teachers from each school to whom the questionnaires were administered.

3.6 Data Collection Methods

Two methods of data collection were used; face-to face-interview and survey for the qualitative and quantitative phases respectively.

3.6.1 Interviews

Semi-structured face-to-face interviews were conducted to explore the school leaders' experiences with technology leadership in order to answer research questions one to four. Interviews are a direct way of gathering qualitative data from research participants. An interview is a useful method of collecting data for this research for two basic reasons: first, given that the researcher was seeking to explore the views and experiences of school leadership on the subject under investigation, face-to-face interviews enabled me to collect in-depth information that was required to answer the research questions in a way that questionnaires or observation, for example, would not (Atkins & Wallace, 2012). Secondly, since interviews offer opportunity for dialogue, the researcher was able to control the line of questioning, seeking clarifications where necessary to ensure that what the interviewees' responses were understood correctly. Interviews were used to collect data from all the twelve respondents and for the first four research questions.

Two semi-structured interview guides were used for the collection of the qualitative data; one for the Heads, Assistants and Heads of Department and the other for the ICT teachers (see Appendix A and B). The design of the interview guides was done by the researcher. The research objectives were translated into questions that formed the main body of the guide. Sub-questions that reflected what I intended to explore under each of the main questions were also outlined under them. Face and content validity of the instruments were ensured by my supervisors and a staff at the Institute of Distance and e-Learning (IdeL) at the University of Education, Winneba respectively.

The instruments were then pre-tested at the Winneba Secondary School in an interview with the Assistant Headmaster in charge of administration. Winneba Secondary School is a public Senior High School having similar ICT characteristics as the ones used for the study. Observations made by the researcher from the responses and comments made by the assistant headmaster during and after the interview, the duration of the interview and nature of responses given helped me to have an idea of what I was likely to experience on the actual field of data collection and hence made appropriate corrections and modifications to the interview guide.

3.6.2 Survey

Surveys are used to collect data from a large group of people at a particular point in time and they capture data from multiple choice, closed ended questions, test scores or observation schedules (Cohen et al., 2007). A survey was conducted to collect quantitative data form teachers in response to the two hypotheses. Questionnaires were used to gather data on the opinions of a number of the teachers. The questionnaire was designed by the researcher to collect data from the sample of teachers for the quantitative strand of the study. The questionnaire was made up of fourteen likert items each having response options of strongly disagree (1), disagree (2), neutral (3), agree (4) and strongly agree (5). The purpose of administering the questionnaire was to measure teachers' perceptions about computers and their use for integration into teaching and learning and to determine whether this was predicted by age and gender. This was done to enrich and corroborate findings from the qualitative phase of the study.

3.7 Data Collection Procedures

An introductory letter was obtained from the Department of Educational Administration and Management of the University of Education, Winneba. This was used to seek permission from the 'gatekeepers' of the schools to conduct the study. I attached letters of consent to the introductory letter and delivered them personally to the respective 'gatekeepers' of each of the three schools (i.e. the school heads). After approval had been given, a date was scheduled for the actual data collection in each school. The entire process of data collection took place between March and May, 2018. Most of the interviews with the school heads and questionnaire data from teachers were collected within March and April while interview data was collected from the other respondents: Assistant Heads, Heads of Department and ICT teachers in May, 2018.

3.7.1 Interviews

The instrument was self-administered at the premises of the schools. All the heads' interviews took place in their respective offices. Because a date and time agreed by both the researcher and respondents had been selected, the respondents were ready for the interview and in Schools 2 and 3, their secretaries were directed to put all visitors on hold as much as possible while the interview was in session. In School 1, the headmaster's secretary's office was located in a different building and so such directive was unnecessary hence making a few interruptions inevitable during the interview. Nevertheless, this did not affect the quality of the interview that was conducted. Even though all attempts were made to conduct all the interviews face-to-face, constraints resulting from unforeseen, unplanned school activities and in some cases unavailability at the school premises on the day of data collection could not make this possible. Nine of the interviews were done face-to-face. Interviews for

ASH1 and ICT1 in School 1 and ASH3 from School 3 were conducted over the telephone. For reasons such as these, interviews may be conducted over the telephone (Creswell, 2012). The respondents agreed to have the interview over the phone and a convenient time and date were scheduled. Indirect contact with the respondents of the telephone interview did not affect quality of responses and respondents' cooperation. Duration of the interviews ranged from fifteen minutes to one hour and thirty minutes. All interviews were audio-recorded with the consent of the interviewees.

3.7.2 Survey

After a brief introduction and explanation of the nature and purpose of the study, the consent of each of the teachers to participate in the study was sought. The questionnaire was self-administered by the researcher to the teachers in their respective schools. In order to reduce the incidence of non-response, in each school, the questionnaire, which took about 10 to 15 minutes to complete, were collected on the same day. This was also useful because it allowed any queries that teachers had regarding the questionnaire or any part of it to be addressed by the researcher (Cohen et al., 2007). 45 of the questionnaires were returned in School 3, 43 questionnaires were returned in School 2 and 25 were returned in School 1, representing a response rate of 67%, 77% and 96% for Schools 3, 2 and 1 respectively. Overall response rate for the questionnaires was 76%. Many survey researches in leading educational journals report a response rate of 50% or better (Creswell, 2012). 76% response rate for this study is therefore considerably satisfactory.

3.8 Data Analysis Procedures

3.8.1 Qualitative data

The researcher went through a number of iterative steps to conduct a content analysis of the interview data from the twelve respondents. The data were analysed using both deductive and inductive approaches. Deductive approach was used to identify themes relating to the research questions that were put forward at the beginning of the study while an inductive approach was used concurrently to capture serendipitous themes that emerged from the data. First, the audio-recorded interviews from the respondents were transcribed. The transcripts were read thoroughly to have an initial familiarity with the issues emerging from them. Atlas.ti version 7 software was used to code the data by breaking them down into useful sentences as units of analysis. A priori codes were created using themes that were expected from the research questions and segments of the text that related to these codes were assigned to them. This was deductive coding. Emerging concepts and themes were added inductively as the coding process progressed. The list of codes were edited and re-grouped to reduce them into a smaller and manageable number of codes. Then, overarching themes were developed from the codes. This process was repeated for all the twelve interview transcripts. Thereafter, a narrative was written using the themes, quotes that support them and interrelationships between the themes. The write-up was organised in accordance with the research questions that guided the study.

3.8.2 Quantitative data

Data from the questionnaires were edited, coded and entered into SPSS version 20 software. An independent samples t-test was run to determine the relationship between the predictor variable (gender) and outcome variable (perception on ICT integration). Furthermore, a One-way ANOVA test was conducted to determine

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whether age groupings of the respondents predicted their perceptions about ICT integration. Thus by these two tests, the predictive effect of the two independent variables on the respondents perceptions about ICT integration was determined.

3.9 Validation of Qualitative Findings

Validity refers to the 'appropriateness, correctness, meaningfulness and usefulness' of inferences that are made from data (Fraenkel et al., 2015). Qualitative methods of establishing validity are varied. According to Cohen and Crabtree (2008) there are seven evaluative criteria for ascertaining good qualitative research: (1) carrying out ethical research; (2) importance of the research; (3) clarity and coherence of the research report; (4) use of appropriate and rigorous methods; (5) importance of reflexivity or attending to researcher bias; (6) importance of establishing validity or credibility; and (7) importance of verification or reliability. In this study, four issues that impinge on the quality of the research design were considered. These are construct validity, internal validity, external validity and reliability. In terms of construct validity (triangulation), a major concern of any research is that its methodology fails to be effective or operationally valid, leading to a significant element of subjectivity entering into the field research and the assessment of the resultant data. In this study, two measures introduced to overcome such a problem in the research design are the use of multiple sources of evidence and the establishment of a logical chain of evidence. Consequently, this study utilized a number of different research methods, both to 'triangulate' the results of the research from different sources and to ensure a logical 'evidential chain'. Internal validity concerns the fact that a researcher might make incorrect inferences if all aspects of the research subject are not considered and rival explanations are not addressed. Consequently, in this study, rival explanations contained in opposing propositions and their associated

literature were considered and addressed. A third concern is external validity, whether the results of the research can be applied beyond the immediate case research itself. This is particularly problematic if the research is based on a single case study, and consequently, the openness of the research to replication will be increased by its utilization of comparative analysis in a holistic multiple case design. This study focused on analytical generalizability rather than statistical generalizability—that is, the identification of common themes and experiences that emerge and persist across cases. The final concern is whether the research is reliable; could the same logical steps be followed and replicated at a later stage and do the methods effectively measure what they are meant to measure? Consequently, in this study, each research step was recorded and all data were retained in a logical manner to maintain a form of database, comprising copies of questions, interview transcripts, computer software data and back-up storage.

3.10 Validity and Reliability of Quantitative Instruments

The questionnaire went through both face and content validity tests. Some colleagues from the Department of Educational Administration and Management studied the questionnaire to identify any errors of spelling, grammatical constructions, etc. Content validity was tested by questionnaire to experts in the field of ICTs and education; a professional at the ICT Services Department of the Institute of Distance and e-Learning, University of Education, Winneba, and the ICT coordinator at the Ghana Education Service, Effutu Municipal Assembly. Suggestions by these three experts helped to modify and improve the content of the questionnaire.

The instrument was then pre-tested at the Winneba Secondary School. Ten teachers were randomly selected to take part in the pre-testing exercise. Suggestions and

comments by the respondents and observations made were also used to make final modifications to the instrument. A reliability test was carried out to determine the internal consistency of the fourteen items. Cronbach's alpha coefficient for the pre-test responses was .70, which is fairly satisfactory. According to Creswell (2012), a reliability coefficient of .6 is an acceptable level for determining whether a scale has internal consistency.

3.11 Ethical Considerations

Ethical issues run throughout all stages of the conduct of a research; from planning to the reporting of research findings (Creswell, 2013; Atkins & Wallace, 2012). They address issues that relate to right and wrong conducts in a research endeavour. This section addresses the ethical issues that attention will be given to in the conduct of this research.

3.10.1 Power relationships

The institutions that were selected as cases for the study were ones that had no vested interest in the outcome of the study. Also, the position of the researcher as an outsider, student-researcher ensured that no issues of power conflict inhibited the process of data collection.

3.10.2 Access and approval

Since gaining access to a research setting is not a right to the researcher according to Cohen et al. (2007), a letter of introduction was sent from the Department of Educational Administration and Management of the University of Education, Winneba, to seek official permission from the 'gatekeepers' of the schools to conduct the research. The letter stated the identity of the researcher as a postgraduate student of the university and that the research was being conducted as a requirement for the

attainment of a master's degree. The purpose of the study was also stated. In all three schools, approval to conduct the study was given by the heads. My letters were signed and referred to other person(s) whose assistance was needed to make data collection successful.

3.10.3 Informed consent

Subsequent to gaining access to conduct the study in the institution, letters were written to the heads of the school and teachers from whom data was collected to seek their official consent to participate in the study. The letter contained information on the research purpose and objectives and data collection methods and procedures. This was done in order not to infringe on the participants' right to freedom and self-determination. Participants were also informed of their freedom to withdraw from the study at any time and for any personal reasons. On the basis of this information, participants agreed to participate in the study.

3.10.4 Privacy, confidentiality and anonymity

Since the results of the research will be a public document, steps were taken to respect and protect individual right to privacy. Two ways of ensuring that this was done were confidentiality and anonymity. All participants in the study were assured of privacy, confidentiality and anonymity of themselves and their responses. Generally, the names, addresses and locations of the institutions where the research was carried out was not indicated in the report in order to protect the anonymity of the schools and participants. The school heads who participated in the interviews were assigned with pseudonyms during transcription and reporting of the data. The teachers were not required to provide their names on the questionnaires so that they would remain anonymous.

CHAPTER FOUR

DATA PRESENTATION, ANALYSIS AND DISCUSSION

4.1 Introduction

This chapter presents and discusses results and findings from the study on the state of ICT leadership in the three Senior High Schools. For the dominant qualitative phase of the study, interviews were used to collect data because they helped to explore the research questions and gather relevant, detailed data to address each of them (Denscombe, 2007). Twelve respondents in three levels of school leadership – School Head, Assistant Head (academics), Head of Department together with one ICT instructor – were purposively selected to provide the data for the study. The process of analysing the data involved a number of steps. First, the audio-recorded interviews were manually transcribed. The transcripts were read and re-read, thereby allowing me to become immersed in the data. While reading and re-reading, I took notes, reflected on the data and wrote down my interpretations. I then coded the data using the Atlas.ti version 7 software. Words and phrases that summarised sections of the transcripts were assigned to the same. Texts that I coded were those I considered to be salient because they reflected the objectives of the study. Themes that emerged from the data and the interpretations that I made from them have been interspersed with selected descriptors of the language of the participants, presented and discussed herein using evidence from current literature. The process of reporting the findings of the study is also consistent with the Consolidated Criteria for Reporting Qualitative research (COREQ) (Tong et al., 2007).

Data gathered for the quantitative strand of the study was also analysed using the SPSS version 20 software. Results have been presented and discussed and inferences made from them to support the qualitative findings.

4.2 Demographic Characteristics of Interview Respondents

Of the twelve respondents who were interviewed, ten of them, representing 83% were males, while only two, representing approximately 17% were females. The heads were asked about their years of experience as heads of Senior High Schools. In School 1, the head had had four years of experience as a head. The heads of Schools 2 and 3 had had ten and sixteen years of headship experience respectively. Table 4.1 shows a presentation of demographic characteristics of the respondents according to the category of their schools. For the purpose of ensuring confidentiality and anonymity, codes were assigned to identify them where their comments are used to support the findings.
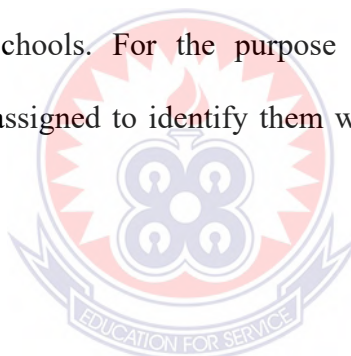
Table 4.1: Demographic Characteristics of Interview Respondents

School	Level of leadership	Sex	Age	Code
	School head	Male	55	SH1
Option 1	Assistant head (academic)	Male	52	ASH1
	Head of department	Female	43	HOD1
	ICT teacher	Male	32	ICT1
	School head	Male	56	SH2
Option 2	Assistant head (academic)	Male	53	ASH2
	Head of department	Male	55	HOD2
	ICT teacher	Male	32	ICT2
	School head	Female	52	SH3
Option 3	Assistant head (academic)	Male	48	ASH3
	Head of department	Male	42	HOD3
	ICT teacher	Male	45	ICT3

Source: Field data (2018).

Five overarching themes emerged from the data analysis:

1. School leaders' ICT characteristics

2. Leadership support

3. Challenges of ICT integration

4. Support systems for ICT integration

5. Emerging themes

Under each of these themes are sub-themes that helped to delineate and vividly explain the issues that emerged from the data.

Research Question 1: What perceptions do the school leaders of the three schools have about ICT integration into teaching and learning?

4.3 School Leaders' ICT Characteristics

4.3.1 Perceptions on the use of ICTs for teaching and learning

The study sought to find out what the school leaders think about using ICTs and technology for teaching and learning. Six of the participants in the study were above the age of fifty and as described by one of them, 'soon to go home'. Four of them were also above age forty. Such older people are perceived to have negative perceptions about ICTs and technology in general (Prensky, 2001) yet the perceptions of school leaders about ICTs determine the extent of success of ICT integration initiatives in schools (Yee, 2000; Rana, 2012). Despite being born at a time when computers and ICTs were not very common, all the school leaders involved in the study expressed positive perceptions about the use of ICTs for teaching and learning. ICTs, they believe, could improve teaching and learning, aiding among other things, better understanding of curriculum content, student retention and improved pedagogy. According to them, ICTs improve teaching and learning by allowing teachers to provide digital audio-visuals for their lessons. Visuals enable students to understand what they are taught better. ICTs also aid in retention and future reproduction of information. Moreover, students are often excited about ICTs and so concentrate better when teachers use them for teaching. These and other similar opinions were shared by most of the respondents as the following comments suggest:

> …technology and ICT for that matter has advantage in terms of speed, demonstrations and visuals. It brings home well the principles underlying a

concept. They help to do better illustrations, and they also affirm or ground better because there are visuals of ICT that allow you to remember what you study better. It will also allow students to appreciate better the principles and concepts underlying a study or topic. It may also reduce the volumes notes and text that one needs before they can understand a topic or before a concept may be disseminated (Interview transcript, ASH3.)

Technology helps to arouse the interest of the students. When you are using it the students usually participate very well in the lesson. It also makes learning easier because the teacher is able to cover a lot with that (Interview transcript, HOD1).

When students see and hear, they understand better than only learning…the raw teaching where teachers only go there to talk and write just a little on the whiteboard does not help so much. If you have something on your machine, and you present it on the projector and teach, students get it better. If you are teaching using PowerPoint for example it goes straight away…It sticks better than just taking. Psychologists say when students see, they get almost 70 percent of the stuff. But when the teacher only talks, only 30 percent is retained. Just look at the difference (Interview transcript, ASH2).

There is also the appreciation of the ability of ICTs to be more efficient in teachers' search for information for teaching. The participants believe that the internet, for example, allows teachers to get volumes of information within a short period of time, a way that textbooks and other hard copy materials do not afford. One of the respondents explained how this can become advantageous for teachers:

…when using textbooks, one textbook may highlight on the principles or a concept to some extent or depth. But if you are using ICTs and you go to the internet and you are talking about the same concept, you may get so many references and the opinions of so many writers on a single concept so it allows the teacher to understand and to teach better…unlike the textbooks that you have to use one, and then look for a second one…just imagine if you have to

stock your room with so many volumes of textbooks just because you are looking for information on just one concept. With ICTs, just with the click of a key all the writings on such a topic can easily be accessed (Interview transcript, ASH2).

The convenience of the internet and the various ways in which it can be used by teachers also enables them to conserve time for use for other relatively beneficial activities related to their duties. The role of teachers in the Senior High Schools is laden with so many responsibilities, including making assessments of students' exercises, preparing lesson notes and doing research to gather more information for teaching. School leaders believe that with ICTs, teachers will be able to have enough time to do other things that they hitherto do not have enough time for. For example, the Head of Department in School 3, who is also a teacher, remarked: 'It (ICT) saves me the time. Anywhere I find myself I can refer to and read my notes. So it's like reading is ongoing every moment'.

These perceptions of ICT integration that the school leaders held was grounded in the realisation that the world is rapidly advancing technologically. Notwithstanding the fact that these leaders belong to an older generation, they accept the reality that society today is different from that in which they grew up and were educated hence the need for instructional methods that differ quite significantly from what existed years ago. One headmaster noted thus:

> The whole world is becoming a superhighway global village and that is being done because of ICT, and government wishes the country also forms part of that movement…your success tomorrow depends on the foundation built today. Where we are now; the direction in which the world is moving, we also have to move towards that direction so that we are not left behind because if they are saying we are now moving into the ICT world, Ghana also has to move there or else we will be left behind (Interview transcript, SH1).

Another respondent shared similar sentiments on the fact that it is about time the country embraced the digital revolution:

> By this time we should be using laptops, projectors and things like that in classrooms to teach. We are in the 21st Century. This is not the time we should be using chalk and white board markers and so on. Let the student see, and then explain to him, then he will understand (Interview transcript, ASH2).

Though born and educated in pre-digital years, these findings from the data reveal that school leaders have positive perceptions about ICT integration, and these perceptions are grounded in the appreciation of the enormous benefits of ICTs for both students and teachers. It confirms Schiller's (2003) finding that most school leaders indeed appreciate the enormous benefits of ICT in education and would attempt to do something to facilitate its use in their schools if they had the opportunity and resources. The finding is also consistent with Mojgan et al. (2008) and Papaioannou and Charalambous' (2011) study of Iranian and Cypriot principals respectively. They found that principals had positive attitudes and perceptions of the relevance, value and impact of ICT on the society, and that ICTs could improve teaching and learning.

4.3.2 Competencies

The school leaders' personal ICT competencies which they perceived to possess were basic and foundational. These competencies found expression in the ability to perform computer tasks such as typing, printing and retrieving saved documents. For example, SH3 commented thus 'On my competency, I can only type 'where is A, where is B' and if you give me the chance, maybe send some messages with the computer' (SH3) ('Where is A, where is B' is a term that is transliterated from a Ghanaian expression that describes a situation where an inexperienced typist literally stops to look for the

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next letter of the alphabet as he/she types a text. This way of typing makes the typing experience very slow.)

Other respondents' comments validate the finding that perceived ICT competencies of the school leaders are basic: 'Personally, I have a laptop. At times I use to it type my exam questions. I can type but not very fast (HOD1). 'Yes, apart from my phone I have a laptop. I use it to type my lesson notes, and a book which I am soon to publish (HOD3).

Apart from typing, printing documents and retrieving saved files, internet surfing and use of the Microsoft Office Suite were other competencies that respondents perceived themselves to possess. One school head remarked:

> …since I came to this school two years ago, even though we have a secretary, most of the administrative work is done by me…The ideal practice is, if it's a letter we have to write, I have to draft it and give it to her to type but most of the time, I do the drafting and do the typing also. If we are to send a document to the region and so on, I do that because when I was in the district office I was the head of the planning and statistics unit, so working with computers is not something I find difficulty with. When it comes to Microsoft; Word, Excel, PowerPoint, I can use all of them…and I am good at surfing the net too (ASH1).

There wasn't found to be a major variation in ICT competencies on the basis of the category of the schools of the respondents. For instance, the basic competency that the head of the Category 'A' School perceived herself to have was similar to that which the heads of both Category 'B' and 'C' schools alluded to. Therefore, the ICT competencies of the educational leaders in this study tend to be dependent on factors other than the category of school. Moreover, the variety in the competencies of the respondents was not found to be associated with age nor gender because some older respondents demonstrated a relatively higher competency with ICTs than their

younger counterparts, and in some cases, people of similar ages expressed different competencies. For example, while both ASH2 and HOD2 were in the same age bracket, their competencies varied markedly as observed from their responses to the question of what tasks they could perform with the computer. According to the former, 'I will say I'm moderate, not too perfect because some of the things I don't know. I can use the computer to…I know how to type, so I can use it to type so many things, to prepare my accounts, my budget, my requisition, and I can also use Corel Draw a little. I can also go to the internet to find information and do so many things on the net (ASH2). On the other hand, according to the HOD2, 'I was introduced to ICT in the university but it was not anything intensive. The machines were run down by virus so those that were working were so few that sometimes two or three people had to share one computer. At the end of the day we had to write something in the exam for assessment. As I sit here now if I have to use the computer to teach I have to be given some revision on it so that I can recollect' (HOD2).

The study revealed moreover that, the competencies that the respondents admitted to possessing were acquired through various means, including personal assertiveness, curiosity to learn, constant practice and in some cases, ICT modules included in tertiary education programmes. For example, one of the heads described how he was able to move from being a 'computer leper' to having the ability to type a whole postgraduate thesis within a few months: 'My style was, because the computers at the time were very limited, I used the computers at the school of graduate studies during vacations. At the beginning I did not have my personal computer so always during vacation I was playing with the computers; going through the icons and other things. And at the end of my studies, I typed all my work' (SH2). Another respondent described how he became proficient with computers: 'I learnt it from a colleague

friend: the ICT boss over here, he taught me how to use them. Usually when I am free and bored, I just try to practice little by little just for excitement. I wasn't trained in ICT but I learnt it from friend' (ASH2).

Unlike evidence from most international researches like Schiller (2003) and Mojgan et al. (2008), where school principals use computers quite often in their work, principals and school leaders in this study did not use computers very much in their work, as the nature of their responsibilities did not 'allow' them to use computers often. According one of the respondents, 'As an administrator, it is good for me to be very current in using ICT, but unfortunately, the work that we do in school does not allow us to' (ASH3). This was supported by comment from another respondent who admitted that 'Yes I have my personal laptop, and the office too has given me a new laptop. I don't use it quite often. I do when the need arises. The nature of our work does not permit us to do so many things with the computer' (ASH2). Additionally, consistent with the findings about African principals by Keiyoro et al. (2016), some of the respondents in the study were computer illiterates and hence used computers very minimally in their work. The practice of sending and receiving e-mails, which are found to be common characteristics of principals' competencies (Mojgan et al., 2008) did not seem to be one of the competencies that the respondents in this study perceived themselves to have.

Finally, these findings support the conclusion the researcher made from the literature review, which is that whereas principals in the developed countries have are more sophisticated in their competence in computers, principals in developing countries have basic ICT competencies.

4.3.3 Knowledge

The study also sought to find out the respondents' knowledge of ICT integration. Specifically, the researcher sought to explore two dimensions of knowledge. The first is 'the what' of ICT integration; that is, what the various conceptualisations of ICT integration by school leaders were. The second dimension was about the respondents' knowledge of ICT integration policies in education in the country. The data showed that, even though conditions in their schools do not make implementation effective, educational leaders have an idea about what ICT integration should entail. Various uses of ICTs before, during and after classroom instruction were mentioned. According to the respondents, before actual lesson delivery, ICTs could be used by teachers for the purpose of researching to get more information to teach their students. The internet makes this possible as textbooks which have been the traditional mode of studying had some limitations. Students could also use the internet to search for information about things that they have been taught in class in order to broaden the scope of their knowledge. One of the respondents expatiated on this point more vividly by saying that, 'As a teacher you cannot rely on only the textbook that has been given to you. You have to do research and get other information from the net to find out what others are also saying about the topic so that you get a broader knowledge in preparing your notes and for teaching your students (ASH1). Another respondent explained what his conceptualisation of ICT integration was:

> … [the teacher] is able to research and bring the concepts and principles out better. For example, when using textbooks, one textbook may highlight on the principles or a concept to some extent or depth. But if you are using ICTs and you go to the internet and you are talking about the same concept, you may get so many references and the opinions of so many writers on a single concept. So it allows the teacher to understand and to teach better, to use different

methodologies and presentations and other things. Unlike the textbooks that you have to use one, and then look for a second one…just imagine if you have to stock your room with so volumes of textbooks just because you are looking for information on just one concept. With ICTs just with the click of a key all the writings on such as topic can easily be accesses (ASH3).

At the time of lesson delivery, ICTs help to project aspects of the lesson to show as pictorial example or evidence of to the students. This is one aspect of integration that most of the respondents demonstrated knowledge of. Several responses made reference to projectors as an essential tool for ICT integration. This is what two of the respondents had to say:

> After the research, if there are any pictorial evidence you have to show to the children, that is the time you can use PowerPoint for example to show it to them because in the Secondary Schools most of the teachers feel reluctant to bring TLMs to the classrooms so if you are using ICT, that will give you the opportunity to bring pictorial evidence of what you are teaching through PowerPoint, by hyperlinking it for them so that they will be able to understand what you are teaching better (ASH1).

> Today we have a way of breaking down your teaching notes into points that can be captured in a laptop, then you can use a projector to teach. When students see and hear, they understand better than only learning. So whatever we are doing in the class, I will say the raw teaching where teachers only go there to talk and write just a little on the whiteboard does not help so much. If you have something on your machine, and you present it on the projector and teach, students get it better (ASH2).

Other aspects of the knowledge of ICT integration that respondents expressed were the use of computers for typing their lesson notes and for recording students' marks in assessment tests. HOD2 explained how he could use ICTs in the assessment of his students. He commented thus: 'Something like recording of our continuous

assessment and student data, we could use them for that. I can enter the marks for my class tests, and then at the end of the term enter the marks for my end of term exams and save it on a pen drive so that whenever I need it I can access it'. School leaders also know that ICT integration implies an integration of ICT devices in all subject areas and not in certain subjects only. Example, SH2 pointed out very vividly: 'If you want to use that word integration, it means every subject should be taught with the application of ICT'. Knowledge was also demonstrated on the need for teachers to focus on letting students get understanding of the content of lessons and not on the acquisition of computer or IT skills while ICTs are used for teaching. That is to say, ICTs should complement, and not be the main emphasis during ICT integration. One of the respondents said about ICT in education; 'It is a complement, it cannot substitute everything in teaching and learning. Principles and concepts will exist but ICTs will enhance its understanding' (ASH3). Some respondents also expressed knowledge of ICT integration by pointing out that it is effective when computers are accessible to both teachers and students. The following comment by SH3 to the question of what effective integration of ICT meant in her opinion stresses this point:

> Actually, if you are teaching with the computer you must have a computer, and the person you are teaching must also have a computer because it is a practical subject. So you must know what you are teaching the child on the computer and the child must be able to immediately access the computer and practice; if it's about typing, if it's about using some applications, whoever you are trying to teach the computer must have ready access to the computer to work with (ASH3)

ICT integration in education is a dynamic and broad concept. Undoubtedly, various and diverse aspects of knowledge were expressed by each of the respondents based on how they understood the concept. Moreover, what the respondents thought ICT

integration entailed, to a certain extent, also reflected their individual competencies in ICT. This finding is in tandem with evidence from previous studies which claim that educational practitioners understand the notion of ICTs in education; that it involves the infusion of modern communication tools in teaching and learning (Malcom & Godwyll, n.d.). It is also supported by Walsh (n.d.) whose qualitative study to explore nine school heads' understanding of what effective integration of ICTs in education meant revealed that they knew that ICTs should be conceived of at the time of planning a lesson, that ICT integration had the aim of teaching curriculum content as its priority and not ICT skills and that ICT integration is planned across the school by teachers of all subject areas.

The second aspect of knowledge explored the respondents' level of awareness of policies regarding the use of ICTs for teaching and learning. There was no mention of the 2008 ICT in Education Policy, enacted by the Ministry of Education and which serves as a guideline for the use of ICTs in all educational institutions at all levels of education in the country, and some of the respondents admitted that they did not know about any government policies concerning ICT integration in education. This notwithstanding, some of the respondents knew about government's intention to give attention to ICT in education. Most of these however centred on the teaching of ICT as a core subject and not the fact of their integration in teaching and learning. The following are comments made by each of the three school heads in the study:

'President Kuffuor introduced ICT in education in 2008; Education Act 778. The Education Act 2005 also stresses on ICT in education. ICT was introduced both in the Basic and Senior High School. It became an elective but optional subject at the JHS level' (SH2).

'I don't know about any government policy on that. But what I know is that some schools do ICT as an elective subject' (SH3).

'…there is a government guideline, GES guideline for both basic and Senior High Schools. In fact before I became a headmaster, at my previous station they were running some special courses for ICT instructors thereby I know very well that it may be a laid down policy…' (SH1)

There is knowledge among school leaders of the fact that government wants ICT to be used in education, but they are not aware of a written down policy document that clearly states this and how it must be carried out. Lack of knowledge by principals has the potential of making them interpret regulations in their own way and according to their own will (Akbaba-Altun, 2006). Again, knowledge of ICT integration among school leaders was not found to differ on the basis of the type of school. As the head of School 3 did not know about any policies that supported ICT integration, so was the case of the heads of Schools 1 and 2.
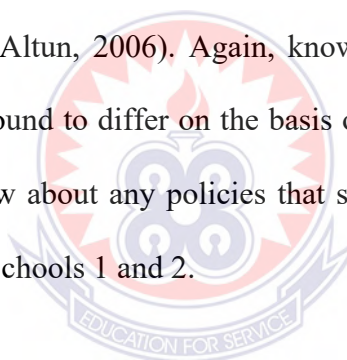
Research Question 2: What strategies do the school leaders use to facilitate ICT integration into teaching and learning?

4.4 Leadership Support

The data analysis also revealed the nature of leadership that the school leaders provided for their teachers with regards to ICT integration in all the three schools. It also revealed how the ICT situation in Ghana influences the kind of leadership that is provided for ICT integration in the schools. As leaders, they are supposed to initiate and disseminate to teachers the vision for ICT in their schools. This is one of the things that the teachers believe should be done if ICT integration will become a success. As one teacher noted,

> The heads should be the ones to champion it. I can submit a proposal but if they are not interested it will not end up anywhere…There should be a top-down approach. If there is a bottom-up approach they may not accept your proposal. Even if there is a bottom-up approach it will still go to the top. It is the top that will accept your proposal and decide to champion it. So there are two ways of dealing with it. The first one is a top-down approach where the headmaster sees that there is a need to inculcate ICT in everything that is done in the school and then champions it so that it goes down. It can also be bottom up: we (teachers or the ICT department) champion it from the ground. We see that this thing is good and then write a proposal to the head. But if the head is not interested, then that becomes the problem (ICT2).

The heads, assistant heads and HODs were asked what they do in their various capacities as leaders to provide support for their teachers to integrate ICT in their lessons. Their responses were corroborated by those from the ICT teachers in all the schools.

School leaders recognise ICT as important in the education of students. However, there is little that they do in terms of support for teachers to use ICT in the classrooms. The study found that knowledge of ICT integration does not automatically lead to heads' support for it. In School 1, the ICT teacher admitted that his administration does not give enough attention to ICT in the school. According to him, 'In my case, my administration does not recognise that. They don't recognise it so they do everything in their own way. They go, bounce back and come back to me for assistance. Meanwhile they have neglected me in terms of administration and management of the school. When they go to management board, they don't include the ICT teacher' (ICT1).

Training teachers to equip them with skills for successful ICT integration was not done in any of the schools. School heads and other school leaders do not see it as their

responsibility to make teachers competent to integrate ICTs in teaching and learning. They expect teachers to develop their own competencies and be responsible for their own ability to integrate ICTs in their lessons. A remark by one of the respondents confirms this point 'I expect the ICT teacher to have training for the teachers because I don't want to take his work from him. I can do that but I expect him to do it because when I was at the district office I was doing it for the staff over there' (ASH1). In-service trainings and orientations are usually organised for all teachers and newly recruited teachers respectively. However, ICT is not the focus in any of these sessions.

> When we have in-service training, normally it is for new teachers when we have them. Because of the new environment they find themselves we have in-service trainings to make them acclimatised to the school…As for the school administration, they do not even have the money to push for ICT proliferation in the school. In fact they don't even think about it. The internet connectivity in the ICT lab is someone's personal initiative, not that of the school management (HOD3).

From the perspective of the school heads, they are not in a position to provide leadership for teachers to integrate ICT in their lessons because the right environment has not been created to enable them do this. They believe the support and vision should first of all come to them from the government so that at the school level, they can carry it out. Since ICT integration has not been made mandatory by the government, implementation by teachers is optional because the heads cannot enforce it. This was emphasised by ASH3 when he remarked:

> Because people are learning on their own, and it has not been made mandatory by the system…if you say something should be done in ICT, for example filling report or something, they will tell you that you have not taught them or there are no machines to do that so they will do it on their own pace or they

> will have to tell their friends to help. So based on that we are not able to put policies down that will compel them to integrate ICTs in their lessons…It is the responsibility of the government, if he believes that ICT is very critical and the backbone in development, then it should be everywhere for the children to see that we cannot do anything without ICT and the computers. But if it becomes optional, then it is not mandatory

Apart from the lack of support and clear policy document detailing how ICT integration is supposed to be carried out in the schools, another reason why heads and other school leaders fail in part to support ICT integration in their schools is because of the overemphasis on students passing the external WASSCE examinations as opposed to their ability to fully grasp the content of the curricula. Even though ICT is a compulsory course of study at the Senior High School level, in the final WASSCE exams that students write at the end of their study, they are not examined on ICT. The examinations are paper based and there are no ICT skills needed to write and pass them. School heads are therefore more interested in improving their schools' performance and ranking in the external examinations since this is what the evaluation of their performance is based on. In the words of one of the teachers:

> There is no vision, I would say. Their focus is not on ICT in education. Their focus is in writing WASSCE. So they don't seem to be interested in ICT. From my perspective they don't do anything to champion ICT in education. They think that if you are using it, you may not be necessarily going through what is in the syllabus that WAEC has given so the focus is on your ability to teach whatever is in the syllabus for the students to be able to write their exams and pass and go (ICT2).

The kind of leadership support that is given for ICT in the schools is the kind that helps to manage the ICT equipment. It is more concerned with seeing to the purchase and repair of broken down computers and other equipment. The following comments confirm this claim:

'…the school has repaired the broken down computers over there and we have also requested for more…The school also buys some computers. These ones were provided by the school. All the three assistants have them, and the head himself. They are networked (ASH2).

'The government doesn't give us support for repairing broken down computers nor training. If a machine breaks down and you have money, you ask the ICT coordinator to find the price and then you give him the money to buy the damaged part or to do the repairs. Everything is from the school' (SH1).

These findings provide insight into the condition of school leadership in Senior High Schools in the country. The role of the school heads in ICT integration is more management than leadership oriented. Heads of schools who are leaders create a vision for change in their organisations while managers keep the day to day running of the school smoothly (Kozloski, 2006). While leaders possess much ingenuity, energy and skill and produce change in an organisation, management is seen as a maintenance activity (Bush, 2007). Even though the function of school leaders as managers in ICT integration is still an important one, leadership functions are necessary to facilitate the effectiveness of ICT integration in Africa in the face of the challenges that bedevil the process. The finding also confirms the nature of school leadership support for ICT integration that is reported by most African studies. School leaders generally provide minimal support for IT integration in their schools as a result of their own limited personal competence. They also do not show enthusiasm and visionary leadership to support teachers to integrate ICT in teaching. (Keiyoro et al., 2016). Moreover, support for ICT integration by educational leaders in the three schools was unlike any of the strategies put forward in the international literature and those practised by other countries especially in the developed nations. For example,

they were not found to be consistent with the ISTE standards for administrators suggested by the International Society for ICT in education which outlines five dimensions of leadership that are required to ensure successful ICT integration in education namely; visionary leadership, digital age learning, excellence in professional practice, systemic improvement and digital citizenship. The nature of support for ICT did not also correspond with Anderson and Dexter's (2005) eight technology related attributes that emerged from their survey to find out the best practices by principals and ICT coordinators of United States schools. Nor were the findings of the school leaders' support consistent with the framework for analysing principals' role as technology leaders which outline the core competencies, personal attributes and responsibilities of school leaders provided by the Calgary Board of Education in 2000 and reported by Flanagan and Jacobsen (2003). Basically, the findings did not reveal a concrete framework for ICT integration in the schools apart from heads' support for maintenance of computers and equipment. This is could be attributed to the fact that, though enshrined in a public policy document, practical guidelines and modus operandi have not been set forth by the government to make the policy of ICT in education workable in the schools. The leadership support identified in this study and nature of ICT use in the participating schools also confirms the assertion by Leithwood et al. (2008) that leadership serves as a catalyst for unleashing the potential capacities that exist in every organisation, and that no school can successfully turn around its achievement trajectory without talented and transformational leadership.

Research Question 3: What challenges do the school leaders face in the implementation of the ICT integration policy?

4.5 Challenges of ICT Integration

The factors that made implementation of ICT integration difficult or impossible from the point of view of the school leaders were explored. The analysis showed a classification of these challenges into three main areas: infrastructure-related, human resource related and financial related challenges.

4.5.1 Infrastructural Challenges

Infrastructure-related challenges were those that related to physical aspects of ICT in the schools. These, according to Ertmer (1999), are a component of the first-order barriers to ICT integration. In this study, first-order barriers were found to be of two major forms: those relating to equipment and facilities and those relating to school and classroom characteristics.

4.5.1.1 Equipment and facilities

This was the major challenge to ICT integration that respondents talked about. Basically, the unavailability and limited number of the needed equipment made it impractical to use ICTs for teaching and learning. Some of the respondents lamented their schools' lack and need for various ICT equipment. The constant breakdown of the limited computers and other machines that were available did not inure to their benefit either. In each of the three schools, there were similar complaints about unavailability of various ICT tools and equipment. In school 3, it was revealed by the ICT teacher that 'We have white screens, we don't have a smart board. And our projector broke down; it has not been fixed yet so we don't have one now as it stands. When we need one urgently, we rely on the administration' (ICT3). The school head also said that, 'Because the computers are not enough, teachers cannot for example give students work to do on the computer' (SH3). In school 2, the HOD and school

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head said respectively: 'Unfortunately for our school, we don't have the facilities. There are not enough computers in the ICT lab. Most of those that are there are also broken down. So now practical lessons in ICT are not even enough' (HOD2). 'I spoke of projectors; go round the schools. How many projectors will you find in one school? The highest number will be one projector to a very big school, stationed at the ICT lab' (SH2). And in School 1, the head reiterated the comments made in the other schools. According to him, 'The equipment are there but they are enough? They are not enough. What about those that are spoilt? Or we are not getting the parts or we are not getting somebody to repair them and when it happens like that then the few will be overused within a very short time and they may also break down' (SH1).

As a result of this problem, the computer laboratories served as the hub of all ICT activities in the schools. However, these labs were not conducive for students to use for ICT lessons because apart from they housing few computers, the size of the rooms were also small compared to the class sizes in the schools. This was the situation in all the schools as the data revealed:

> Our lab is not big enough to accommodate the students. Even though most of our classrooms are sizeable, this year for example From One Arts Two they are about hundred so in that case if they are to enter the lab they will have to go in batches and that one is not good. Even if the labs had been two, since we have two teachers, fifty could be in each class (SH1).

> …when the UN built, that block for us they earmarked one room for ICT but due to the growing numbers of the student population, that one room is not enough. There is therefore the need us to get additional classrooms and computers so that we can mount projectors and screens for effective teaching (ASH1).

…even the room itself. You see, we are about 100 teachers and 2,012 students using this small room with 25 workable computers. If even teachers alone want to learn, it means if we go today unless the next five days before we go and continue, and ICT is something you should be doing continuously. So we dint have enough facilities…Due to the nature of our ICT lab teachers teach ICT on shift. The lab takes 30 to 35 students at a time, and that makes the teaching of ICT very slow because a class of about 60 students have to be taught in 2 batches. There is not a single class that can sit at the ICT lab at a go. The facilities there are also not many. So for we have about 25 workable computers so you can imagine the speed with which ICT teaching can go on. That is the biggest problem (ASH2).

A school of two thousand and five hundred students cannot even boast of a lab of forty or fifty computers. With all the loud speaking about female education and this school being one of the largest, if not the largest girls' schools in the country, attention should have been given to it. But it is not there. It is by theory (ASH3).

Throughout literature on educational technology, infrastructural challenges are cited as one of the major challenges to ICT integration in many countries. This finding is therefore consistent with that of others such as Akbaba-Altun (2006), Opoku-Peprah (2016), Mue (2006) and Malcom and Godwyll (n.d.).

4.5.1.2 School and classroom characteristics

The nature and characteristics of the classrooms was the other infrastructural issue that hampered integration of ICT in the schools. First, the classrooms were not built to support the use of ICTs. This could be either because most of them were put up many decades ago when ICT in education was not a priority or because the planners of the buildings had no vision of integration at the time of planning and putting up the buildings. For example, electricity is an infrastructure that cannot be done without in the use of most digital equipment. Computers, projectors, scanners, printers are all

powered by electricity. However, electricity connection in almost all the classrooms was non-existent so that for example there were no sockets to power projectors if teachers wanted to use them for their lessons in the class. This is one of the reasons why the computer labs in all the schools was a major point of reference for everything that had to do with ICTs in the schools. The labs were wired, and apart from the offices, they were the only buildings that housed all IT equipment in the schools. Anytime a teacher wanted to integrate ICT in their lesson, it had to be done in the computer lab. The respondents made several comments about the nature of the classrooms. 'One other thing is the nature of the classrooms. They don't have any power source, so if you want to use your laptop or a projector, you cannot get electricity to power it' (HOD3). 'We also don't have a system where the computers are everywhere so that a child can say that we learnt this last week so let me practice and see if I will be able to do it. The computers are sitting at the ICT lab' (SH3). '…the classrooms are designed such that you have to close all the windows. If the colour of the school is black or green, you cannot use the projector. Unless you use a white background because even getting the screen is another problem…When it comes to infrastructure, even the building of the classrooms is not designed to suit the application of ICT in teaching and learning' (SH2).

Without the presence of ICT tools in the classrooms, it becomes difficult for integration to happen since effective ICT integration takes place best when ICT tools are at the point of instruction. One of the respondents laid emphasis on why integration cannot take place in most schools: '…every school, no matter what the size is, you will see only one common ICT lab and it is not seen in any classroom, which means you can't integrate it' (SH2). The situation in all three participating schools is as such, so that ICT integration in teaching and learning is greatly

hampered. Akbaba-Altun (2006) found the problem of unsupportive classrooms to be a factor that hindered IT integration. In the future, schools that will be put up should be designed with the ergonomics to support ICT integration.

4.5.2 Human Resource Challenges

These are challenges that related to skillsets that hindered or facilitated ICT integration. In all the three participating schools, evidence from the data suggested that there were no training programmes for teachers which had ICT as their major focus. At the teacher training institutions, that is, in the Colleges of Education and teacher training universities, knowledge of ICT integration does not form part of the methodological knowledge that prospective teachers are taught to possess. Older teachers who passed through the Teacher Training Colleges did not have the opportunity to experience ICT training at all. Those who continued to the universities and others who started their teacher training from the universities, even though studied courses in ICT, were not trained to use ICTs as part of their pedagogy. As one of the respondents pointed out:

> We have institutions that train teachers in the country: about thirty eight or thirty nine colleges of education and other selected universities in the country. ICT has become a microscopic aspect of their courses of study. Now, if you are to be trained as a teacher, we have something known as methodology; methods of teaching. So if ICT is going to be designed and mounted as an aspect of methodology of teaching, where it becomes compulsory and a core subject for every human being who is enrolled to become a teacher to be equipped to know how to use ICT in teaching (SH2).

An older teacher and Head of Department also explained his experiences with computers during the years of his teacher training: 'At my time when I was in the training college there was even nothing like a phone. Common things like TV and fan

were the things that we had at that time. The way the machines that we had functioned was like the first phase of computer coming into the world' (HOD2). This was further corroborated by another respondent who was also a Head of Department in a different school. He highlighted a contrast between his days in the training college and those at the university: 'At the university we did some computing, but in the training college I never even saw a computer' (HOD3).

At the school level, in-service and pre-service training programmes are organised for teachers to equip them with skills for effective teaching. ICT does not form part of these training sessions. Teachers who have a considerable level of proficiency in the use of computers and other ICT tools acquired these competencies through their own means; from friends or self-financed private tuition. Some of the respondents made the following comments: 'No, there are no training programmes for helping teaches to integrate ICTs in their lessons, and when there is any in-service training, usually ICTs do not form part' (ICT3).

> No, we don't have any training programmes to update ICT teachers in whatever we are doing. We individuals go around to have research to update ourselves because you know very well that if you are not learning constantly, you are going to be lagging behind. We don't have any in-service training for ICT teachers, neither do we have for teachers in general. It is something that I discussed with my HOD some time back; if we can be organising such training for teachers, it will help (ICT2).

> It is teachers who by themselves have their personal computers and have updated themselves. But GES and the school itself have never been able to help or to organise in-service training or those kind of things. People just have to update themselves' (ASH3).

'We have training for teachers when they are newly recruited. That training is done for the whole school. But for ICT there has not been any training on using it to teach' (HOD1).

The absence of ICT training for teachers seems to have an adverse effect on their level of skilfulness with computers. Because there were no training programmes to equip teachers with the skills for ICT integration, teachers were reported to lack the ability to use computers and other ICT devices for teaching and learning. As some of the respondents revealed:

> Majority of the teachers are not conversant with ICT. They only come there to use it for their own research and go and use it to teach. If you see a teacher in the lab, then he or she is there to do his or her own research using the internet. But as to integrating and using it to teach, they don't normally do that (ICT3).

'Some of the teachers are not well versed in the use of ICTs so at times we ask the ICT teachers to help' (HOD1).

From the data, the major ICT skill teachers possess is the ability to use the computer to search for information to enhance the content of their lessons. The lack of technical ICT skills by teachers means that ICT integration cannot take place the way the Ghana's Ministry of Education has outlined in the ICT in Education Policy document, as Tondeur et al. (2007) found in the case of the Flemish educational setting. Also consistent with the findings of a Ghanaian study by Malcom and Godwyll (n.d.), a lack of resource capacity and professional development programmes to upgrade teachers' skills in emerging technologies were some of the factors impeding successful ICT integration in Ghanaian schools.

4.5.3 Financial Challenges

ICT equipment are capital investment that require huge sums of money to purchase, install and maintain. Findings from the study revealed that limited financial resources posed a challenge to attempts to integrate ICTs into teaching and learning in the schools. As far as ICT is concerned, there is not enough supply of funds to the schools for the purchase and maintenance of the equipment and accessories that are necessary for smooth and effective integration and the government does not give financial support to schools for the repair and maintenance of broken down computers. One headmaster comments on this and says:

> The government doesn't give us support for repairing broken down computers nor training. If a machine breaks down and you have money, you ask the ICT coordinator to find the price and then you give him the money to buy the damaged part or to do the repairs. Everything is from the school' (SH1).

Easy access by teachers and students to the internet is a crucial element in ICT integration. Nevertheless, the cost of making internet accessible is very high, and schools have not been able to secure funds to purchase and install internet bandwidth. 'The school is also not having enough funds to help put those machines in good shape… I don't think getting the parts may be difficult but money to buy the parts is what is not available' (SH1). In School 2, a similar concern was raised:

> Funding is also another issue. When you are using these machines some of them will break down, you need other things to work with them. For example we don't have the means whereby teachers can easily go to the internet, and that is also posing a big challenge. It's all about funding. If you have money you can build all these facilities, but we don't have the funding (ASH2).

Where the equipment for internet connection has been installed, it was not functioning because of unavailability of money to purchase the internet data '…but even then most of [the computers] do not have internet connection. In fact there is internet in the school but most often it is not working. A few times also if you have to but internet

data it becomes a challenge' (SH3). Lack of funds to support ICT programmes have been found to be one of the major challenges to the failure of ICT integration efforts in schools (Keiyoro et al., 2016).

Research Question 4: What support systems can be put in place for effective ICT integration leadership?

4.6 Support Systems

This section describes the nature of support for ICT integration identified in the data. The current support systems are grouped into two: support from the government and support from other sources.

4.6.1 Government-Related Support

Government support for ICT in education comes in the form of supply of computers and other IT equipment to schools. There have also been presidents' personal initiatives to support efforts to integrate ICT in education chiefly through the supply computers to students. The following comments substantiate this point: 'About two to three months ago I went to the regional office and I was given a machine for charging computers. It was from the government. I made a request for it and I was considered' (SH1).

'It was recently that I was asked to count the computers at the lab, those that are spoilt and those that are functioning. When I went there I saw some of those small computers there. The government brought them' (HOD2).

The Ghana Investment Fund for Electronic Communications (GIFEC) is an organisation that was found to support ICT in the schools. GIFEC is a Government of Ghana agency that is backed by a legislation promulgated in 2008 as the Electronic Communications Act 775 with the aim of providing for electronic communications,

broadcasting and the use of the electro-magnetic spectrum and other related facilities in Ghana. They provide financial resources for the establishment of universal service and access for all communities. They also facilitate the provision of basic telephony, internet, multimedia broadband and broadcasting services to communities. Their support to the participating schools was mainly in the form of supply of IT equipment including computers. 'The computers that are [at the computer lab] were acquired through me. They were given by GIFEC' (ICT1). 'It's only last term that a company - GIFEC, through GES, gave us some computers to augment what we have' (ICT3).

In many countries, support for ICT integration comes from the government in the form of supply of equipment, provision of in-service training for teachers and school leaders and mainstreaming ICT into the curriculum. This finding from the three Ghanaian schools is therefore consistent with findings from other studies, example, Walsh (n.d.), Schiller (2003), Tondeur et al. (2007).

4.6.2 Other sources of support

Other support for ICT for the schools was in the form of school fees. Schools are allowed to charge an amount of money as a component of student bills which they keep as a fund to support ICT as and when the need arises. This was confirmed by some of the respondents: 'The kids pay ICT levy. I think it is 3 cedis per child or so' (ICT1). 'The government has asked us to charge the students an approved amount of 3 cedis for ICT' (SH1). Parent-Teacher Associations (PTAs) also helped by contributing and donating money and computers to the schools. 'The PTA too helps sometimes so that we always have tools and equipment to work with in the lab' (ICT3). '…many young men who attended private ICT courses have been hooked on who are mostly paid by PTA to man the ICT section of many schools' (SH2). Parents

have been found to be supportive of ICT integration in their children's schools by assisting with acquisition of computers and other equipment (Walsh, n.d).

Old student associations in two of the schools supported IT also through the provision of equipment, mainly computers. However, in each of the schools where their support was acknowledged, it was revealed that their computers were almost always inadequate or of very poor quality.

> Old girls have contributed before but their computers were not…well I will say it's a sign of helping but it wasn't enough. They gave us six computers – six good computers, brand new ones (ICT3).
>
> A year batch adopted the lab but their work input is in my perspective below average because some of the equipment that they brought are old items, very old. They are there but nobody is using them. It is like a dumping ground. Maybe they are not financially strong to do that. So for me I think they did their best but it is below average (ICT2).
>
> From what I came to learn, we have had a time that some old girls gave about forty computers; but they were substandard and I learnt they were very inferior, so they did not even take one year before they started breaking down (ASH3).

In School 1, nothing was said about old students' support for ICT. In fact, the assistant head admitted that 'Apart from GIFEC there was no institution, organisation or individual that helped with ICT it the school' (ASH1). This could be attributed to the fact that School 1 was a small and new school as compared to the other two schools which had been in existence for several years and hence had had many batches of old students. The findings also reveal that, all the support for IT in the three schools were of one kind; provision of computers and other hardware equipment. No other support in any other form was recorded apart from these.

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4.6.3 Alternative Support Systems

The study sought to find out what the views of the respondents were concerning alternative support systems that could ensure successful ICT integration. Most of the alternative support was suggested to come from the government through initiatives such as professional training and supply of more equipment. First, the respondents believed there should be the supply of more computers to the schools to solve the problem of inadequate computers. This would improve access of students to computers. Constant and periodic supply of computers will also enable broken down and worn out ones to be replaced. Also, since it is suggested that ICT integration should also be given priority right from the basic schools, old classroom blocks should be redesigned and if possible, connected to electricity to make them modern classrooms that can be supportive of ICT integration. Some of the respondents expressed their views about some of these and why and how they can be done:

> The government must make it a habit to provide computers the way it provides textbooks. The way government provides textbooks annually, government should provide computers annually. You are bringing in new students, they must come in with computers because it is part of the teaching and learning materials. So that is what should be, so that if they are also breaking down that's normal because the textbooks also go through wear and tear… On the other hand, every three years, a whole set of students go. So every three years, you give new set of computers to the schools to take care of the next three years (ASH3).

> There should be supply of materials and logistics, tools and equipment; projectors and their screens, etc. in every classroom. I wish the government would equip all schools, and that even small computers or laptops would become part of the items that children bring to school. If that is done, then integration will work. Taking computer as part of prescribed textbooks to either be supplied by the government or provided by the parents, and then

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intensive training and workshop for all teachers, not only ICT teachers, then integration could work…then we also refurbish or design all the existing classrooms to create a conducive atmosphere for teaching ICT in all subjects. The syllabus should also be designed in a vertical manner in graduation, so that kindergarten pupils will acquire some level of knowledge before they get to class one, students in the lower primary will acquire some level of knowledge before they progress, and so on. The syllabus should be developed and designed to graduate them in that manner. That way, before they get to even primary six, the whole country will be plunged into ICT (SH2).

Equipping teachers with skills through training in ICT integration is also another way of providing support for ICT integration. 'The teachers should be empowered so that they can integrate it in their teaching, not for their own research alone' (ICT3). This can be achieved at the training institutions and also during in-service training programmes specially organised to equip teachers with the skills to integrate ICTs in their lessons. At the teacher training institutions, ICT integration should be taught as a teaching methodology so that prospective teachers will be aware of how they are expected to use computers and other ICT devices in the classroom when they graduate and are posted to their stations to teach. For those teachers who have already completed teacher training and are teaching, the in-service training programmes will achieve the same results.

The onus is also on the universities to teach the students who will come to the schools and teach. They should train them. Instead of doing these liberal courses like philosophy and things like that, why don't you teach him ICT? Because when they come out this is what they will be using. Today everything is ICT. So they should make it a core subject in the university. At least after the first and second year, the student should be computer literate. If they do it there, if they come here then they can apply (ASH2).

ICT should first be integrated into the institutions that teach the teachers-to-be.

>It should be a methodology and course of study in the training colleges… then we have to mount extensive and pragmatic training to the old teachers who are already in the system for them also to be equipped with that knowledge (SH2).

Attention should also be given to training school heads and other educational leaders to be proficient in the use of ICTs for teaching and learning since they are the ones that will facilitate ICT integration through influential and innovative leadership. One of the school heads expressed his need for and readiness to participate in any such training programmes the government might organise for heads: 'I think training is and should be number one. All heads must undergo in-depth training in ICT. ICT is not only for school or office work only but it can also help you outside also. The training is very necessary' (SH1). The suggestions made by the respondents in this study present to the government and educational policy makers clues to areas where attention, focus and resources need to be directed to make the integration of ICT in teaching and learning successful. According to the findings, two priority areas for the government to achieve effective ICT integration in the schools include:

1. Supply of adequate computers to schools on a consistent basis
2. Training and continuous professional development of school leaders and all members of staff

Since using ICTs for teaching and learning seems to be optional for teachers because there are no mechanisms for ensuring enforcement, in addition to training and professional development, there is also the need to mainstream the idea of ICT integration into the curriculum so that it will become mandatory for all teachers to practise.

4.7 Emerging Themes

The following are themes that emerged from the data analysis:

4.7.1 'Born Before Computers'

Most of the participants in the study admitted to the fact that they were born before the present digital revolution, and also described how this affected certain aspects of their work as educational leaders and their personal lives. From the data, direct connections could be made between this condition and the ICT competencies of the respondents. The combined effect of these characteristics influenced the kind of leadership the respondents were able to provide their teachers with regards to ICT integration. In admitting their status as digital immigrants, some of the respondents remarked;

> At my time when I was in the training college, there was even nothing like a phone. Common things like TV and fan were the things that we had at that time. The way the machines that we had functioned was like the first phase of computer coming into the world (HOD2).
>
> …even though some of us are BBC but with our little training it can do so may wonderful, things… I myself am BBC…' (SH1).
>
> '…if you are BBC, then you become a leper. You can only use your handset to receive and make calls. But to manipulate something of this nature on your desk, for information technology and gathering of data, no…many of the heads are BBC (SH2)

(**NB:** BBC is an abbreviation for 'Born Before Computers'; the expression that most people in Ghana use to refer to people who are digital immigrants.)

Prensky (2001) coined the term 'digital immigrants' to refer to individuals who were not born in the digital era, specifically those who were born before the 1980s. These people have at some point in their lives become fascinated by and adopted some parts of new technologies.

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4.7.2 Adaptation

Older people are usually fascinated by modern technology, but the adoption of modern and digital technologies for them is more than merely an issue of fascination. In most areas of their work in the 21st Century, using information technology tools is more of a necessity than an option. And as Prensky (2001) notes, older people learn to adapt to the digital technology environment in which they find themselves. This theme describes some of the methods by which the respondents adapted to the aspects of their work that required ICT skills. The finding shows that, because of the basic and limited competences that they possess, school leaders in the study adapt to the necessity to use IT through various self-devised means. One of the respondents referred to this kind of adaptation as 'finding your own level'. Basically, most of them rely on the help of people around them to perform most of the IT aspects of their day to day responsibilities. In situations where their assistants are more competent, the heads rely on them to perform most of their ICT tasks. At home, some of them depend on their children for assistance. These ways by which the educational leaders adapt to the ICT components of their daily work were captured in the following comments as found in the interview data: 'I personally rely on those people under me - my subordinates – to do most of the things I need… I make a schedule for those under me to ensure that I get what I want and then I also pass it to the headmistress' (ASH3). This was corroborated by the following response from the head of School 1:

> Any information we need we give the instruction to my assistant and then it will be done. My assistant has a second degree in ICT so with my administrative work as far as ICT is concerned, he is the one who is in charge. In my former school I was getting so many people. My own children will come to me at my office after school and then we will be going through the process bit by bit…my boys were able to take me through after school. I

would call them to come, and then we could, be there for some hours. I was even having some notes to guide me so that when they were not there I could follow it: add this, from here go to that place…

Others make use of other teachers, especially the ICT teachers in their schools. In School 2, the assistant head admitted to dependence on the ICT teacher in the school by the administration (and other teachers as well) when it comes to the performance of certain tasks that need computer skills. According to him, '…we rely so much on ICT for report system; end of term report, class list, sign list, everything we go to the ICT people and they do it for us.' Another respondent commented on how the ICT teachers in her school are consulted on tasks that require a certain level of skill in the use of computers: 'When we are setting exam questions for instance, there are a lot of diagrams in science for example that we usually have to include in our questions. When it comes to those things we call the ICT teachers to help' (HOD1).

In the absence of programmes that offer structured and formal training to school leaders, some of them who are eager to learn resort to help from friends in order to develop their competencies in ICT. The practice of getting help from colleagues and friends and experimenting with their computers in the form of play is one of the common ways school heads learn about computers (Schiller, 2003). These different ways by which different educational leaders adapt to the use of ICTs is worthy of note. While some leaders simply make use of subordinates and others around them to perform various tasks for them, others take up the challenge of learning, developing their own competencies and becoming skilful in the use of ICTs.

4.7.3 Leadership Training

School leaders prefer to learn more about using ICTs and to be prepared for their roles as technology leaders through short training workshops that target this need (Schiller, 2003). Issues relating to the training of school leaders for successful ICT integration leadership emerged in the analysis of the data. Training is important for two main reasons. First, because many educational leaders are digital immigrants, the opportunity helps to facilitate the process of their adaptation to the digital world. Secondly, training equips school leaders with necessary knowledge and skills to enable them to effectively help their teachers to integrate ICTs in their lessons. Leaders must lead, and no one can lead another person to a destination when he does not know the way to the said destination.

There wasn't found to be any training programme designed for school leaders to equip them to effectively help their teachers practice ICT integration. At the level of the school heads, any opportunity to attend seminars where ICT is the focus was absent. All the schools heads involved in the study attested to the fact that no ICT training programmes were organised for them at all. Each of the heads was asked the question of whether they have had the opportunity to attend a training programme that sought to equip them with skills for effective instructional technology leadership. To this, the responses by all three heads were quite straightforward and succinct:

'I have not attended any training on ICT. No at all. We attend different things and then in fact, we have to use the machine, but I have not attended any ICT course since I became the head'

(SH1).

'I have not had the opportunity to attend any workshop on ICT since I became a head' (SH3)

'…nobody has ever in a formal way, under a structured manner, called a headmaster to show us how to use ICT even in his or her administration, let alone instructing teachers to integrate them in their teaching' (SH2).

The analysis further revealed that, it was at the tertiary institutions that an attempt to introduce them to some form of ICT training had been made. However, because these institutions were not established to train educational leaders, the courses of study did not focus specifically on introducing their students to the specificities of ICT and ICT integration, the nature and mode of teaching at that level does little to help their students to acquire relevant IT competencies. The comment of the HOD above validates this claim:

> I had surface training in Winneba…Over there it was an ICT course and the practical aspect was not enough. The computers themselves were not enough and my experience over there was not the best...We did a course on educational technology, and we were not using the computers. They were only teaching us how computers can be used to teach. The lack of the practical aspect didn't help some of us. During the end of semester exams they asked us to use the computer to write a formal or application letter. A group of four or five students, none of us was even average. All of us were below average and we were just trying our hands on it. I developed a negative attitude towards technology and computers (SH1).

As little attention is given to the training of the school heads, it confirms the findings in several studies on school technology leadership that school leaders have not been prepared for their roles as technology leaders. There is therefore the need for professional development of educational leaders to prepare them for innovative, 21st

Century school leadership (Schiller, 2003; Arokiasamy et al., 2014). In the absence of this, the vision of ICT integration may continue to be a mirage.

4.8 The Concept of Instructional Anachronism

Anachronism is a situation where a person, an event, artefact, an idea, a custom or any other thing is attributed to a period to which it does not belong. It occurs when something is displaced in its rightful time. The findings reveal a phenomenon in the schools that can appropriately be described as anachronistic in nature. The Government of Ghana documented its appreciation of the potential of ICT to propel the development of all sectors of the nation. In its ICT for Accelerated Development (ICT4AD) Policy (2003), specific strategies for utilising ICTs to enhance this economic development are outlined. Education is reported as one of the pillars that are priority focus areas of the policy, with the government hoping that, the deployment and utilisation of ICTs in education will serve as a strong foundation for attaining Ghana's vision for ICT in the information age. Today's students are digital natives, thus several aspects of their lives revolve around technology and ICT tools; mobile phones, video games, the internet, computers and laptops, etc. The importance of the role of ICT integration in capturing students' interest and hence aiding better understanding in teaching and learning therefore cannot be overemphasised. Indeed, the Ministry of Education's ICT in Education Policy (2008) appreciates this fact and hence calls for the integration of ICTs into teaching and learning for success. All these notwithstanding, the researcher found what appears to be an anachronistic situation in the participating schools, specifically in the classrooms where teaching and learning takes place (hence 'instructional' anachronism).

In every school, teaching and learning takes place in the classroom. All materials that

support the process should therefore ordinarily be located in the classroom which is the point of instruction (Gunter & Gunter, 2015). For effective ICT integration, the following are necessary preconditions should be met:

1. ICT equipment should be installed (or be capable of being installed) at the point of instruction, i.e. in a classroom

2. Teachers should be able to use different ICT tools and software in their methodology (technological knowledge)

3. Teachers should know the ICT skills which are relevant for students to acquire during a particular lesson (ISTE standards for students, 2000).

Evidence from the data showed that these conditions were not met in the schools that participated in this study. In the three schools:

1. Classrooms were completely unsupportive of ICT tools' installation chiefly due to lack of electricity connection thereto. The following comments that some of the respondents made support this observation:

> One other thing is the nature of the classrooms. They don't have any power source, so if you want to use your laptop or a projector, you cannot get electricity to power it' (HOD3). 'When it comes to infrastructure, even the building of the classrooms is not designed to suit the application of ICT in teaching and learning (SH2).

2. Owing to the condition stated above, any instructional demonstration that needed to be carried out with a computer, projector or the internet took place in the computer labs. Hence, the computer labs in these schools were the hub of all ICT activities associated with teaching and learning. One of the respondents pointed to this situation (i.e. how teachers send their students to the computer lab whenever they want to use ICTs in their lessons). He was explaining the need for 'special computer classrooms' in his school:

There is therefore the need for us to get additional classrooms and computers so that we can mount projectors and screens for effective teaching because if we have let's say even three computer rooms, we can use one for the teachers; when they want to teach their students and they want to use the projector and other equipment they can go there and use that room rather than relying on the ICT lab and bringing their students there even when they don't have ICT (ASH1).

3. Not having been trained to use ICTs as a component of their teaching methodologies, most teachers were not conversant with ICTs, and they were also not fully aware of what their expectations to integrate ICT in their lessons entailed. As one of the school heads stated,

A whole lot of teachers are not conversant with using the computer. So if you ask such a teacher to use the computer to teach, what are you saying? The only thing perhaps they can do is to prepare their notes with the computer and take their notes from the computer to teach (SH3).

The condition in the schools described here portrays a situation where it is almost impossible for ICT integration to take place the way Ghana's ICT in Education Policy suggests. The researcher believes that for the schools to be totally devoid of the essential preconditions for successful ICT integration in the 21st Century where the importance of educational technology is appreciated in many parts of the world depicts a situation where teaching and learning is potentially carried out in these schools in a manner that is contrary to the tenets of modern-day instruction. A phenomenon which she terms '**instructional anachronism'**.

4.9 Background and Demographic Characteristics of Survey Respondents

One hundred and forty-nine (149) teachers were sampled from the total population of teachers in the three schools; 17.45% (n =26) from School 1, 37.59% (n = 56) from School 2 and 44.97% (n = 67) from School 3. After administering the questionnaires, 117 of them were returned (25 from School 1, 43 from School 2 and 45 from School 3), representing a total response rate of 76%, which is considered as considerably satisfactory. Out of the 117 teachers who responded to the questionnaires, 76.1% (n = 89) were male teachers while 23.9% (n =28) were female teachers. Table 4.1 shows the mean scores of male and female teachers on the 14-item scale.

Table 4.2: Descriptive statistics of respondents (gender)

Group Statistics					
	Sex of the respondent	N	Mean	Std. Deviation	Std. Error Mean
Per_ICT_mean	Male	89	2.6288	.25832	.02738
	Female	28	2.4974	.22121	.04181

Source: Field data (2018).

From the table, male teachers have a higher mean score than female teachers, which means the male teachers tend to have a more positive perception of ICT integration (M = 2.63, SD = .26) than female teachers (M = 2.50, SD = .22)

$H_0$1: Male and female teachers do not differ in their perceptions of ICT integration

Relationship between gender and perceptions of ICT integration

At a 0.05 level of significance, an independent samples t-test revealed a statistically significant difference between male and female teachers in their perceptions about ICT integration t (115) = 2.42, p < 0.05. Male teachers in the three schools therefore tend to have more favourable perceptions about the use of ICT in teaching and learning than their female counterparts. Therefore, the result provides enough

evidence to reject the null hypothesis that male and female teachers in the three schools do not differ in their perceptions of ICT integration.

Table 4.3: Results of Independent Samples t-test

		Levene's Test for Equality of Variances		t-test for Equality of Means				
		F	Sig.	T	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
Per_ICT_mean	Equal variances assumed	.391	.533	2.423	115	.017	.13132	.05419
	Equal variances not assumed			2.628	52.189	.011	.13132	.04997

Source: Field data (2018).

Knowledge of differences between male and female teachers in these schools is important for educational stakeholders to design and implement programmes that will meet the training needs of each group. From the result, although the female teachers did not express negative perceptions about ICT integration, they tend to be neutral in their standpoint, hence the conclusion can be made that the female teachers in the three schools are indifferent to ICT integration. However, the male teachers expressed strong support. This pattern of gender difference in ICT perception appears consistent with findings of studies like Venkatesh and Morris (2000) and Cassidy and Eachus (2002) that examined and found significant gender differences in perceptions of ICT integration.

H₀2: Teachers' age groupings do not predict their perceptions of ICT integration

Relationship between age and perceptions about ICT integration

From Table 4.3, it can be observed that more than half of the respondents (i.e. 51.3% of them, n = 60) were 30 to 40 years. 24.8% (n = 29) were less than 30 years. 19.7% (n = 23) were in the range of 41 and 50 years and 4.3% (n = 5) were above age 50. Table 4.3 shows the mean scores of teachers in the various age groupings on the 14-item scale.

Table 4.4: Descriptive statistics of respondents (age) Per_ICT_mean

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean	
					Lower Bound	Upper Bound
less than 30	29	2.5631	.21175	.03932	2.4825	2.6436
30-40	60	2.6141	.28198	.03640	2.5412	2.6869
41-50	23	2.6211	.25156	.05245	2.5123	2.7299
above 50	5	2.4857	.15485	.06925	2.2934	2.6780
Total	117	2.5973	.25530	.02360	2.5506	2.6441
Model Fixed Effects			.25650	.02371	2.5504	2.6443
Random Effects				.02371[a]	2.5219[a]	2.6728[a]

Source: Field data (2018).

Table 4.5 seeks to examine the significant difference between the teachers' mean scores in their perceptions about ICT integration on the different age groupings.

Table 4.5: Results of ANOVA test Per_ICT_mean

	Sum of Squares	Df	Mean Square	F	Sig.
Between groups	.126	3	.042	.639	.591
Within groups	7.435	113	.066		
Total	7.561	116			

Source: Field data (2018).

One-way analysis of variance test showed that at a 0.05 level of significance, age groupings of teachers were not significant in predicting their perceptions about ICT integration, $F (3, 113) = .639$, $p = .591$ and therefore the study failed to reject the second null hypothesis that age groupings of teachers' in this study will not predict their perceptions about ICT integration in teaching and learning in the three schools.

Findings from the qualitative data did not show clear age and gender differences in teachers' perceptions about ICT integration. However, results of the quantitative data show significant gender, but not age differences in male and female teachers in their perceptions of ICT integration. Schiller (2003) in a study of Australian principals found variations in perceived competencies of principals to be attributed to both differences in age and gender of the principals. Assuming that schools heads, assistant heads and HODs in the three schools do not have demographic characteristics that are different from the teachers, result from the quantitative strand of this study enriches the qualitative finding that all school leaders (irrespective of age and gender) have positive perceptions about ICT integration. The qualitative results show that this is true for age, but not for gender.

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.0 Introduction

This chapter summarises the findings and presents a conclusion to the study. Recommendations based on the findings and suggestions for further research have also been discussed. The study sought to explore the situation of ICT integration leadership in three Senior High Schools within three districts in the Central Region. ICT integration leadership refers in this study to the support that school leaders give to their subordinates in order for them to implement ICT integration. Three levels of school leadership were used following the theory of distributed leadership; school heads, assistant heads (academic) and Heads of the Science Department. An embedded mixed method design was used to explore four research questions and two hypotheses. The purposive sampling and simple random sampling techniques were used to select 12 school leaders and 149 teachers for the qualitative and quantitative phases respectively. Interview guides and a questionnaire were used for the collection of the qualitative and quantitative data respectively. The qualitative data was analysed using Atlas.ti software to develop codes and themes whereas the quantitative data was analysed using t-test and ANOVA. The study sought to:

1. explore the school leaders' perceptions about ICT integration into teaching and learning.

2. identify strategies used by the school leaders to facilitate ICT integration into teaching and learning.

3. explore challenges faced by the school leaders in the implementation of ICT integration policy

4. identify support systems that could be put in place for effective ICT integration leadership

5. determine the relationship between gender, age and teachers' perceptions of ICT integration

The under-listed key findings emerged from the process of data analysis.

5.1 Summary of Key Findings

The first objective was fully met in the data analysis. The data provided evidence for all the dimensions of perceptions that the study sought to explore. Additionally, some serendipitous themes were identified from the data. Among the findings under research question one are that:

a. School leaders have positive perceptions about ICTs and educational technologies in general.

b. All educational leaders in the study were 'digital immigrants' (i.e. born before computers), and this mirrored the nature and style of their support for ICT integration.

c. School leaders' competencies in the use of ICT devices are basic, ranging from proficiency in the Microsoft Office Suite, using the printer and surfing the internet.

d. The basic ICT competencies possessed by most educational leaders, coupled with the necessity to use ICTs in their work, compels them to adopt several adaptation mechanisms to help them get along in the digital terrain.

e. School leaders are not aware of the ICT in education policy by the Ministry of Education, but they have a fair knowledge of what effective integration of ICT in teaching and learning entails.

f. There are no training programmes that are designed for and intended to equip school heads with knowledge and skills for ICT integration leadership.

The second objective was to find out the strategies that the three school heads and other two leaders in each school used to facilitate ICT integration in their school. The objective was not met exactly as the study intended because findings revealed that ICT integration was not practised in the schools in accordance with the vision of educational policy makers. Two key findings were made under this objective thus:

a. Knowledge of ICT integration does not automatically lead to leadership support and formulation of strategies to ensure its success.

b. Leaders' support for ICT integration is more management oriented, concerned primarily with overseeing the purchase and maintenance of equipment.

Under the third objective, the study sought to explore the challenges faced by educational leaders in their roles as ICT integration leaders. Because finding from the first research question revealed that the various school leaders have not been sensitised about and prepared for their role as technology leaders and hence they do not know what is expected of them in the first place, most of the issues that came out from the data dwelt on the challenges to the practice of ICT integration in general. The key findings under this research question are:

a. There are inadequate and in some instances absence of ICT infrastructure, especially computers, projectors and computer laboratories to facilitate effective ICT integration.

b. Classrooms are not supportive of ICT integration because they were not built to support the use of ICTs. This situation led to the development of the concept of **instructional anachronism.**

c. Teachers have not received the training, neither do they benefit from professional development in ICT integration hence they lack the requisite skills for effective ICT integration.

d. Colleges of Education and Universities of Education in Ghana do not have it as part of their curricula to equip trainee teachers with skills for ICT integration.

e. There is not enough supply of funds to the schools for the purchase and maintenance of the equipment and accessories that are necessary for smooth and effective integration and the government does not give financial support to schools for the repair and maintenance of broken down computers.

Under the fourth research question, the following were the findings:

a. Support for ICT integration comes from the government through GIFEC

b. Old student associations and Parent-Teacher-Associations in the various schools and an ICT levy which is a component of students' fees are other sources of support for ICT integration.

c. All the support that is received is in the form of equipment supply.

d. More support is expected to come from the government in the form of initiatives such as professional development and supply of more equipment.

The last objective sought to analyse quantitatively the relationship between ICT perceptions of a sample of teachers in the three schools as a dependent variable, and age and gender as independent variables. The results of the analysis showed that while teachers' ages groupings was not significant in predicting the dependent variable,

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gender was significant in predicting the dependent variable, with male teachers having more favourable perceptions of ICT integration than female teachers.

5.2 Conclusion

This study has explored the state of ICT integration leadership in three Senior High Schools within three districts in the Central Region. The study adopted an embedded mixed method design with a dominant qualitative strand. Four research questions were analysed using qualitative methods and one objective was analysed quantitatively.

The school leaders in the study acknowledge the benefits of ICTs for teaching and learning. However, they have not been equipped adequately to take up their roles as technology leaders. Moreover, the integration of ICT into teaching and learning in the schools is fraught with so many challenges ranging from the unsupportive ergonomics of the classrooms, inadequacy of ICT infrastructure and limited skills of both school leaders and their teachers. Transformational use of ICT for teaching and learning can be achieved with well-equipped and professionally trained ICT leadership set up in the schools. This, coupled with a national framework for ICT leadership in schools will promote the integration of ICT in the schools.

5.3 Limitations

Time constraint was a major limitation to the study. The findings of the study would have been enriched if more than the three schools had been chosen to participate in the research. However, the brevity of the one-year period the researcher had to complete the study made it difficult to expand its scope beyond three schools. The geographical situation in Senior High Schools in Ghana is such that schools are widely distributed across the districts and hence working with many schools at a time

would imply traversing from one long geographical location to another. In order deal with this limitation, the researcher purposively selected three schools that represented each of the three categories of Senior High Schools in the Ghana Education Service Classification of schools. This enabled the problem to be studied holistically taking into consideration the unique characteristics of each of the schools.

5.4 Recommendations

Based on the findings of the study, the following recommendations are made to help educational policy makers improve the practice of ICT integration and technology leadership in Senior High Schools:

1. Even though almost all the school leaders in the study were 'digital immigrants' (born before computers), it was found that a few of them have made personal attempts to get acquainted with computers and various computer software. The researcher believes that all educational stakeholders will be interested in seeking private, personal help in ICTs if they have the motivation to do so. For this reason, it is recommended that the Ghana Education Service in the three districts initiate a Senior High School award scheme that recognises and rewards headmasters who show evidence of personal technological development as well as supporting ICT innovations in their schools, say 'Most Innovative Headmaster Award'.

2. The study further revealed that participants were not conscious of the fact that school leadership in the 21st Century entails technological leadership. Educational stakeholders in the districts should organise sensitisation workshops and professional development programmes for Senior High School heads on ICT integration and ICT integration leadership.

3. Skill-sets for ICT integration should be included in the curriculum of teacher training institutions in the country since the study established that most teachers and heads did not receive in-depth ICT training from their respective Colleges of Education and Universities.

4. The Ghana Education Service and leadership in the three schools should begin processes of making their classrooms supportive of ICT integration, especially by extending electricity connection to them. Moreover, since ICT integration cannot take place without ICT tools and equipment, the government should supply these facilities to the schools on a regular basis and also provide funds and/or human resource to ensure their regular maintenance.

5. Last but not least, the ICT in education policy, ICT for Accelerated Development (ICT4AD) Policy and other government expectations for ICT in the education sector should move beyond their being in public documents. All educational stakeholders and the general public should be sensitised, educated and informed about the importance and urgent need for ICT integration in education. This can be done by the media, National Commission for Civic Education (NCCE) and through public education at the district levels.

5.5 Suggestions for further research

1. The number of participating schools for this study could not be increased beyond three due to the limitations of time and resources. Future research can expand the scope of the present study by using as many schools as possible in order to ascertain whether the findings herein will be sustained or refuted.

2. The present study concentrated on exploring ICT integration leadership in three Senior High Schools. Future research can investigate the state of ICT

integration and transformational leadership practices in basic schools in the country.

3. A visit to the Senya Senior High School in the Awutu Senya East Constituency in the Central Region in the course of the study revealed that, though an Option 1 school (lowest category) according to GES classification, the school had modern ICT equipment, and was practising ICT integration better than any of the three schools that participated in the present study. This school (and other similar ICT enriched schools that may be identified can be used as a case study of ICT integration in the future to learn about their successes, failures and challenges.

4. Future research can replicate the quantitative phase of this study using school heads as participants to determine whether the effects of age and gender in predicting their perceptions about ICT integration will be consistent with the findings of the present study.
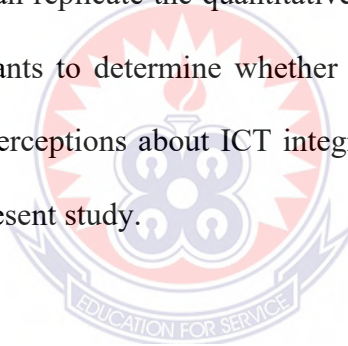
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APPENDICES

APPENDIX A

Interview guide for Heads, Assistants, HODs

1. School leaders' perceptions about ICT integration
- In your opinion, what does effective integration of ICT mean/entail?
- How, in your opinion, can ICTs be beneficial in teaching and learning?
- ✓ To teachers
- ✓ To students
- ✓ Any other person or groups of people in this school?
- How would you describe your expertise in the use of computers and other ICT devices?
- Do you have a personal computer? How often do use it and for what?

2. Strategies for leading ICT integration
- What strategies have been put in place to promote the use of ICTs in the school in terms of:
- ✓ Sharing a vision of ICT?
- ✓ Promoting a culture of teaching and learning with ICTs
- ✓ Training and equipping teachers with skills to integrate ICTs in their lessons
- ✓ Using ICTs to improve the school as an organisation
- ✓ Dealing with the ethical and legal issues surrounding the use of ICTs

3. Challenges in leading and implementing ICT integration
- What challenges are encountered in attempts to help teachers use ICTs in teaching and learning with regards to?
- ✓ Infrastructure
- ✓ Human resources
- ✓ Others

4. Support systems for effective ICT integration
- Which person/groups of people have been supporting you to use ICTs for teaching and learning?
- What support will your school need to help teachers use ICTs effectively for teaching and learning?

APPENDIX B

Interview guide for ICT teachers

1. Strategies for leading ICT integration
- What strategies has your school leadership put in place to promote the use of ICTs in the school in terms of:
✓ Sharing a vision of ICT?
✓ Promoting a culture of teaching and learning with ICTs
✓ Training and equipping teachers with skills to integrate ICTs in their lessons
✓ Using ICTs to improve the school as an organisation
✓ Dealing with the ethical and legal issues surrounding the use of ICTs

2. Challenges in leading and implementing ICT integration
- What challenges are encountered in attempts to help teachers use ICTs in teaching and learning with regards to?
✓ Infrastructure
✓ Human resources
✓ Others

3. Support systems for effective ICT integration
- Which person/groups of people have been supporting you to use ICTs for teaching and learning?
- What support will your school need to help teachers use ICTs effectively for teaching and learning?
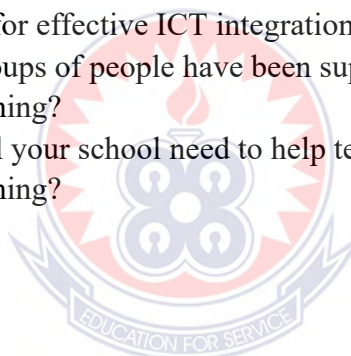
APPENDIX C

TEACHERS' QUESTIONNAIRE

This survey is being conducted for research purposes by Anna Koomson, a postgraduate student of the University of Education, Winneba. The purpose of the survey is to determine teachers' views about using technology (computers and other ICT devices) as an instructional tool.

You are assured that your responses will be kept confidential and anonymous and used only for the purpose of the research. Please answer all questions as sincerely as you possibly can. The survey is not a test, so there are no right and wrong answers. Thank you for agreeing to complete this questionnaire.

Demographic information

Gender (Tick one box)

Male ☐   Female ☐

Age (Tick one box)

Less than 30 years ☐   30-40 years ☐   41-50 years ☐   Above 50 years ☐

Highest academic qualification (Tick one box)

Certificate ☐   Bachelor's degree ☐   Postgraduate ☐

Number of years in teaching (Tick one box)

1-9 years ☐   10-19 years ☐   20-29 years ☐   30 years and above ☐

Using the scale below, please **TICK [√]** the appropriate box to indicate the degree to which you agree or disagree to each of the statements below.

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
1. Technology can improve teaching					
2. Using technology for teaching can be a waste of time					
3. Students will enjoy learning with technology					
4. When students use technology in school, their learning outcomes will improve					
5. Our school is prepared to use technology for teaching and learning					
6. Teaching without technology is more productive					
7. Ghanaian students will abuse technology if they are allowed to use it in school					
8. When students use ICT devices at home, they will study hard					
9. Using technology for teaching will motivate students to study hard					

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10. Too much technology for teaching and learning will distort our Ghanaian culture					
11. Teaching ICT as a subject is not enough for students to acquire relevant ICT skills					
12. All subject areas can be taught better with ICT tools					
13. Computers can be used to teach in more efficient ways					
14. I have enough competency to use technology for teaching					

APPENDIX D
Sample letter of request

<div align="right">

P. O. Box 256
Winneba.

8th March, 2018.

</div>

The Headmaster
(Institution's address)

Dear Sir/Madam,

<div align="center">

REQUEST TO CONDUCT RESEARCH IN YOUR SCHOOL

</div>

I am Anna Koomson, a second year student on the MPhil Educational Administration and Management programme at the University of Education, Winneba. I have been pleased to select your school as one of the sites for my final research project and would want to, by this letter, secure your consent to collect data for the work.

The study will involve the following:

1. An interview with the headmaster, assistant head (academics) and head of Science department on administrative/leadership experiences with ICT in the school

2. A sample of teachers to respond to a 14-item closed ended questionnaire.

I hope to come to the school premises to collect the data at a time that will be determined by you based on your convenience and that of your staff.

I have attached an introductory letter from the University of Education, Winneba for your perusal.
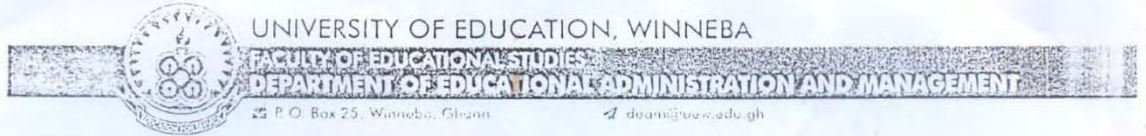
Looking forward to hearing favourably from you.

<div align="right">

Yours sincerely,

…………………
Anna Koomson
(0208012495).

</div>

APPENDIX E

Introductory Letter

UNIVERSITY OF EDUCATION, WINNEBA
FACULTY OF EDUCATIONAL STUDIES
DEPARTMENT OF EDUCATIONAL ADMINISTRATION AND MANAGEMENT
P.O. Box 25, Winneba, Ghana   dean@uew.edu.gh

UEW/EAM/INT/24

February 19, 2018.

TO WHOM IT MAY CONCERN

Dear Sir/Madam,

LETTER OF INTRODUCTION

We write to introduce Anna Koomson a student on the M.Phil. Educational Administration and Management programme of the Department of Educational Administration and Management.

Ms. Koomson is working on a research project titled *"Technology Integration in Three Ghanaian Public Senior High Schools"*.

Please, give her the necessary assistance and co-operation.

Thank you.

Yours sincerely,

Dr. Hinneh Kusi
Head of Department

cc: Dean, School of Graduate Studies