UNIVERSITY OF CAPE COAST

THE IMPACT OF TUTORS' DIGITAL LITERACY ON ICT INTEGRATION OF PRE-SERVICE TEACHERS: A CASE STUDY OF OLA COLLEGE OF EDUCATION

EDWARD ACQUAH

2023

UNIVERSITY OF CAPE COAST

THE IMPACT OF TUTORS' DIGITAL LITERACY ON ICT INTEGRATION OF PRE-SERVICE TEACHERS: A CASE STUDY OF OLA COLLEGE OF EDUCATION

BY

EDWARD ACQUAH

Dissertation submitted to the Department of Mathematics and ICT Education of the College of Education Studies, University of Cape Coast, in partial fulfilment of the requirements for the award of Master of Education degree in Information Technology

MARCH, 2023

DECLARATION

Candidate's Declaration

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

Candidate's Signature: ..... Date: .....

Name: Edward Acquah

Supervisor's Declaration

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

Supervisor's Signature: ..... Date: .....

Name: Dr. Rosemary Twum

ABSTRACT

It is essential for Ghana to have teachers who are proficient in ICT as the use of ICT in classrooms grows. However, available data shows that not much attention has been given to exploring teachers' digital literacy and the technology integration in the classroom. This study examined the effect of tutors' digital literacy on pre-service teachers' use of ICT at Ghana's colleges of education using OLA College of Education as a case study. The study specifically explored the digital literacy skills level of ICT tutors, examined the relevance of tutors' digital literacy skills on ICT integration, and interrogated the factors which influence tutors' digital literacy skills level. Data for this qualitative study was gathered from interviewing four (4) students and two (2) tutors of OLA College of Education. The findings revealed that tutors' digital literacy level was high and they implemented such skills in their lesson delivery. Again, tutors' digital literacy was imperative to prepare teacher trainees to fit into the modern digital age. Lastly, the effective integration of ICT in classroom instruction at the College of Education was challenged by students' overconcentration on making good grades, inadequate ICT infrastructure and poor internet connectivity. The study recommends that students of the Colleges of Education in Ghana need to be oriented to appreciate and focus on the practices that can afford them ICT integration skills during their training rather than just focusing on passing examination. Also, Colleges of Education in Ghana must be stocked with adequate ICT infrastructure for student-teachers to learn with during their training.

KEY WORDS

Digital Literacy**:**

The capacity to appropriately make use of computer devices, information, tools, and services, that could be used for lifelong learning procedures.

Digital Competency:

Digital Competency requires sensible use of healthy ICTs as well as knowledge and attitudes about legal and ethical issues, privacy and security, as well as an awareness of ICT's role.

ICT Integration:

The approach to employing technology for teaching and learning that is most closely related to using educational technologies in classrooms.

ACKNOWLEDGMENTS

My foremost expression of appreciation goes to Dr. Rosemary Twum, who as my supervisor, made major contribution to the work, and offered professional guidance, advice, and encouragement towards the success of this research.

I love to thank Mrs. Emefa Agbo Kumanya for helping me with the data collection.

I also wish to express sincere thanks to Dr. Bernard Wiafe Akaadom, Dr. Valentina Akorful and Dr. John Bitian Lanbon for always encouraging me to deliver on time.

I further want to express appreciation to the staff and students of the OLA College of Education (ICT Department) for allowing me to conduct the interview for this study.

I would also like to thank my colleagues and friends for their continuous support and encouragement throughout my academic journey.

Last but not least, I want to thank Emelia Owusu, Albertina Acquah and Juliet Acquaye, for their motivation in completing this work.

DEDICATION

To my wife Emelia Owusu and my children: Baaba acquah and Boaz Nana Yaw Acquah.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

ICT	Information and Communication Technology
ICT4AD	Information and Communication Technology for Accelerated Development
MDGs	Millennium Development Goals
PCK	Pedagogy, Content Knowledge
SDGs	Sustainable Development Goals
TCK	Technological Content Knowledge
TDL	Teachers Digital Literacy
TPACK	Technological Pedagogical Content Knowledge
TPK	Technological Pedagogical Knowledge
UNESCO	United Nations Educational, Scientific and Cultural Organization

CHAPTER ONE

INTRODUCTION

Background to the Study

Digital literacy and digital competence are often used when discussing media-related competence. However, these phrases are still not well defined and are frequently used interchangeably (Ghavifekr & Rosdy, 2015; Godhe, Lilja, & Selwyn, 2019). Whereas digital literacy has targeted the development of technology skills, the idea of competence encompasses a wider range of information, talents, and dispositions required of future instructors (International Finance Corporation, 2019).

The capacity to utilize and assess digital information, tools, and services appropriately as well as integrate technology into ongoing educational processes is known as digital literacy (Falloon, 2020). It is closely related to communication skills and information abilities in the field of information and communication technology (ICT). Sensible and healthy ICT use necessitates certain knowledge of, and attitudes toward, matters of law, ethics, and security, as well as an awareness of ICT's role. Therefore, knowing how to use technology devices and programs is definitely not enough to be considered digitally competent (Johnson, Jacovina, Russell & Soto, 2016).

Digital literacy has become so important in the 21st century that it has been estimated that by 2030, Sub-Saharan Africa will have 230 million "digital jobs" and Ghana alone will provide 9 million digital employment and approximately $4 billion in revenue by 2030 (International Finance Corporation, 2019). The digital skills requirement is gradually shifting from basic skills, like computer literacy, to intermediate skills in industries.

Banking and similar industries are moving from clerical to digital in terms of outlook. (Fau & Moreau, 2018).

There are three degrees of digital skills: Basic Digital Skills, Intermediate Digital Skills, and Advanced Digital Skills, according to research by the United Nations Educational, Scientific, and Cultural Organization on Digital Skills for Life and Commerce (UNESCO, 2017). The capability of utilizing technology to carry out tasks linked to one's line of work is referred to as having basic digital skills. It is limited to rudimentary use of digital devices and applications for entry-level functional abilities. Users with basic digital abilities can often access and save information from online sites, create online accounts and profiles, and use devices like computers and cellphones. Using digital equipment for practical reasons, communicating online via emails, and finding, managing, and storing digital data are some more functional competencies (UNESCO, 2017).

The Intermediate Digital Skills on the other hand is the ability to do work-related tasks using technology. Individuals with intermediate digital skills can employ technology for more significant task-oriented objectives. The abilities that allow one to use online services and applications effectively and meaningfully, are frequently necessary for professional development and can be applied to a variety of job profiles. These abilities include using specialist software for presentations, analytics, bookkeeping, and project management, as well as graphic design, site design, social media analytics, and digital marketing (UNESCO, 2017).

Advanced Digital Skills is the ability to do specialized activities in information and communication technology-related occupations. These are the

group of skills that serve as the basis for specialized roles and jobs in information and communication technology (UNESCO, 2017). Data scientists, artificial intelligence specialists, and computer programmers are a few examples of these positions. Other abilities under this level are Programming in a computer language-Cloud computing and network administration, Computational intelligence, Big Data Analytics and Data Science - Cyber Security, Search Engine Optimization and Web Development skills (Reddy, Sharma, & Chaudhary, 2022).

Hermans, Tondeur, Van Braak, and Valcke (2008), on the other hand advanced that there are three primary stages—integration, enhancement, and complementary—for ICT to be given the needed respected and consideration by instructors. By integrating proper ICT utilisation in a discipline that requires complicated concepts and skills, the integration strategy seeks to promote student success and attainment. Also, a relook at the curriculum is necessary to make sure that only relevant ICT resources and suitable software are installed in order to achieve the curriculum's main aims and objectives (Ghavifekr & Rosdy, 2015). The improvement technique entails using ICT to emphasize the introduced problem strongly. For instance, presenting the material using Microsoft PowerPoint in a remarkably original and creative approach might promote discussion and the exchange of ideas. (Ghavifekr & Rosdy, 2015).

Last but not least, an additional strategy involves enhancing and facilitating students' academic advancement through the use of ICT. By enabling them to take notes on a computer, submit their work via email from home as long as the due date is met, and get data from a number of internet

sources to complete the assignment given to them, this strategy enables students to be more efficient and organized (Ghavifekr & Rosdy, 2015).

In the twenty-first century, using "technology" effectively is a key topic in many areas, consisting of education. The reason behind this is that technology has largely replaced traditional methods of information transfer in most nations. The development and transformation of our society brought about by the use of technology has fundamentally altered how people think, function, and live today (Grabe & Grabe, 2008). With the purpose of preparing students for life in "a knowledge society," information and communication technology (ICT) must be taught in schools and other educational institutions (Ghavifekr, Razak, Ghani, Ran, Meixi & Tengyue, 2014).

The use of computer-based communication that is incorporated into the educational process in a common classroom is referred to as ICT integration in education. It usually describes a method of teaching and learning that is dependent on technology and is directly pertaining to the usage of educational technology in schools (Janssens-Bevernage, Cornille, & Mwaniki, 2005). As well as preparing learners for the modern digital environment, educators or instructors are looked up to as the main players in incorporating ICT into their normal classroom businesses. Teachers' utilisation of ICT has a significant impact on learners' digital skills, particularly when this technique is used across all topics and not just in computing classes. As a result, ICT teacher training is critical (Fau & Moreau, 2018).

This is as a result of the fact that ICT can provide a vibrant and progressive teaching-learning environment (Arnseth & Hatlevik, 2010). Nonetheless, it also mentions the advantages of bringing learning communities together to deal with the problems caused by current globalization. ICT integration seeks to raise the bar for the effectiveness, accessibility, and affordability of student instruction (Bingimlas, 2019). ICT adoption is a process that involves several, incessant steps that fully complement the given of instruction in the classroom, learning, and information resources. The application of ICT will end up in successful learning with the assistance and backing of ICT components and components, and the use of technology in education significantly increases the pedagogical components of education. (Finger & Trinidad, 2012).

In actuality, ICT offers supplementary assistance to both teachers and students. It is undoubtably true that adopting tech-based tools and equipment can make learning a wide range of subjects by pupils more effective. Computers and technology are viewed as a tool to supplement instruction and learning rather than as a replacement for competent teachers. Again, the value of ICT integration in education cannot be emphasized given that technology makes it possible for teaching and learning to take place outside of the classroom environment, even when educators and learners are put apart by physical distance. (Ghavifekr & Rosdy, 2015).

Using technology to teach and learn offers several interesting techniques, including films for education, brainstorming, guided exploration, mind mapping, data storage, and database use that will enhance and deepen the learning experience (Finger & Trinidad, 2012). Yet, when students are not

hampered by the restricted resources and curriculum and instead have access to practical activities in a course that uses technology are intended to assist them increase their grasp of the subject, they will profit from ICT integration. Additionally, it aids educators in building captivating lesson plans that will motivate learners to take part in active learning. (Jamieson-Proctor, Albion, Finger, Cavanagh, Fitzgerald, Bond & Grimbeek, 2013). Teachers' use of ICT has a significant impact on students' digital skills, particularly when this technique is used across all topics and not just in computing classes. As a result, ICT teacher training is critical (Fau & Moreau, 2018). Nonetheless, the majority of earlier studies demonstrated that introducing and utilising ICT into the learning environment will enhance student learning and increase their abilities for active learning.

In Africa, there is a major supply and demand imbalance in digital skills at all levels, with reduced availability of skills and significant gaps in supply of intermediate and advanced (International Finance Corporation, 2019). Education could be revolutionized by technology-based learning and instruction, but this would require rigorous planning and policy creation. The future plan must be clear to both researchers and decision-makers. Hockly, Dudeney, and Pegrum (2014) assert that national ICT plans can fulfil a variety of crucial functions. They are advantageous to learners, educators, parents, and the nation as a whole by providing a justification, a set of goals, and an illustration of how educational institutions might operate if ICT were integrated into the process of instructing and learning.

Ghana's education stakeholders are worried about how teachers and pupils use Technology in classrooms and how their utilisation improves learning since the early 1990s. Ghana's ICT for Accelerated Development (ICT4AD) policy was passed by the Ghanaian Parliament in 2004. This strategy tackles 14 main focus areas, including speeding human resource development and supporting ICT in education, and it expresses Ghana's vision for the information age (Ministry of Education, 2003).

In this sense, governments started paying more attention to ICT utilization in teaching and learning. ICT must be used for teaching and learning at all levels of the educational system, according to Ghana's ICT in Education Policy. As a result of this commitment, the ICT in Education Policy was developed in 2008 with the goal of integrating ICTs into teaching and learning throughout all tertiary, secondary, and elementary schools in the country. The Ministry of Education (MoE) has worked to support institutions in their attempts to educate IT literacy. Efforts are put in place to gradually give educational institutions with access to ICT skills and to promote ICT as a crucial component of the educational process in order to handle the demands and difficulties of globalization. The Ministry of Education/Ghana Education Service (MoE/GES) has also incurred significant costs in an endeavor to enhance the learning environment by utilizing educational software and technology.

Teachers in Ghana who are proficient in ICT are essential as the utilisation of information and communication technology in classrooms grows. As stated by Janssens-Bevernage et al. (2005), greater focus must be placed on the primary transformers' capacity being increased during this process,

teachers, as computer technology and software become available to more schools. The introduction of ICT into schools confirms the critical need to offer teachers both professional teachers and teacher trainees the attention they need in order to build the fundamental ICT competencies required for their work. This, along with other factors like underutilized ICT resources in schools due to teachers' lack of digital literacy and the many benefits that ICT in education offers, is what prompted the Ghanaian government and policy makers to incorporate ICT into the school curriculum, including Colleges of Education. (Natia & Al-hassan, 2015). The diagram in Figure 1 shows the summary of the background of the study.

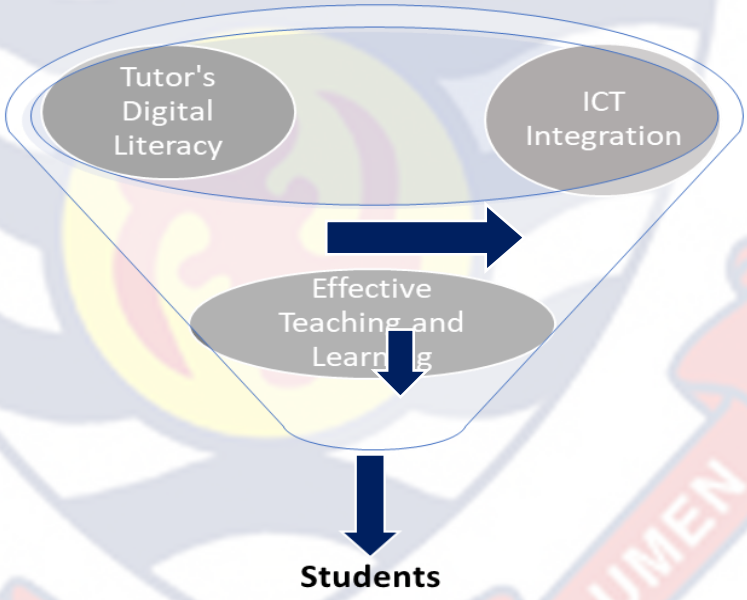

Figure 1: Summary of Background to the Study

Figure 1 displays 3 distinctive but related ingredients of modern education. The term "digital literacy" describes the ability of tutors to appropriately use computer devices, digital information and other tools and services to effect lifelong teaching and learning process. ICT integration refers to the use of learning technologies in schools and the associated technology-based teaching and learning process.

Effective teaching and learning refers to a teacher's ability to have a beneficial impact on a student's life and academic career, which includes the capacity to impart important skill sets, offer cutting-edge concepts, and resolve any conflicts in the classroom. The student is the recipient off all the ingredients of modern education listed above. If tutors are digitally literate, it inspires them to include ICT into teaching and learning thereby achieving effective and efficient teaching and learning and the students become successful in their academics.

How equipped are the colleges of education and how prepared are they to incorporate ICT into teaching and learning despite all these admirable objectives on the part of policymakers? This research, therefore, aims at assessing tutors' digital literacy and integration of ICT in the Colleges of Education in the Central Region of Ghana.

Statement of the Problem

ICT usage by students, including trainee teachers from sub-Saharan West Africa remains limited (Kayisire & Wei, 2016). According to Makgato (2014), The capacity of instructors, the accessibility of ICT infrastructure, and teachers' use of ICT in the classroom all have a significant role in how well technology is included into both education and training. Available data shows that, not much attention has been given to exploring teachers' digital literacy and the integration of technology in teaching. Prior research has mostly concentrated on evaluating the ICT situation in schools (Kayisire & Wei, 2016; Yeboah, Sarpong & Appiah, 2020), the accessibility and use of ICT resources in educational institutions (Acquah-Doughan, 2015; Yusuf, Maina, & Dare, 2013); teachers' attitudes and perceptions towards the integration of

ICT in schools (Arkorful, Barfi, & Aboagye, 2021; Buabeng-Andoh & Yidana, 2015).

Tutors' digital skills and knowledge of technology, pedagogy and content are very necessary for effective and efficient incorporation of technologies in teaching and training (Koehler & Mishra, 2009). Colleges of Education are entry points to effective teaching where the use of technology is necessary to help teacher candidates build their ICT integration skills. Among the courses taught at Colleges of Education is ICT in teaching and learning processes (Nzilano & Kafyulilo, 2012; Yeboah, et al., 2020). This, notwithstanding, studies reviewed reported a low level of ICT competency in schools in most developing countries including Ghana. According to Fau and Moreau (2018) and Yeboah et al. (2020), an educator's ability to incorporate technology into their lessons is heavily influenced by how they learned it; the low level of teaching ICT is therefore the outcome of the poor training that teacher trainees received from their respective colleges.

This therefore, has heightened the need to explore tutors' digital competency, which transcends to teacher trainees acceptance and integration of technology in the basic schools of Ghana.

Purpose of the Study

The intent of this research is to explore the impact of ICT tutors' digital literacy skills on ICT integration of pre-service teachers in the OLA College of Education. As the research methodology, the researcher intends to gather all related documents to describe the context of the school under consideration before conducting an in-depth interview. The study's goals and questions are listed in the sections below.

Objectives of the Study

The general objective of the study is to explore the effects of ICT tutors' digital literacy on pre-service teachers ICT integration skills. Specifically, the study seeks to:

1. Determine the digital literacy skills level of ICT Tutors in the OLA College of Education in the Cape Coast metropolis.
2. Examine the relevance of tutors' digital literacy skills on pre-service teacher's ICT integration in basic schools in Ghana when they eventually teachers.
3. Examine the factors which influence ICT tutors' digital literacy skills level in OLA College of Education.

Research Questions

1. What are the digital literacy skills levels of ICT Tutors in OLA College of Education in the Cape Coast metropolis?
2. What is the relevance of tutors' digital literacy skills on teacher trainees ICT integration in Basic Schools in Ghana when they eventually come out as teachers?
3. What factors influence tutors' digital literacy skills level in OLA College of Education?

Significance of the Study

The study will provide insight into the digital literacy of pre-service teachers and the integration of ICT in teaching. This will help school administration to be informed about the digital literacy of its staff so as to put appropriate measures in place (where necessary). The study will also address concerns about ICT integration in instruction from the viewpoint of pre-

service teachers. This will serve as a manual to helping decision-makers, investors, educators, and helps other interested parties make wise decisions on information and communication technology (ICT) policy, as well as investments in ICT infrastructure and facilities. Finally, this study will broaden the body of knowledge on digital literacy of pre-service teachers and ICT integration in educational institutions.

Delimitation of the Study

In terms of methodology, this study used only qualitative approach. This study is restricted to only one College of Education in the cape coast metropolis in the central region of Ghana. Per the purpose of the study, only one college of Education in the cape coast metropolis was selected to enable the researcher have control over the study. Likewise, the study only considered students who were in third year because the first years had not yet been introduced to the study of ICT and the second years are also on their out programme. The researcher then concentrated on ICT tutors and third year students who were ICT major only.

Limitation of the Study

The results or the outcomes cannot be generalized to other tertiary institutions except Colleges of Education in the country but with caution due to the fact that conditions in other Colleges of Education may vary. However, this study could be used as a reference if there are any effects of transferability to readers from another context.

Organisation of the Study

The study was organised into five chapters. Chapter one comprised background to the study, statement of the problem, purpose of the study, research questions, the significance of the study, delimitation of the study, limitation of the study and the chapter summary. Chapter two addressed the related theories and the review of related literature. The literature review was based on the objectives of the study. Chapter three addresses the research methodology. Specifically, the research design, study area, population, sample and sampling procedure, data collection instrument, as well as methods for data collection, data processing and analysis. In addition, this chapter included ethical considerations. Chapter four looked at the results obtained from the study and it was discussed within the context of the literature review. The fifth chapter provided a summary, conclusions and recommendations of the study. In the last chapter, suggestion for further studies was made.

Chapter Summary

The chapter looks at the background, the statement of the problem, research objectives and questions, significance of the study, limitation, definition of key terms and the organization of study. The study aims to examines the impact of tutors' digital literacy on ICT integration pre-service teachers in the Colleges of Education in Ghana.

CHAPTER TWO

LITERATURE REVIEW

Overview

This chapter explored further about the three core areas in this study, that consist of: (a) the Digital Literacy Skills levels of ICT Tutors in the Colleges of Education; (b) the relevance of tutors' digital literacy skills on teacher trainees ICT integration in Basic Schools and (c) factors that influence tutors' digital literacy skills level. These works of literature were used to support theoretical framework. The researcher then presented reviewed literature under the units of analysis from the objectives of the study.

ICT in Education

The issue of ICT in education is complex and it is difficult to say that ICT does not have any effect on learning (Fu, 2013). Various studies and media reports of education technology, have identified expected benefits of technology in education (Oliver, 2006). However, there is still the need to develop an understanding of the relationship between education and ICT in terms of how and why ICT is actually used within educational settings, rather than concentrating on how it could or should be used (Ghavifekr & Rosdy, 2015).

Schools have a responsibility to prepare pupils for involvement in technologically advanced surroundings of their foreseeable future workplaces and society, therefore it is significant that educational institution make the utilization of ICT to support instruction and learning (Natia & Al-hassan, 2015). Hawkridge cited in Farmery (2014) highlighted four justifications for ICT use in schools. Despite Hawkridge's writings being old, they nevertheless

hold true today. The four are: pedagogic (ICT improves teaching and learning); social (to educate learners for the use of ICT in daily life); vocational (to prepare students for utilizing ICT at work); and catalytic (IT can transform what is taught and how).

It is clear that ICT has made it possible to transform both the learning process and content. It has made new educational tools available that help students create their own learning and enable new or more effective ways of carrying out tasks (de Winter, Winterbottom & Wilson, 2010). The use of ICT in music is examined by Wise, Greenwood, and Davis (2011), who point out that digital technologies are used in the music industry, which is changing how music is taught in schools to incorporate such technology. Wise et al. (2011) identify obstacles that music teachers face in adjusting to curriculum and technological changes, but conclude that the use of ICT improves performance, especially in composition assignments. Ott & Pozzi (2011) concentrate on cultural heritage education, where the World Wide Web and the internet have made it possible for museums to offer free digital artifact repositories. Artifacts can be examined from various angles and with more detail by utilizing ICT tools like pan and zoom. Historical artifacts can also be contextualized and recreated in the manner in which they would have existed, with specific instances of ancient Greek and Roman ruins. Utilizing ICT enables personalized inquiry-based learning, collaborative learning, and information sharing with a wider spectrum of people. (Ott & Pozzi, 2011).

Lehtinen's (2010) The incorporation of information and communication technology does not always result in improvements in learning, according to a meta-analysis of ICT-based research that found four

consistent themes in relation to students' learning: they gain more knowledge, learn at a quicker rate, gain in relation to motivation, and increase social interaction. When technology is utilised to support both learning and teaching, it is most likely to have a positive motivating influence on learners behavior, learning, and achievement (Rohatgi, Scherer, & Hatlevik, 2016). Some authors mention using the Interactive Whiteboard (IWB) to show pupils content that is rich in media. (Twiner, Coffin, Littleton & Whitelock, 2010; Heemskerk, Kuipert & Meijer, 2014). Yet, teachers contend that this tension between learning and enjoyment undermines learning when learners are not actively participating in reflection, discussion, and social interaction when viewing multimedia content (Hill et al., 2012).

When students are engaged in activities they care about and enjoy, they are more inclined to pick things up and participate in "difficult" tasks (Resnick, 2004). Resnick, Wishart, and Triggs (2010) highlight the efforts made by museums to offer fun activities for kids and other visitors. According to Madej (2003), who examined the development of children's literature throughout the years, including digital works, the debates over the integration of entertainment into education date back to the 1700s, when authors first started producing children's literature that was both entertaining and educational.

Gee (2007), Madej (2003) and Murray (2006) all mention the educational value of video games. Craig and Amernic (2006) and Okan (2003) refused to agree, arguing that educators should be more focused on "instruction" than "entertainment," as the two are incompatible. According to Okan (2003), students who anticipate studying to be enjoyable are ill-equipped

to put in the necessary "hard effort and serious study." Contrarily, Resnick (2004), Madej (2003), Gee (2007), and Murray (2006) point out how pupils can, for instance, develop resilience and a willingness to "work hard" when they play computer games.

Information and communication technology may be put in use to help teaching and learning by using the internet to expand the learning community outside of the classroom in terms of knowledge of the internet and other learning abilities (Law, Lee & Chow, 2002). ICT is also increasingly being used to strengthen connections between parents and schools by giving parents access to messages and information about their children and involve them in their children's education (Selwyn, Banaji, Hadjithoma-Garstka & Clark, 2011; Zieger & Tan, 2012). Parents' opinions on the limited usage of these technologies and the dearth of two-way communication are, however, divided. Due to increased expectations from parents and schools as a result of these communication channels, teachers are also under pressure and held to a higher standard of accountability. (Selwyn, et al., 2011; Zieger & Tan, 2012).

History of ICT in the Colleges of Education

Several governmental agencies and academic institutions view the integration of ICT into instructing and learning as a major priority globally. A number of countries have created master plans for the utilisation of ICT in education (Buabeng-Andoh & Yidana, 2015).

Teachers in most schools claimed to have exceeded average levels of digital literacy; yet, more than half of the education institutions are technologically proactive. Educators do not appear to be adopting ICT tools and digital tools for professional practice, according to this study (Quaicoe &

Pata, 2020). ICT usage is rising across the board in African nations, including Ghana. The spread and usage of ICTs in educational institutions in Western nations are well-known, but less is known about how ICTs are utilised by instructors and learners in Ghanaian schools. Also, there is a significant difference in ICT usage between schools in rural and urban areas (Aduwa-Ogiegbaen & Iyamu, 2005). When he stated that "each institution must be able to assess its current situation with regard to its capacity to use ICT in teaching and learning, research outreach, professional services, as well as to achieve administrative efficiency," Adubifa (2001) underlined the importance of assessing the state and use of ICT (p. 6).

Ghana ICT Policy Framework

The usage of ICT in schools is growing in Ghana, making it essential for educators to be proficient in the technology. Since more schools have computers and software at their disposal, it is necessary, in the opinion of Janssens-Bevernage, Cornille, and Mwaniki (2005), to focus more on the capacity development of the teachers who will serve as the primary change agents in this process. Due consideration must be given to the educator (both practicing teachers and aspiring teachers) in order to help them acquire the essential ICT skills and competencies required for their position, as evidenced by the introduction of ICT in schools. This, along with other factors including underutilized ICT resources in schools due to instructors' poor ICT skills, and considering the many benefits ICT in education dispensation offers are some of the most likely factors that influenced the government of Ghana and policy makers to integrate ICT into the school curriculum including institutions of education. In Ghana, however, the initial implementation of ICT into the

schools became a reality in the late 2010/2011 academic year when ICT4All policy was implemented in all Primary and Junior Secondary School (JSS) across the country (Ampratwum, Offei, & Ntoaduro, 2016). The findings from the research studies in Ghana show that the implementation followed the recommendation of the Education Review Report 2003 due to its transformative agenda of changing teaching and learning from braille-oriented instruction to the use of ICT mediated pedagogy. The above report concluded that to ensure the success of the policy, the best form of educational practice for all blind learner in the 21st century must be technology -driven.

In his view, Mfum-Mensah (2011) opined that the ICT initiative was based on Information and Communication Technology for All (ICT4All) and Information and Communication Technology for Accelerated Development (ICT4AD) policy documents which were rectified in 2003 had its primary aim of making ICT the engine of growth for Ghana's economy. In addition to the above, the ICT4All Policy was also aimed at promoting disability studies in Ghana especially among visually impaired learners. According to the ICT policy document, this was to ensure that learners get a better education through the IT education and training, as well as to equip them with the needed skills to make them fit into the job market.

The ICT4AD on the other hand was geared towards making ICT the engine of growth for the development of the economy (Ampratwum, Offei, Ntoaduro, 2016; Ewurah, 2017). Also, the ICT policy was to curtail all forms of digital discrimination as well as narrow the digital gap in ICT education as a way of moving the nation towards the accomplishment of the Sustainable Development Goals (SDGs 2020) (Franco & Derbyshire, 2020).

ICT was added to the curriculum of both the primary and Junior High School as a core subject which is learnt twice a week for 70 minutes per session. Learners are required to pass the Basic Education Certificate Examination (BECE) by the West African Examination Council (WAEC) with a credit pass at least (Avoke & Hayford, 2017).

Furthermore, the Ministry of Education (MoE) and the Ghana Education Service (GES) in 2007 introduced the Information and Communication Technology for All (ICT4All) policy as part of fulfilling the Universal Primary Education for All program. This was done to enhance the effectiveness of ICT education and to reduce the digital divide between general education and special needs institutions. Another Policy was the Information and Communication Technology for Accelerated Development (ICT4AD) which was initiated in 2003 (Avoke & Hayford, 2017). These policies are the working documents from which the ICT curriculum of the school for the blind was carved with the aim of moving the country to the direction of achieving of the United Nations Millennium Development Goals (MDGs) of 2015 and the Sustainable Development Goals (SDGs) by 2020. The framework for the ICT for Accelerated Development (ICT4AD) implementation model is shown in Figure 2.

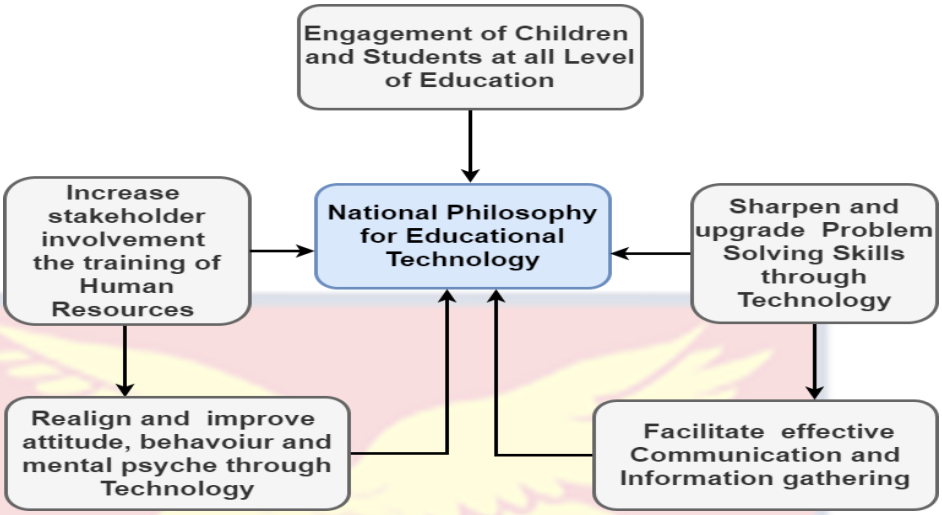

Figure 2: Framework for Ghana ICT for Accelerated Development (ICT4AD)
Source: (Avoke & Hayford, 2017; Frimpong, 2010)

According to the Yidana (2018) the ICT in Education Policy of 2015 reaffirmed the earlier Policy of 2003 but added the introduction of ICT into special education supported by three focal points or objectives, each of which should be given diverse policy initiatives prominence and approach to ensure its success. These pillars according to the report are:

a. Using ICT as an operating tool as well as a learning tool
b. Integrating ICT into the intructing and learning process
c. Ensuring that students take ICT as a career option

To guarantee that the above-mentioned goals are achieved, teachers were mandated to ensure that the policy guidelines are followed for the effective delivery of ICT. Again, Headmasters were to supervise the smooth implementation of the design curriculum with the content and pedagogy relevant and applicable to learners (Opoku & Mprah, 2017).

Policy Framework for ICT in Education in Ghana

Ghana has succeeded in providing its people with the ICT skills they need to function well in a world that is gradually becoming knowledge-based. ICT adoption has thus become a top priority in public policy across all spheres of the economy, including education. The national ICT for Accelerated Development policy from 2003 and the ICT in Education policy from 2008 serve as the foundation for efforts to introduce ICT into classrooms.

The importance of ICT to the nation's economy has been emphasized by the government of Ghana. The Ghana Poverty Reduction Strategy Paper (GPRS I&II) and the Education Strategic Plan 2003-2015, which both serve as the country's medium-term development plans, all advocate using ICT to connect with Ghana's poor (Government of Ghana, 2004). ICT for Accelerated Development (ICT4AD) in Ghana is a policy that was enacted by the Ghanaian Parliament in 2004. This strategy tackles 14 main areas, including speeding human resource development and supporting ICT in education, and it expresses Ghana's vision for the information age.

The ICT in Education policy, which was released by the Ministry of Education in 2008, details the plans and methods for integrating ICT in education at all levels. The ICT in Education policy's overarching objective is to utilize the right ICTs to support and harmonize the sector ministry's policies, objectives, and strategies, particularly with regard to equitable access to education, educational quality, educational management, technology, labour market, and science needs. In addressing sectoral issues now and preparing Ghanaian communities, educators, and students for the needs of the twenty-first century, the goal is to explain the significance, responsibility, and

effectiveness of using information and communication (Ministry of Education, 2008). The policy's specific objectives are to: promote ICT adoption, use, and development in the educational system to enhance educational delivery and access to support instruction and learning from the primary level up; transform the educational system to refine the quality of instruction throughout the entire educational system and to increase access to education, training, and research facilities; and align all levels of the educational system to international standards (Ministry of Education, 2008).

The techniques for reaching the particular goals listed in the policy are supported by four important aspects. Equity in resource distribution, cheap, ongoing access to ICT facilities, development of user capacity, and the creation of standards and guidelines for ICT use are among them (Ministry of Education, 2008).

The policy also includes seven different topic areas. To realise the objective of integrating ICT in education, these categories provide an overview of the fundamental principles and techniques to employ. Through strengthening the Ministry of Education's abilities and every agency within it, the first theme area aims to improve education management. ICT can effectively produce data for data-driven decision-making by doing this. Developing the ICT skills of everyone involved in providing education, but teachers in particular, is the focus of the second thematic area. This would make it simpler to include ICT into Ghana's teaching and learning processes at all educational levels. Facility provision, e-readiness, and fair access to ICT in all schools are among the subjects covered under the third theme area. Content production, Integration of Technology into the curriculum, technical support,

and upkeep, and the long-term stability of ICT infrastructure are other areas of concern (Ministry of Education, 2008).

Three stages make up the policy's implementation. The primary objective of this stage is to improve the capacity of educational institutions to use ICT for administrative, teaching, and learning functions. The introduction of ICT integration curriculum guidelines and community support promotion for ICT facilities in institutions of education make up the second step. The highest level involves integrating ICT into all aspects of educational management, instruction, and governance (Ministry of Education, 2008).

Technological Pedagogical Content Knowledge (TPACK)

The TPACK framework is developed from Shulman's (1986) model which portrays the connection between Technology, Pedagogy, and Content. The initiators of the TPACK model were of the notion that pedagogy alone does not make any impact in the classroom unless it is based on a sound content understanding of the subject matter and the appropriate use of technology as a tool. It is therefore recommended that in 21st-century education, all the three constructs namely technology, Pedagogy and content must work together to achieve technology integration (Kokoç & Karal, 2019). Technology is seen as the pivot around which content and pedagogy revolves (Koehler & Mishra, 2009). TPACK model is the basis for promoting effective and efficient teaching and learning of technology irrespective of the subject. A clearer understanding of the TPACK model will help ease some of the challenge's teachers face in the use of Computers and other emerging technology devices.

The TPACK model interrelates the three components of the teachers' knowledge of 21st-century education. The three sub-components that are derived from the TPACK model (Harris & Hofer, 2017). These subdivisions are Pedagogy, Content Knowledge (PCK), Technological Content Knowledge (TCK), and Technological Pedagogical Knowledge (TPK) as shown in Figure 3. The model of TPACK emphasizes that content, pedagogy, technology, play an important role in lesson delivery. Research shows that successful teaching and learning demands frequent creating and maintaining an active balance of all components (Kokoç & Karal, 2019). According to Harris and Hofer (2017), teachers must be familiar with the TPACK framework as it forms the nucleus of every pedagogy. Harris and Hofer are of the view that technology use should be "content-keyed and activity-based" which means the content with its activities should be similar to the technology used. Banini (2019) however noticed in research that the TPACK concept is not yet a well-exploited area of research in Ghana.

The TPACK model was designed to help improve better procedures for integrating and implementing technology related proficient subject matter in a classroom situation (Graziano, Herring, Carpenter, Smaldino, & Finsness, 2017). It empowers instructors to be in a best situation to comprehend the difference in stages of technology integration. What's more, the TPACK system provides new options for undertaking research on teacher professional development, teacher education, and teachers' utilization of technology. In addition, the model permits teachers, researchers, and instructor of teachers not to consider technology as an "add-on" or take technology for granted in the teaching and learning procedure. The TPACK model as depicted in figure

2.2 below displays the seven segments of how technology is related to knowledge and content of teachers

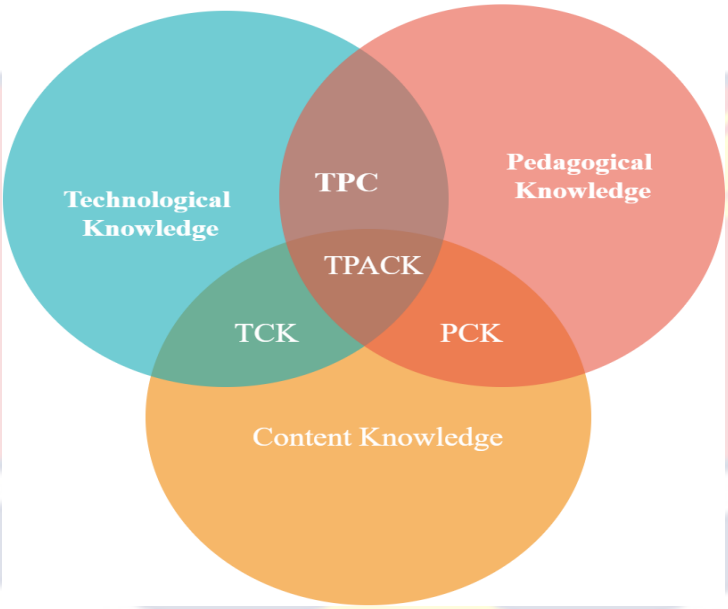

Figure 3: Technological Pedagogical Content Knowledge (TPACK)
Source: Adapted from Schmidt, Mishra, Koehler, et al. (2009)

Conceptual Framework

Technological Pedagogical Content Knowledge (TPACK)

This study relies on the Technological Pedagogical Content Knowledge (TPACK) framework proposed by Koehler and Mishra (2009) to conceptualize how tutors' digital literacy skills may influence ICT integration among teacher trainees. TPACK is an extension of Shulman's (1986) Pedagogical Content Knowledge (PCK) framework, which posits that effective teaching requires an understanding of how particular subject matter can be organized, adapted and represented for instruction. TPACK extends this idea by incorporating knowledge of technology.

According to the TPACK framework, effective technology integration for teaching specific subject matter depends on the development of three core components of knowledge:

1. Technological Knowledge (TK) refers to knowledge about standard technologies and skills required to operate them. In this study, TK relates to tutors' digital literacy skills.
2. Pedagogical Knowledge (PK) involves knowledge about student learning, classroom management strategies, lesson planning etc.
3. Content Knowledge (CK) refers to knowledge about the actual subject matter being taught or learned.

In addition, TPACK identifies three interactions between the core components:

1. Pedagogical Content Knowledge (PCK) – Knowledge of teaching strategies tailored for specific topics.
2. Technological Content Knowledge (TCK) – Knowledge of how technology can be used to enhance teaching of specific topics.
3. Technological Pedagogical Knowledge (TPK) – Knowledge of how various technologies can be used for teaching.

The intersection of all three components is Technological Pedagogical Content Knowledge (TPACK), which identifies the complex knowledge required by teachers for effective technology integration in their specific teaching areas.

Application of TPACK in the current study

The conceptual framework guiding this study is illustrated in Figure 3 below:

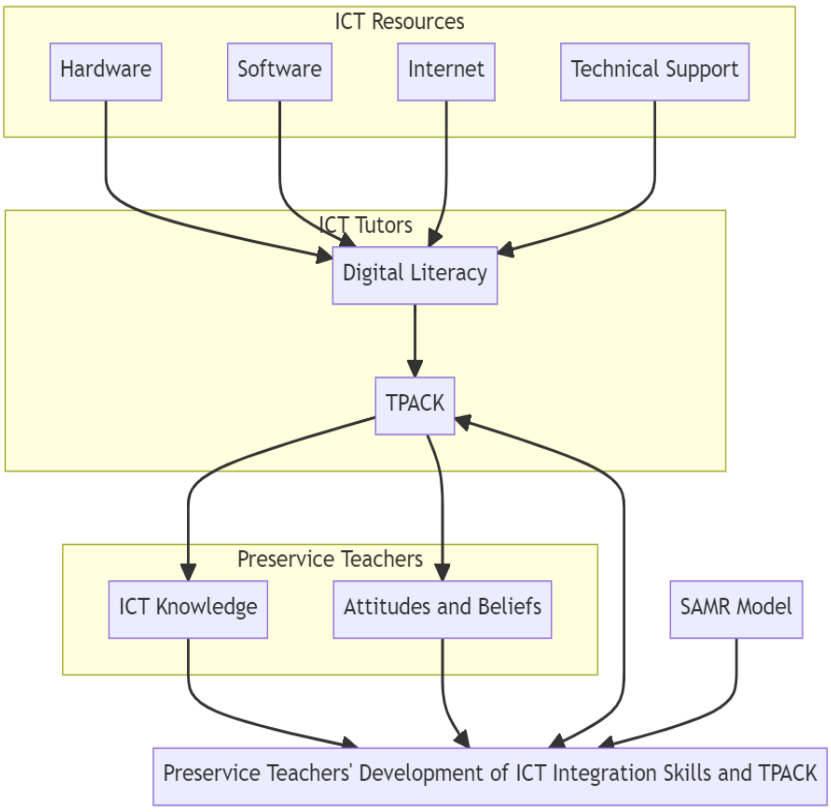

Figure 4: Conceptual Framework

At the center of the framework are the ICT tutors in teacher training colleges, whose digital literacy levels and technological pedagogical content knowledge (TPACK) are key variables of interest. Tutor TPACK encompasses the tutors' understanding of how to effectively integrate technology into pedagogical content delivery (Mishra & Koehler, 2006).

Tutors' digital literacy refers to their abilities to use technology appropriately for instructional purposes, including skills like using digital tools to enhance teaching, modeling effective technology integration, evaluating digital content, and managing classroom technology use (Falloon, 2020).

These tutor characteristics both shape and are shaped by the ICT resources and infrastructure available for teacher training, represented by the themes above the central component of the conceptual framework. Availability of hardware, software, internet connectivity, and technical support affect the development of tutors' digital skills and TPACK (Tondeur et al., 2017).

Below the central factor (ICT tutors in teacher training colleges) of the framework are the pre-service teachers in training, whose baseline ICT knowledge, skills, attitudes and beliefs affect their ability to learn technology integration practices from digitally literate tutors. Their development of TPACK and ICT integration capacities during teacher training is the key outcome variable.

The bi-directional arrows represent this reciprocal relationship - tutors influence pre-service teachers' learning, while pre-service teachers' responses provide feedback to shape tutors' instructional approaches.

This framework draws on subsets of the TPACK framework (Mishra & Koehler, 2006) and the SAMR model of technology integration (Puentedura, 2006) to analyze how tutors' digital literacy is enacted through their teaching practices and influences pre-service teachers' capacities.

The study methodology involves interviews with tutors and pre-service teachers to provide qualitative insights into these elements and their inter-relationships within the conceptual framework.

Factors that Affect ICT use in Education

It may be difficult to successfully incorporate or include ICT into education because it is a complex process. In fact, a number of problems

prevent the introduction of ICT into the classroom. Some of the causes are community-based (external), some are school-based (internal), and some are personal issues for the teachers. Researchers categorize these components as both manipulative and non-manipulative. Non-manipulative characteristics include things like age, teaching experience, and computer proficiency. Affective, phobic, interest-based, and computer-using skill-related manipulative factors include government policies, the accessibility of ICT resources, and the availability of outside assistance.

Teachers' Attitude towards the use of ICT

The tendency of a person to react favorably or adversely to a specific thing, an individual, or a situation is known as their attitude. Ajzen (2014). ICT incorporation into the classroom situation depends a much on the encouragement and attitudes of the educators. Teachers' attitudes and opinions regarding technology are some of the elements that have an impact how well ICT is incorporated into instruction (Hew & Brush, 2007; Keengwa & Onchwari, 2008). The usage of technology in the classroom evironment and the recognition of technology's value among instructors are both influenced by attitudes about ICT. Numerous theorists (e.g., van Braak, 2001b; Vannata & Fordham, 2004) have argued that teachers' attitudes on using technology in the classroom have a significant influence on teaching and learning.

One of the most crucial ideas for making a decision is attitude because it plays a significant role in social judgments and behaviors (Venkatesh & Morris, 2000). In a report by BECTA (2004) while Rhoda and Gerald (2000) discovered that attitudes that are constructive toward ICT usage are widely acknowledged as an essential requirement for effective and efficient ICT use

in teaching, it was previously stated that negative attitudes were a roadblock to the adoption of ICT in the classroom.

Teacher Competence and Confidence

The capacity to control a wide variety of various technologies for a range of purposes is known as ICT proficiency. According to Prestride, ICT-assisted teaching is the most suitable ability for an educator to possess, yet many do not have it (2012). It is probable that this is the result of the fact that their training hardly ever included it. According to Bordbar (2010) using ICT in teaching is significantly predicted by teachers' computer proficiency. Most educators who indicated an apprehension or neutrality about the use of technology in education procedures lacked the knowledge and skills required to "make informed decisions" (Al-Oteawi, 2002). According to a study by Peralta and Costa (2007), teachers who have greater familiarity with computers are more assured of their capacity to use them as effectively as possible. According to Jones (2005), a teacher's competence and confidence are closely associated. The level of confidence that teachers have in their abilities to use computers and its accessories in the classroom is similarly related to how competent they believe their students to be.

Their level of comfortability with utilizing the technology is a crucial aspect in determining how engaged instructors are with ICT. Instructors who are uncomfortable or unsure about using computers and other ICT facilities in the classroom will try to avoid them completely (Dawes, 2000). The majority of the study, according to BECTA (2004), this is a substantial barrier to instructors using ICT in the classroom, according to some evidence. Several research have looked into the reasons why teachers lack confidence in using

technology. Beggs (2000) claimed that lack of confidence in instructors was a result of their "fear of failure." Contrarily, Balanskat, Blamire, and Kafela (2006) found that because of their little ICT understanding, instructors lack the confidence to use ICT in the classroom situation, which makes them uncomfortable. Using ICT in a class of students who might already be ICT inclined than they are causes anxiety in many teachers who don't consider themselves to be ICT experts.

The ability of instructors to incorporate technology into their lesson plans poses another difficulty that is directly tied to teacher confidence (BECTA, 2004). Most teachers without the skills and understanding required to utilize computers, and many were uninterested in the changes and additional learning that would emerge from integrating computers into their teaching methods (Ghavifekr, Kunjappan, Ramasamy & Anthony, 2016). Recent investigations have shown that this barrier differs between countries. Studies show that teachers' lack of technological proficiency is one of the biggest roadblocks to their use of ICT in underdeveloped countries (Bingimlas, 2019). One problem, for instance, is the lack of technological competence among teachers in Syria. (Albirini, as quoted in Bingimlas, 2019). Similar to Saudi Arabia, where a lack of ICT knowledge is a major impediment to incorporating technology into science education (Al Mulhim, 2014). According to Omboto, Kanga, and Njageh (2022), like most developing countries, Kenya's use of ICT is still limited to teaching computer literacy. The research reveals that educators who do not use computers in the classroom assert that a barrier keeping them from doing so is a "lack of ICT abilities." The lack of teachers who expert may therefore be one of the main challenges

to the integration of technologies into education. It might also be a factor in people's resistance to change.

Access to ICT facilities

Access to ICT infrastructure and resources in schools is a necessary condition to the integration of ICT in education. Inaccessibility or unavailability of ICT, a school level barrier, has been identified as a key obstacle that impedes teachers from using ICT in teaching. Shortage of resources includes different factors, such as lack of access to hardware and software, poor quality hardware and inappropriate software. Effective adoption and integration of ICT into teaching in schools depends mainly on the availability and accessibility of ICT resources such as hardware, software, etc. Obviously, if teachers cannot access ICT resources, then they will not use them. Therefore, access to computers, updated software and hardware are key elements to successful adoption and integration of technology.

According to a number of studies, a further substantial obstacle that makes teachers' want to avoid incorporating emerging technology into classroom environment is a lack of access to facilities, especially home access (Bingimlas, 2019; Tondeur, Valcke & Van-Braak, 2008; Yildrim, 2007). It's not always the case that ICT resources are unavailable because the school lacks the requisite hardware, software, or other ICT resources. It might be the result of various problems, such as teacher not having personal access, a bad system for organizing the resources, poor technology, bad software, or flawed software. Infrastructure accessible to teachers, inadequate or insufficient supply, and ICT-related teaching time are considered factors in determining the level of access to ICT at a school.

Adequacy of ICT infrastructure

Hardware, software, constrained internet access, inadequate bandwidth, and erratic electricity are examples of inadequate technical infrastructure (Behrane, 2012). Few teachers, according to Hennessy et al. (2010), noted infrastructure issues including a lack of computers in good working order, unstable electricity, or limited internet connectivity, though these issues differ by nation.

Teaching Experience and Professional Development

Despite claims in some research that the utilisation of technology in the classroom by instructors was not greatly influenced by their past classroom experience, the majority of studies revealed that prior classroom experience had a significant impact (Buabeng-Andoh, 2012). According to Gilakjani (2013), effective computer use is correlated with the freedom of the teacher to adjust the curriculum in order to satisfy the needs of the pupils as they are observed by the teacher and technological comfort levels. Also, it is said that more seasoned educators are less prepared to incorporate ICT into their instruction (Mafang'ha, 2016). This could be as a result of new teachers having more experience with technology. Also, a meta-analysis and assessment of 81 research articles revealed that expertise in the classroom does not erase fears related to computers and that many seasoned teachers exhibit some trepidation, uneasiness, and/or little computer-related anxiety (Rosenet et al. cited in Mafang'ha, 2016).

The successful incorporation of computers into classroom learning depends on teachers' professional development. Knowledge of their level of experience, ICT-related educational initiatives help instructors learn how to

use computers more effectively, change their attitudes about them, and organize their use of technology and the importance of new tools in the classroom (Buabeng-Andoh, 2012). Teachers have a higher likelihood of incorporate technology into their courses when given the chance to use it in practice, learn, share, and collaborate with peers. The literature most commonly mentions inadequacy of efficient training as a hindrance. There's a demand to provide training in order to obtain high levels of ICT proficiency among teachers, and perhaps not unexpectedly, there is a lot of literary evidence to back this up to imply that in order for instructors to effectively integrate ICT into their teaching, effective training is essential.

Technical support

Without both good technical support in the classroom and whole-school resources, teachers cannot be expected to overcome the barriers preventing them from using. Lack of technical assistance has been identified as a major challenge to the integration of ICT in education. These technical barriers include waiting for websites to open, failing to connect to the internet, printers not printing, malfunctioning computers, and teachers having to work on old computers. Technical barriers impede the smooth delivery of the lesson or the natural flow of the classroom activity (Sicilia, 2005). ICT support in schools helps teachers to use ICT in teaching without losing time through having to fix software and hardware problems. BECTA (2004) reports that clearly, there is a close relationship between two technical barriers; the more frequently that actual breakdowns occur (perhaps due to the lack of preventative technical maintenance), the more likely teachers are to avoid using the technology in the first place. The report proceeds, it was found that

teachers who tried to carry out a task on a computer, but who were unsuccessful due to technical problems, would then avoid using the computer for several days. This, then, further highlights the need for adequate technical support in schools.

Challenges in the Integration of ICT in Education

The relevance of ICT in education has been acknowledged. Integration of ICT in education ensures that instructors and learners work effectively in an information age (Salehi and Salehi, 2012). Nevertheless, the use of ICT for education has some barriers which need to be brought on desk for educational actors to make deliberate efforts to handle them effectively. According to Yunus, Salehi and Kashefian-Naeeini (2011), the use of ICT is quite complicated and needs skills from both teachers and instructors. For instance, access to information can pose a real danger of information overload if instructors and students do not have the requisite skills in filtering relevant information, or are unable to establish a coherent organizing principle.

Challenges were described as barriers by Scheopp (2005), who divided them into inner and extrinsic impediments. He views obstacles as situations that make achieving a goal challenging. Al Mulhim (2014) distinguished between extrinsic and intrinsic barriers, describing the former as those connected to the lecturers, administrators, and students while the latter are those connected to the institution in question. He further clarified that access, time, support, resources, and training are examples of first-order ICT hurdles in distant learning, while second-order intrinsic barriers include attitudes, beliefs, behaviors, and resistance.

The hurdles can also be divided into teacher-level hurdles and school-level hurdles, according to other educational experts. The impediments at the teacher level comprise inadequate confidence, time constraints, and opposition to change, while those at the school level include inadequate technical problem-solving instruction and restricted access to ICT facilities. According to Yunus et al. (2011), some of the obvious difficulties facing the use of ICT for remote education include inadequate supply of ICT facilities, such as computers and copies of applications, inadequate ICT knowledge and abilities, difficulties including ICT into instruction, and a lack of teacher time.

In their 2012 study, Salehi and Salehi focused particularly on the difficulties that instructors have when using ICT in the classroom. This was accomplished by examining teachers' familiarity with ICT and the obstacles standing in their way. The outcome showed that although though the majority of the instructors used ICT often, many of them acknowledged that they knew little about how to use it effectively to offer education. Several people verified their belief that their fellow teachers also had very little expertise on how to use ICT to deliver instruction. The information clearly shows that most teachers struggle to use ICT effectively to ensure effective knowledge sharing, and this has an impact on the standard of instruction teachers provide to their students. Ifinedo (2012) highlighted Africa as having a severely inadequate ICT infrastructure and services for enhancing education. For instance, even in the urban centers of many African countries, the number of telephone lines required for distance learning is insufficient. Ghana still has an extremely low internet penetration rate, and using the internet costs absurd amounts of money, making education exceedingly expensive.

Studies on ICT Integration in Education

In 2009, Ayebi-Arthur et al undertook a study on internet usage in second cycle schools in the Cape Coast Metropolis of Ghana's Central Region, 100 learners and 25 instructors from three senior high schools made up the sample. The stratified random sampling technique was used to select the three schools to represent the school types (mixed, girls only, and boys only schools) with one school in each stratum. The findings show that majority of the teachers had access to the internet. Once more, 70% of the students had internet access. The results indicated that although the majority of teachers had access to the internet, they barely ever used it. The ones who did use it frequently did so for personal growth. Also, 28% frequently used it to present lessons and communicate with other teachers.

In order to better understand potential preschool teachers' attitudes regarding computers and the status of their computer usage, Kutluca and Gokalp (2011) conducted research on Turkey. It was found that the aspiring early childhood educators use computers more at home and in internet cafes, and that their proficiency levels in utilizing computer programs are intermediate or higher. The scores of attitudes toward computers were found to differ significantly depending on the variables of taking computer courses, owning a computer, level of computer program usage, frequency of computer use, computer experience, and class. Contrarily, there was no discernible difference based on gender (Kutluca & Gokalp, 2011).

The study by Amenyedzi, Lartey, and Dzomeku (2011) on the use of computers and the internet as supplemental sources of educational material used a case study of second cycle schools in the Ghanaian metropolis of Tema.

From the three schools, a total of 120 students and 60 tutors were chosen. The study found that approximately 24% of teachers use computers to gather academic data from their students; approximately 11% use computers to type test questions for their students; and approximately 13% use computers as Materials for Teaching and Learning (TLMs), real-world examples, or for drill and practice. Approximately 16 percent of instructors use ICT for pleasure, compared to less than 35 percent who use it for study.

Agyei and Voogt (2011) did a study on ICT use in mathematics teaching: Implications for pre-service teachers' professional development in Ghana. Teachers in training were questioned about the availability of specific IT resources. A sum of 180 educators comprised of 60 teachers who were in the service and 120 teacher trainees took part in the study. A minimum of one computer laboratory was reported to be present in the schools by 98% of the teachers in the service from the 16 SHS. The Parents-Teachers Association (PTA), according to several instructors, was instrumental in getting computers installed in their schools. To find out how accessible these facilities were, more inquiries were made. Low numbers were found, which suggests that computer facilities are not widely accessible. Internet connectivity was available in 46% of locations, with access to computers in offices and computer labs at 21%, staff common areas at 13%, and libraries at 46%. The teachers said that it was challenging to use computer lab resources for personal utilisation or other purposes because they were primarily used for information technology (IT) sessions, which were required of all students.

At Ghana's second-cycle schools, Buabeng-Andoh (2012) investigated the knowledge, attitudes, and behaviors of educators on the use of ICT for instruction and learning. 231 professors who were chosen from public second-cycle institutions participated in the study. The results revealed that most teachers believed ICT could give them options to access educational resources from the internet to enhance course content and also to improve teaching and learning procedures. ICT can improve student collaboration (90.4%) and increase student engagement and feedback to teachers (90.9%), according to the majority of teachers. On the other hand, the lowest perception was that ICT can help students' language writing skills (76.2%). The use of Technology in the teaching and learning environment was generally well received by teachers.

Sim and Lau (2014) conducted research on Malaysian teachers' attitudes on using ICT to teach science and math. Teachers were asked on their feelings regarding the usage of ICT in the classroom. The study employed a survey approach for gathering basic information about how ICT is being used in secondary school science and math instruction and to look into the requirements of teachers for ICT assistance and training. The study's primary subject matter was the science and math instructors at the 21 public secondary schools in Kuching, Sarawak. According to the findings, the respondents largely went with the fact that using ICT helped them become more efficient teachers (75%), more organized workers (80%), rely less on textbooks (37%), and be better able to satisfy the various demands of pupils (48%). While the majority of respondents—39.2 percent—agreed that using ICT will require lengthier instructional blocks, 43.4% of them refused to agree that doing so

will end up in a loss of too much control over the learning process. In general, respondents concurred that using the internet and technology had made their lesson plans richer (55%), and that it has altered the way they set up classroom activities (56%).

In order to analyze the ICT condition in second cycle schools in the Lower Manya Krobo District, Adebi-Caesar (2012) carried out descriptive research. The study included a sample of 154 teachers in total. According to the study, only 2.1 percent of teachers in all of the schools recounted having enough computers, and 97.9 percent said they lacked the necessary resources. Once more, when asked whether they used computers at work, 90.7 percent of instructors indicated that they never did, and only 9.3 percent said they did.

Similar research was undertaken by Yusuf, Maina, and Dare (2013) in Kaduna State, Nigeria, on the availability, management, and use of ICT infrastructure in second cycle schools for the teaching of the English language. The study employed a descriptive survey research design for the investigation. Twenty randomly chosen second cycle schools from the city of Kaduna were surveyed to obtain data. The study's conclusions showed that secondary schools in Kaduna lack adequate ICT resources because the majority of the schools visited had a paucity of these resources. This shows that there aren't many ICT resources in schools. Instructors lack enough computer resources, interactive whiteboards, teaching software, and multimedia equipment.

The usage of ICT by learners and instructors in second cycle schools in the Sekondi-Takoradi Metropolis in the western region of Ghana was the subject of a 2010 study by Afful-Dadzie. To take part in the study, teachers were chosen from each of the public second cycle schools in the Sekondi-

Takoradi Metropolis. The teachers concurred that integrating ICT creates ambiguity, which is one of the challenges to its adoption in the second cycle schools in the catchment region. They lacked the knowledge necessary to integrate ICT into the conventional teaching method. The survey also showed that teachers were unwilling to abandon their conventional methods of instruction in favour of using ICT, even though they acknowledged that habit is a barrier to fully examining IT. The study also showed that a weak support system stands in the way of ICT integration. The incorporation of ICT in the instructing and learning process was also thought to be hampered by insufficient follow-up support.

In a similar vein, Olufemi, Olukayode, and Oladele (2013) looked into the difficulties ICT faced in second cycle schools in Nigeria's Ondo state. It aimed to learn how much access secondary school teachers and students had to ICT. The study looked into how much ICT was used in secondary schools for educational purposes as well as how teachers and students felt about this use. 450 randomly chosen teachers from 296 second cycle schools across the 18 local government areas of Ondo State filled out questionnaires to provide information. The results indicated that most of responders largely concurred that factors impeding the effective use of ICT facilities for educational purposes include teachers' lack of IT expertise, lack of ICT confidence and insufficient expertise of how to use ICT tools, lack of facilities, lack of understanding of how to assess ICT use and its contribution to teaching and learning, and a lack of familiarity with suitable software to use for a given task.

The Digital Literacy Skills levels of ICT Tutors

Several studies have evaluated ICT teachers' digital literacy. In a study by Quaicoe and Pata (2020) to investigate the type of digital gap in Ghana's primary and secondary schools from the standpoint of the educators usage of digital tools in the classroom, the authors calculated the averages of all the instructors' replies in randomly selected schools to determine the Teachers Digital Literacy (TDL) and TDA status of the schools. At least five teachers from each school took part in the survey, and outcome was based on their talents and school activities. In every single one of the schools, overall, teachers had more than average level of digital literacy across all four TDL domains (Teacher Digital Knowledge (TDkn), Teacher Digital Skills (TDsk), Teacher Digital Attitude (TDAt), and Teacher Digital Application (TDAp). The component of technology-facilitated learning (TDL) with the highest estimated score was the teacher digital attitude (TDAt). It was discovered that teachers' digital activities (TDA) in schools were carried out in a very infrequent manner throughout the districts that were investigated. The TDL of the instructors at the level of the school was as follows: TDkn (M = 3.57, SD =.421), TDsk (M = 3.51, SD =.446), TDAt (M = 4.00, SD =.422), and TDAp (M = 3.38, SD =.547). The schools don't make everyday use of the information and communications technology tools and digital resources. Fisher's exact test was used to contrast the TDAs of the different districts so as to identify whether the location of the school and the digital disparities are related. This was done based on the main purpose of this research, which was to determine the factors that are contributing to the Digital Divide in schools. There was a difference that could be considered statistically significant (p

=.019) between the districts in terms of the frequency of teachers' participation in digital activities (TDA). The vast majority of schools in a number of school districts displayed what is known as a passive approach in teacher digital activities (TDA), which means that technology use was not a typical activity for teachers in the schools. It was discovered that TDA engagements occurred nearly never (48.9%), at least once a month (46.7%), or at least once a week (4.4%) out of the 45 schools. There was not a single school where teachers participated in TDA on a daily basis. Their studies complemented the previous studies by Quaicoe and Pata (2020).

Even though there seems to be limited number of articles evaluating the digital literacy skills levels, the apparent shortfall may be due to the inconsistencies employed in defining what digital literacy is. In one systematic review, the topic of digital literacy was found to be referenced explicitly in five out of the forty-three research studies. One of those articles defined digital literacy as the human capabilities necessary to learn, work, and live effectively in today's increasingly digital environment. Adding to these five articles, were two other papers that used the same term as 'critical digital literacy.' They described it as the accessibility and assessment level of an individual's or society's contact with digital technology in order to use and/or generate information. 'Paraphrase' is a term that is used in connection with literacy. In addition to these, the results sections of forty-three papers that mentioned other literacies revealed about twenty-four other categories. Thus, there doesn't seem to be a clear definition for digital literacy skills.

In India, Kumari and D'Souza (2016) looked into the utilisation of information and communication technology by instructors during the teaching-learning procedure as well as their level of digital literacy. The study compared teacher digital literacy and ICT utilisation in teaching and learning and discovered a relationship among the two variables. The results revealed that teachers' levels of digital literacy and their use of ICT overall are both average. However, the scientists found no discernible correlation between instructors' usage of ICT and digital literacy. Nonetheless, there is a favorable association between digital literacy and teachers' usage of ICT. (Kumari & D'Souza, 2016).

In a similar vein, Hafifah and Sulistyo (2020) investigated ICT integration and teachers' ICT literacy in a higher education environment in Indonesia. They found that more than 60% of teachers' Teachers' illiteracy levels are more than average and that they mostly use ICT in their everyday classroom practices (although they still face some challenges concerning internet facility and lack of ICT development). The study also shows a strong degree of correlation between teachers' degrees of ICT literacy and their training backgrounds, frequency of internet use, and use of ICTs in language instruction. Teachers will become more literate as they use ICTs more frequently. (Hafifah & Sulistyo, 2020).

More recently, Özcan (2022) investigated future teachers' levels of digital literacy and attitudes about mobile learning. The results demonstrate a significant and favorable correlation between attitudes toward mobile learning and digital literacy levels among potential instructors. The potential teachers scored well on the subdimensions of attitude, technique, cognitive ability, and

emotional-social intelligence, but only somewhat on the subdimensions of information, information sharing, content designing, security, and problem-solving intelligence. Also, 35% of prospective instructors' opinions toward mobile learning can be attributed to their level of digital literacy. However, there are considerable differences between potential teachers' degrees of digital literacy based on their gender, grade level, and department. (Özcan, 2022).

The Relevance of Tutors' Digital Literacy Skills on Teacher Trainees ICT Integration

According to recent research, the successful increase of teachers' digital literacy in schools has fundamentally altered the traditional teaching and learning culture (Genlott, Gronlund, & Viberg, 2019). Students in today's generation spend an average of more hours online than students in any preceding generation did. In contrast to the publishing industry, the internet is completely uncontrolled. When it comes to addressing the numerous issues that result from this (cyberbullying, viewing contents that are inappropriate, unachievable body-standards or expectations, social media addiction or fixation, data breaches, or even accruing debt from using virtual currency), a teacher may be well-intentioned and thoughtful, but if they lack a solid foundation of digital literacy abilities, they will struggle, they will not have much of an idea about what their students are seeing or consuming online. If you are just aware of the symptoms and not the underlying cause, your capacity to assist will be severely limited.

When it comes to your sources, being able to differentiate between truth and fiction is another essential component of having digital literacy. A teacher who is not digitally literate runs the risk of using inaccurate information when studying the subject matter of a class and may even put their faith in a source that is not reputable when it comes to specific demographics of their student body. In addition to having one of the most successful educational systems in the world, Finland has made significant investments in the training of its citizens to be proficient in digital technology. The relationship between the two is quite close.

On the whole, there are things that are true (inductively), and there is also disinformation that may appear true at the moment. However, if you have a tendency toward philosophical thought, you can argue that there is no such thing as a fact, and that everything is both subjective and inductive. If we want to become the most effective educators we can be, we need to make sure that the information we teach our pupils is rock-solid and is supported by facts wherever feasible. Literacy in digital media is a significant component of this (Allan, 2021).

In fact, the inclusion of ICT at all levels of education depends on tutors' digital literacy. Murithi and Yoo's (2021) investigation examining educator's ability to include technology into their lesson delivery was based on both the Technology Acceptance Model and constructivist learning theory. The majority of the educators claimed to have only had rudimentary instruction in computer literacy. Hence, although believing that using computers was essential, teachers had trouble adding technology into their lesson deliveries. With the help of Welch tests and Games-Howell post hoc

comparisons, inferential statistics were used to examine the impact of age and gender on teacher capacity. Instructors in their 40s rated their own usefulness as being higher than those in their 30s (Murithi & Yoo, 2021).

Factors that Influence Tutors' Digital Literacy Skills Level

According to research conducted by Kamaruddin et al. (2017), people who regard ICT to be useful in fostering learning are more likely to adopt it, and that deployment of ICT systems successful depends on the preparation of teachers and even on professional ICT training. The ways in which educators approach the utilisation of ICT devices also provide insight into their level of preparedness. If they have the necessary skills and a good attitude toward using technology, teachers should be able to effectively implement an ICT system in the classroom.

According to Aziz and Rahman's (2017) research on indigenous elementary schools, teachers often lack resources like LCD projectors, computer labs, and even the time to set up a session in which they will employ these technologies. Lack of access to ICT in the classrooms and inadequate technical support for ICT-integrated teaching have contributed to these issues or responses from their respondents. School leaders are often blamed for this issue. School administrators are the ones in charge of managing the time restrictions of ICT-integrated programs. They need to be ready to develop an information and communication technology policy that addresses the needs of educators in classrooms. Teachers' ability to use and teach using ICT in the classroom will be bolstered by the policy's requirements for increased ICT implementation and integration.

In addition, some educators have shown a lack of respect for students' information and communications technology competence. The people who take part in Kalra's studies, however, are separated into two groups: first, novice teachers, and second, veteran educators. Therefore, there was variation in responses across categories, which could affect how educators responded. According to Kalra's (2018) findings, veteran educators have consistently reported not using digital resources in the classroom. These educators likewise failed to appreciate the value of having ICT competency skills in the classroom. With that said, there are some subtle distinctions between the ways in which seasoned educators and newcomers to the profession use computers. Teachers with more expertise used the computer fewer times each month than those with less. However, Kalra's research was conducted in Thailand. Because this study will be conducted in a different setting than Kalra's, its findings may differ.

In addition to instructors, administrators play a crucial role in providing them with the greatest possible support on ICT tools. The study by Cheok et al. (2017) found that administrators play a pivotal role in ensuring that teachers have adequate access to appropriate ICT tools and technologies. They will have to make sure that qualified teachers are available to help students. The research also notes that administrators, who should be called management in a school setting, should provide instructors with enough of dependable and more effective support.

Ghavifekr, Kunjappan, Ramasamy, and Anthony conducted a study in 2016 to look at teachers' perceptions of the challenges related to implementing ICT tools in the classroom. Overall, it was found that the following significant

issues and difficulties prohibited instructors from using ICT tools effectively: limited network connection and accessibility, limited technical support, insufficient training, time restraints, and a lack of teacher competency. Also, the outcomes of an independent t-test reveal that male instructors (M = 2.08, SD = 0.997) use ICT tools in the classroom at a higher rate than female teachers (M = 2.04, SD = 0.992).

Similarly, Kihoza, Zlotnikova, Bada and Kalegele (2016) TPACK and the SAMR (Substitute, Augmentation, Modification, and Redefinition) models were used to evaluate the prospects for and difficulties with integrating ICTs in the classroom. Tutors and teacher candidates from teacher training colleges participated in the case study. The majority of responders, according to the results, had low pedagogical ICT competencies. Nonetheless, tutors displayed a high degree of understanding across all TPACK and SAMR elements evaluated. Moreover, teacher candidates demonstrated inadequate abilities and inadequate assistance in using the most basic ICTs (hardware, software, and associated peripherals). Most of the problems stemmed from a lack of infrastructure, a refusal to change, and a lack of knowledge about educational ICT applications (Kihoza, et al., 2016).

Moreover, Ghavifekr and Rosdy (2015) analysed ICT integration's effectiveness in supporting instructing and learning in the schools, according to teachers. A random sample of 101 instructors from 10 public second cycle schools received a survey questionnaire. The results demonstrated that ICT integration is very advantageous to instructors and students. As a result of the findings, teachers who are well-prepared with ICT tools and resources are one of the essential elements for technology-based teaching and learning to

succeed. Programs for teacher professional development have also been shown to be crucial for improving students' academic performance. (Ghavifekr & Rosdy, 2015).

Edumadze (2015) also assessed the degree of ICT integration in Ghana's colleges of education. The study looked at how ICT tutors felt about the intention to strengthen the ICT curriculum in COEs based on the material produced by UNESCO on ICT integration in education and teachers' use of ICT. It also looked at how they believed their students could successfully instruct ICT classes at the foundational levels in Ghana's educational system. The research's findings showed that instructors believed Anderson's ICT in Education model's ICT integration for teaching and learning was still in its early stages. They also believed that an optional ICT discipline should be added to prepare educators who will focus on teaching ICT in our elementary and middle school level (Edumadze, 2015).

Finally, Saimi and Yamat (2021) assessed the factors impacting the competency abilities among selected teachers. In order to provide definitive answers to the research questions, this study employed a quantitative research strategy, and relied on the responses of 80 people who lived in the Mukah neighbourhood. This study's results shed light on the ways in which instructors' attitudes and the availability and technical support in schools influenced students' ICT competency levels.

Chapter Summary

The chapter provided background information about the various subtopics taken from the unit of analysis where literature was reviewed from both local and international journals and some thesis on. The subtopics

reviewed under this chapter included: (a) the Digital Literacy Skills levels of ICT Tutors in the Colleges of Education; (b) the academic impact of tutors' digital literacy skills on ICT integration in Basic Schools in Ghana and (c) factors that influence tutors' digital literacy skills level in the teaching and learning of ICT in Ghana.

The primary data seems to support the various works of literatures that there is a lack of ICT facilities are in most of the schools in Ghana. This leads us to chapter three, where the research approach is covered.

CHAPTER THREE

RESEARCH METHODS

Overview

The purpose of the study was to look into how tutors at OLA College of education in the Central Region use ICT and possess digital literacy skills. The research's methodology is detailed in this chapter. The research design, study area, population, sample, sampling method, research equipment, and data collecting, processing, and analysis methodologies are all specifically covered in this chapter. In this chapter, ethical issues are also covered.

Research Design

This study was guided by the qualitative research approach, specifically using a descriptive cross-sectional design. This type of study design utilizes data from either an entire population or a subset of it to answer research questions of interest. Creswell (2008) posit that cross-sectional studies make use of data gathered from research subjects at a specific point in time or during a very short period of time. The existing nature and conditions are described through a descriptive cross-sectional study approach that exists (Cohen, Manion & Morrison, 2007). The distinctive characteristics of this design are that it can be completed quickly and cheaply, that it examines the relationship between various factors at one moment in time, and that it also demonstrates how variables interact. It does, however, have significant drawbacks. Issues include recollection bias, the observer-expectancy effect, and its inability to capture social dynamics or change (Cohen, et al., 2007). Also, descriptive cross-sectional studies establish only associations and not causality (Sedgwick, 2014). Nevertheless, the design is appropriate to

investigate the situation of digital literacy and ICT inclusion in education. With this design, data was collected from the respondents only once and in a short amount of time. Thus, the respondents were not followed over time.

Study Area

The study was carried out in Ghana's Central region of Ghana. The Central region is frequently referred to as Ghana's educational stronghold. Two public institutions of higher learning (University of Cape Coast and University of Education, Winneba) are located in the area, there is also one technical university (Cape Coast Technical University), three colleges of education (OLA College of Education, Komenda College of Education, and Fosu College of Education), and numerous respectable senior high schools. Given that the study focuses on ICT instructors in colleges of education, much emphasis will be given to the OLA college of Education.

Figure 5: Map of the Central Region showing OLA College of Education
Source: Department of Geography and Regional Planning, University of Cape Coast (2023)

Population

The target group which the researcher is interested in gaining information and drawing conclusions is known as the population. Polit and Hungler (1996) (as cited in Amedahe 2002) have explained that population is the entire aggregation of cases that meet a designated set of criteria. It describes all components (people, things, or substances) that satisfy particular requirements to be included in a study (Burns & Grove, 2011). In other terms, a study population is typically a sizable group of people or things that are the core subject of a scientific inquiry and from which a sample is drawn. The third-year students and tutors at Cape Coast's OLA College of Education made up the study's population. From the administration staff of the OLA College of Education, the tutors were 50 and the third-year students were 350 in number. Third year teacher trainees were selected because the first years had not yet been introduced to the study of ICT and the second years are also on their out programme.

Sample and Sampling Procedures

The study utilised purposive and convenience sampling procedures to select respondents for the study. Using a small sample of respondents who will provide the most crucial data for the study is known as purposeful sampling. Moreover, purposeful sampling is done depending on the researcher's professional judgment or some resources they have located (Teddlie & Yu, 2016). As a result, selecting and identifying cases with a wealth of information on the topic of interest using purposeful sampling is common in qualitative research (Palinkas, Horwitz, Green, Wisdom, Duan, & Hoagwood, 2015).

Therefore, third year teacher trainees were purposively selected since they can provide rich information to answer the research questions.

Convenience sampling also encompasses the selection of respondents based on their accessibility to and interest in taking part in the study. Based on this, all 5 ICT tutors including the head of ICT unit in the OLA College of Education were targeted. On the side of the students, 10 of them were targeted. This brought the sample size to 15.

The tutors were contacted in their offices while the teacher trainees, in their classes (after class hours). Only tutors and teacher trainees who were available and willing to participate were included. In other words, the selection of the tutors and teacher trainees was based on their convenience. As shown in Table 1, the only persons who met the criteria set by the researcher were selected.

Table 1: Criteria for sampling of participants

Interviewee	Criteria for Selecting the Samples
ICT Tutors	There are five tutors at the ICT department of OLA College of Education. The five ICT tutors were purposively selected because they are familiar with teaching and learning of ICT in the schools. They also serve as technical advisers so far as the digital literacy is concerned.
Head of Unit (ICT)	Head of Department (HOD) of the ICT department was also selected to take part in the study. As a subject for triangulations, these HODs provides the depths and information on the the schools since they play supervisory role over the tutor.
Third year Teacher Trainees	Ten third year teacher trainees were selected. The researcher contacted the unit head of the OLA College of Education for 10 students to be interviewed. The unit head then selected available and willing students to take part in the interview. Only third years were selected because the first years have not yet been introduced to the study of ICT and the second years are also on their out programme.

Validity and Reliability

The researcher's supervisor from the Department of Mathematics and ICT Education at the University of Cape Coast, who has in-depth experience on the subject of ICT integration in education, subjected the instrument to a face and content validity evaluation. This was to ensure that the interview guide has relevant questions which will help to answer the research questions and also ensure that there are no ambiguities or lack of clarity in the questions. The pre-testing exercise was one of the measures employed to increase the accuracy and dependability of the research tools.

Pre-test of Research Instrument

The instrument was pretested at Holy Child College of Education in the Western Region prior to the actual data collection. Because Holy Child College of Education contains all the variables present in OLA College of Education, it was chosen for the pre-test. The pre-testing was to enable the researcher to correct likely mistakes in the instruments and to work on the likely challenges to be faced during actual data collection. The pretest at the Holy Child College of Education included two teacher trainees and one tutor.

Trustworthiness of Data

The data collected should be trustworthy and free from prejudices which often come with interviews. The researcher took short notes in addition to recorded information. Again, respondents were given the chance to confirm their statements after the interview. This was to ensure that the recorded audio is reflected in what has been transcribed for presentation. Moreover, the transcripts were verified in line with interview questions to ensure that the researcher does not affect the validity of the data gathered.

Data Collection Instrument

Unstructured interview guide was used as instrument for gathering data from the respondents. The use of interview guides as instruments for gathering data is as a result of the in-depth knowledge of the participants. The use of interview guides, therefore, allowed the researcher to gather more data from the available and willing respondents through probing. A total of two (2) interview guides were used for the study. This comprised interview guides for the Head of ICT Department (HOD) and the ICT tutors, and interview guide for third-year students. All the research instruments employed open-ended questions. The aim is to enable the respondents to freely express themselves by giving as much information as possible. This allowed the participants to give additional information about their academic background, as well as their digital literacy level.

Data Collection Procedures

Two weeks was devoted for data gathering. The data collection was conducted with the help of two (2) individuals who are skilled when it comes to data collection. Before data was collected, A letter of introduction was acquired from the University of Cape Coast Department of Mathematics and ICT Education to the OLA College of Education. The letter was sent to the authorities to seek permission and approval to undertake the study. During the two weeks of data collection, any ICT tutor who was prepared to take part in the study and was available was included. The participants were encouraged to express what they believe about the issues being presented during the interview. The field assistants were available during the time of data collection to help speed up the process.

Data Processing and Analysis

The data gathered was thematically filtered by identifying the subject in each research question, coded, and input into MS Word after data collection. The analysis was completed in accordance to the study's questions. Later, the transcripts were sent to the interviewees for their verification and consent before the researcher writes the dissertation. The second level of analysis begun once the participants sent back the validated copy of the transcript. Themes were developed to form the basis for the analysis. Statements of the respondents were presented as quotes to substantiate responses given to questions posed during the interview process.

Chapter Summary

Research methodology is an integral aspect of every study because it forms the pivot on which the study revolves. The chapter, therefore, presented the major stages the study was carried through to arrive at the findings. Data were collected, then thematically filtered, coded, and entered into MS Word. The analysis was conducted in line with the research questions

CHAPTER FOUR

RESULTS AND DISCUSSION

Overview

This study aimed to investigate the effects of ICT tutors' digital literacy abilities on pre-service teachers' use of ICT in the Central region's colleges of education. The qualitative data analysis from the conducted interviews and focus groups is described in this chapter. This study's main objective is: "to explore the effects of ICT tutors' digital literacy on pre-service teachers ICT integration skills" As previously stated, the study adopted a thematic analysis following the series of coding processes from the transcripts. This method was adopted to ensure that analysis is in line with the research questions and the unit of analysis or themes. Therefore, each section opens sequentially with a research question followed by its unit of analysis which consists of the ICT Tutors and some selected third year students of OLA College of Education. They were interviewed using an interview schedule derived from the three research questions. The data also offered further information to address the 'how' and '*why*' aspects of the other research questions.

Background Characteristics of Respondents

In all, six (6) respondents were interviewed which is made up of four final year students and two ICT tutors. Their background characteristics are summarised in Table 2. The identity of the tutors and selected third year students has been preserved for the sake of anonymity. Tutors have been assigned the code T1 and T2 representing tutor 1 and tutor 2 respectively. The

third-year students have been assigned codes S1, S2, S3 and S4 representing student 1, student 2, student 3 and student 4 respectively.

Table 2: Background characteristics of respondents

Anonym	Position	Highest Degree	Years of Service	Gender *
T1	ICT tutor	Masters	10	M
T2	ICT tutor	B.Sc. ICT Education	7	M
S1	Student	N/A	2	F
S2	Student	N/A	2	F
S3	Student	N/A	2	F
S4	Student	N/A	2	F

Source: Fieldwork (2022)

* F = Female; M = Male

Results

The outcome of the study is presented in the following section, according to the research questions of the study.

Digital literacy skills levels of ICT Tutors in OLA College of Education in the Cape Coast metropolis

The first research question sought to ascertain the digital literacy skills of ICT tutors at the OLA College of Education. Two themes emerged concerning the digital literacy skills possessed by the tutors being specialized skills and general skills.

Theme 1: General skills

The findings revealed that the tutors possessed general ICT skills. In the words of one tutor,

"Basically, that [referring to ICT] *is what we use to work every day. Our research report, course outline, course manuals and course materials we give to students. Specifically, MS word, Access, Excel, PowerPoint which we use to teach most often"* (Tutor 1).

He continued,

"I can produce media content. I can design my own simple webpage. I can use tools like google classroom, Schoology to teach and assess students" (Tutor 1).

The other tutor also indicated that he is able to use computers for communication and other purposes, adding that he uses Microsoft Office Suite in teaching as well as gathering and analysing data. This was what he said.

"I have the ability to use phones in communication and have the skills in using laptop computers. I am very conversant in using MS office. Using it in teaching and gathering data and analysing data" (Tutor 2).

The students affirmed that their tutors possessed some ICT skills. Specifically, they mentioned that their tutors use PowerPoint for their presentations. According to one student,

"Teachers are expert in PowerPoint presentation" (Student 2).

Other students expressed similar opinions.

"They [referring to tutors] *project some of the things needed for the lesson for us especially during lectures and give us the opportunity to prepare our slides for presentation"* (Student 1).

"They [the tutors] *normally do presentation of what to teach and make sure that we get the understanding of what they are teaching"* (Student 4).

Theme 2: Specialized skills

According to the findings of the study, the tutors possessed some specialized ICT skills. Thus, in addition to general ICT skills, the tutors are also specialized in certain areas. Both tutors interviewed maintained that they have their own areas of specialization. For instance, according to one tutor,

> *"I have adequate knowledge in programming language skills. That is my area of specialization"* (Tutor 2).

In the words of another tutor,

> *"I am specialised in learning management systems. How to assist leaners to learn using ICT tools and to teach with them when they become teacher"* (Tutor 1).

Nevertheless, the students indicated that they are not aware of any specialised skills possessed by their ICT tutors. These were some of the things they said.

> *"I am not aware of any specialised area of my tutors"* (Student 2).
>
> *"I do not know any specialised area of my tutors"* (Student 4).

Relevance of tutors' digital literacy skills on teacher trainees ICT integration in Basic Schools in Ghana when they eventually come out as teachers

The second objective of the study was to examine the relevance of tutors' digital literacy on teacher trainees' ICT integration. The results are presented under the following themes: importance of learning ICT, benefits of tutors' digital literacy, and relevance of ICT curriculum.

Theme 1: Importance of learning ICT

The respondents mentioned various reasons for which it is important to study ICT. These are categorised under three sub-themes.

Sub-theme 1: Fit into society

The results revealed that studying ICT helps students to fit into the modern-day society. The respondents believe that in this digital age, teachers will become handicapped if they are not digitally literate. These are the words of a tutor;

> *"These are students who major in ICT; It is important to them because they are being prepared to teach in the basic school … If they are not digitally literate, they will be handicapped. It helps them to qualify as a modern-day teacher"* (Tutor 1).

The students also maintained that the study of ICT is helpful to fit people into modern-day society. Some students cited the period of COVID-19 restrictions to buttress their point. According to one of them,

> *"The study of ICT is good so that I can fit in today's society. For example, during the COVID period, we stayed at our homes but still enjoyed lessons and interactions with our tutors thanks to ICT tools. So yes, learning ICT has become very important now than ever"* (Student 2).

In the words of a different respondent,

> *"We live in a digital world so we need ICT to fit in today's society"* (Student 4).

Another respondent added,

> *"You can't live in the past. One needs to acquire the basic ICT skills to fit in today's society. When schools were closed down due to COVID, it is the ICT skill that helped some of us to still enjoy our classes"* (Student 3).

Sub-theme 2: Acquire integration skills

Moreover, the students indicated that studying ICT helps them to acquire skills helpful to integrate ICT into their teaching when they become teachers. These were what they said;

> *"It* [referring to the study of ICT] *helps us acquire integration skills to be used when we finally come out as teachers"* (Student 2).
>
> *"Yes, it is important to learn ICT because it equips the student to integrate ICT in teaching when they come out as teachers"* (Student 1).
>
> *"It helps us acquire the skills in teaching in the basic schools when we finally come out as teachers"* (Student 3).
>
> *"It helps us impart knowledge learnt to those in the basic schools"* (Student 4).

Sub-theme 3: Problem solving

Again, it became evident that the study of ICT instils problem solving skills into learners. A tutor explained that studying ICT helps students to use computers to solve classroom-related problems. This was what he said;

> *"So that they can use phones and computers to solve classroom related problems as and when they face them during teaching and learning when they have become teachers"* (Tutor 2).

Theme 2: Benefits of Tutors' Digital Literacy

The respondents also mentioned various benefits of tutors' digital literacy. Primarily, the teacher trainees maintained that when tutors are digitally literate, it makes learning effective and fun.

Sub-theme 1: Makes learning effective

It became evident that ICT tutors' digital literacy skills is very relevant for effective lesson delivery. All four students interviewed advanced the point that lessons are highly effective as their tutors lay bare their digital literacy skills in class.

> *"... It is effective because the tutors allow us to get other resources online to prepare our own lesson"* (Student 2).
>
> *"Yes, we are given the opportunity to set up the lab for lessons"* (Student 3).
>
> *"Very effective because our tutors engage us by giving us presentation assignment"* (Student 4).

Sub-theme 2: Makes learning fun

All four students expressed that when teachers are digitally literate, it makes learning fun and interesting. For instance, according to a student, tutors' digital literacy *"makes learning fun and interesting and increase learner engagement"* (Student 3).

Another student added that it makes the teaching and learning process collaborative.

> *"Integrating ICT in teaching makes learning interesting and make the teaching and learning collaborative"* (Student 2).

In addition, a different student said when tutors are digitally literate, it helps to capture and sustain the attention of learners. In her own words,

> *"It helps to get students attention during teaching. Sometimes you may not be interested in the topic being discussed in class but once the tutor digitally presents the lesson with full of activities, they automatically get your attention"* (Student 1).

Theme 3: Relevance of ICT Curriculum

When tutors were asked about the relevance of the ICT curriculum of the colleges of education, tutors expressed that the curriculum lack some basic components that will make student teachers suffer to teach ICT in the basic schools. According to a tutor,

> *"The curriculum is good to some extent but it lacks some important areas that we need to engage stakeholders and curriculum writers going forward. For example, basic programming is learnt in the basic schools but at the colleges of education, students don't learn programming yet they are supposed to go and teach in such basic schools"* (Tutor 1).

A different respondent added,

> *"ICT is very relevant because as students in colleges of education learn ICT, they will be able to transfer the knowledge acquired to the younger ones on the field to use basic ICT tools to solve problems. But the new curriculum poses challenge because our students don't learn some aspects like programing"* (Tutor 2).

The students could not speak a lot about the relevance of the ICT curriculum of the Colleges of Education to ICT education at the basic schools.

Almost all of them maintained that they are not aware of the ICT curriculum used at the Colleges of Education. This was what one student said;

"I'm not aware of the curriculum. We are using the basic school curriculum" (Student 2).

Another student similarly expressed that

"I'm not aware of ICT curriculum at this level" (Student 3).

However, another student explained that their course outlines are said to correspond to the basic school ICT curriculum.

"We are only taken through the basic school curriculum. At beginning of each semester, our tutor only gives us course outline which they claim is in line with the curriculum of the basic schools in Ghana" (Student 1).

Factors influence tutors' digital literacy skills level in OLA College of Education

The number three objective of the study was about the factors which influence digital literacy skills of tutors. The results obtained are categorised under four (3) sub-themes: motivation to study ICT, skills expected in learners, and barriers to effective ICT education and training.

Theme 1: Motivation to study ICT

The tutors indicated that they were motivated to study ICT and become ICT teachers because they want to impart knowledge which will result in problem solving using ICT tools. According to a respondent,

"Seeing tools been used to solve everyday problems motivated me to become ICT tutor. And wanted to train people to contribute to solving societal problems using ICT tools" (Tutor 1).

The second tutor expressed similar opinion. This was what he said;

"The ability of student to solve problems motivated me to become a teacher. For me that is so huge that my students complete school and become a teacher and is able to use ICT tools to find instructional resources to overcome instructional related problems in the classroom" (Tutor 2).

Theme 2: Expected skills

The tutors again mentioned certain skills that they expect their students to acquire. One tutor said he expects his students to learn and master Microsoft Office Suite so they can integrate it into their teaching when they eventually become teachers. This was what he said;

"I am expecting my teacher trainees to acquire the full knowledge in using MS office Suite for easy integration in their lessons when they eventually become teachers" (Tutor 2).

The other tutor also explained the skills he wants his students to learn.

"It is expected that every student will at least have any of these 21st century skills in IT. During the COVID, those without IT skills were those who complained and wished schools opens soon" (Tutor 1).

He further noted,

"They are curious to know. You will not find the situation where student have ICT and they refuse to come to the ICT lab for the lesson. I expect to build on such interest to create in students the ability to create and use learning management systems which will go a long way to helping them to effectively integrate ICT in their teaching when they become teacher in the near future" (Tutor 1).

Theme 3: Challenges

Finally, the respondents mentioned some challenges that hinder the effective teaching and learning of ICT. In all, three (3) sub-themes emerged which are focus on grades, inadequate computers and poor internet connectivity.

Sub-theme 1: Focus on grades

The tutors indicated that one major challenge they face is that their students are more focused on making good grades rather than acquiring practical skills. According to one tutor,

> *"Students are more interested in making the grades rather than concentrating on the content to practice. So, they are so engrossed in grades at the expense of using the content to practice"* (Tutor 1).

Another tutor reiterated,

> *"Students are too exams minded that they pay little or no attention to equipping themselves with practical skills which will help them in future when they become teachers"* (Tutor 2).

Sub-theme 2: Inadequate computers

Inadequacy of computers was also stated as a significant obstacle to ICT teaching and learning. Both students and tutors mentioned this challenge. One student, for example, lamented that

> *"When we go to the ICT lab, the number of computers there are more than the students but only a few are working the rest of them have broken down so when we go there, some of us don't get computers for practical lessons"* (Student 1).

Similarly, another respondent (a student) stressed,

> *"Most of the computers in the lab are not working. So, we don't get enough practical lessons. Only a few of us have our own laptop computers others do not have"* (Student 3).

Again, inadequate computers as a challenge to the effective teaching and learning of ICT was alluded to by some tutors. In the words of a tutor,

> *"There are big problems! Because the basic ICT tools that they need to learn with to become better equipped as teachers are not available. Lack of ICT tools to learn with"* (Tutor 2).

Sub-theme 3: Poor internet connection

Additionally, it was unravelled that poor internet connectivity also challenges the effective teaching and learning of ICT at the OLA College of Education. According to a respondent,

> *"There is internet connection problem. For so many months we don't get stable internet connection so we need to buy own data"* (Student 2).

Another student when asked about the challenges they face responded that

> *"There is inadequate supply of computers and other devices. Internet connection is also very poor"* (Student 4).

Discussion

In a study by Murithi and Yoo (2021), it was reported that teachers faced challenges integrating technology in their lessons although they perceived the use of computers as very important. This was owing to their poor digital literacy skills. However, in this study, contrasting results were found. It was very clear that the digital literacy skills level of ICT tutors is

adequately high. Further, they implement such digital literacy skills in teaching and learning to help student learn to be able to integrate ICT in their teaching and learning when they eventually become teachers in the Ghanaian basic schools.

This study's findings on the digital literacy of ICT tutors corroborates the findings of Kihoza, Zlotnikova, Bada and Kalegele (2016). In their evaluation of the use of ICT in the classroom in connection to the TPACK and SAMR (Substitute, Augmentation, Modification, and Redefinition) models, Kihoza et al. discovered that instructors had a high level of expertise across all of the TPACK and SAMR constructs..

This conclusion is supported once more by the research by Quaicoe and Pata (2020), which examined the extent of the digital divide in Ghana's primary and secondary schools from the viewpoint of teachers' digital literacy and usage of technology in the classroom. The authors calculated the averages of all the instructors' replies in randomly selected schools to determine the Teachers Digital Literacy (TDL) and TDA status of the schools. In every school, the overall level of teachers' digital literacy with respect to all four aspects of the TDL (that is, there were above-average scores for teacher digital knowledge (TDkn), teacher digital skills (TDsk), teacher digital attitude (TDAt), and teacher digital application (TDAp)

Clearly, the study of ICT has several advantages that cannot be overexaggerated. As unravelled in this study, ICT helps learners to fit into the modern-day society, acquire integration skills and be able to solve classroom-related problems. This suggests that ICT is essential for delivering education effectively and has enormous potential to improve educational achievement.

This corroborates the findings of past studies (Brás, Miranda & Marôco, 2014; Joseph, 2021; Lei, Xiong, Chiu, Zhang, & Cai, 2021; Pongsakdi, Kortelainen & Veermans, 2021; Suleman, Hussain, ud Din, & Shafique, 2017). For instance, according to Joseph (2021), Technology aids teaching and learning, increases access to educational resources, improves student comprehension, encourages group collaboration, and raises student interest in the course. Similar to this, Brás et al. (2014) indicated that ICT can significantly contribute to successful teaching and learning by increasing accessibility to educational resources, improving the standard of instruction, and doing well to improving the quality of learning.

Further, According to Pongsakdi et al. (2020), ICT fosters students' intellectual and creative perspectives in the current information society and offers more useful and innovative teaching and learning opportunities. According to other research, ICT may significantly contribute to several aspects of educational growth and effective teaching and learning by promoting efficiency, enhancing access, elevating the standard of instruction, and enhancing the standard of learning (Suleman et al., 2017; Lei et al., 2021). ICT has a positive impact on students' creativity, motivation, and engagement, according to a collaborative study by Wong, Quek, Divaharan, Liu, Peer, and Williams (2016). According to Wong, et al., ICT helps students feel more confident and makes studying more fun. It also encourages innovation and creativity in both teaching and learning.

It became evident that ICT tutors' digital literacy skills is very relevant for effective lesson delivery. All four students interviewed advanced the point that lessons are highly effective as their tutors lay bare their digital literacy

skills in class and explained further that their tutor's digital literacy skills help them to access the right content on the internet since the internet is referred to as the 'ocean' of both appropriate and inappropriate information. This confirms what Agélii Genlott, A., Grönlund, Å., & Viberg, O. (2019). Disseminating digital innovation in school–leading second-order educational change. *Education and Information Technologies, 24*, 3021-3039. Genlott, Gronlund and Viberg (2019) discovered in their study. They advanced that students in today's generation spend an average of more hours online than students in any preceding generation did. In contrast to the publishing industry, the internet is completely uncontrolled. When it comes to addressing the many issues that result from this (cyberbullying, viewing improper content, unachievable body-standards or expectations, social media addiction and fixation, data breaches, or even accruing debt from using virtual currency), a teacher may be well-intentioned and thoughtful, but if they lack a well-honed set of digital literacy skills, they will not have much of an understanding of what their students are viewing or consuming online. If you are just aware of the symptoms and not the underlying cause, your capacity to assist will be severely limited and these are all as a result of being digitally literate.

It was also discovered that ICT helps to make teaching and learning more efficient and enjoyable. This outcome is in line with those of Wong et al. (2016), who discovered that ICT can significantly improve student motivation and help teaching and learning in the school environment by promoting clearer thinking. Moreover, several research with related results have been published (Amuko, Miheso, & Ndeuthi, 2015; Khan, Hasan, & Clement, 2012; Ngeze,

2017). ICT is crucial for teaching and learning, as demonstrated by studies by Amuko et al. (2015) and Ngeze (2017). It affects the subjects taught and improves students' learning.

This study also unearthed the challenges to the successful ICT integration. Lack of infrastructure has been identified in previous studies as a key challenge to the successful teaching and learning of ICT as well as the integration of ICT in teaching (Ghavifekr, et al., 2016; Joseph, 2021; Kihoza, et al., 2016; Malekani, 2018). In fact, according to Ghavifekr et al., limited accessibility and network connection were the most notable challenges to utilizing ICT resources in schools. Similarly, Malekani (2018) discovered that the most frequent obstacles to the successful addition of ICT in delivery of content in the classroom were sluggish internet speed (19.3%) and subpar computers (18.8%). According to Joseph (2021), the biggest obstacle to ICT integration in Tanzanian schools is a lack of suitable ICT infrastructure, specifically projectors, software, computers, scanners, and printers.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Overview

In the preceding chapter, the data gathered was presented and analysed as they emerged from the empirical qualitative study. This chapter has the sole goal of summarising the study. It also presents the conclusion with regards to the research questions raised and the subsequent recommendation. Considerations for further studies are also added in this chapter.

Summary of the Research

As a recap, this study explored how tutors' digital literacy impact on ICT integration of pre-service teachers in the colleges of education in Ghana using OLA College of Education as a case study. The study specifically sought to explore the digital literacy skills level of ICT Tutors in the OLA College of Education in. In addition, the study also examined the relevance of tutors' digital literacy skills on ICT integration in basic schools in Ghana. Again, the study interrogated the factors which influence tutors' digital literacy skills level. Data for this qualitative study was gathered from interviewing some selected students and tutors of OLA College of Education. The data from interviews were collected from two tutors and triangulated with four other final year students of OLA College of Education.

Key Findings of the Study

The findings of the study indicated that the tutors academically certified to teach ICT are rich in digital literacy. The tutors lay bare their

digital expertise in lesson delivery. Some of expertise of the ICT tutor ranges from programming language skills, effective and efficient use of MS office suite, creation of learning management systems, production of media content and designing of simple webpage.

It became evident from the study that tutor's digital literacy is very important to the pre-service teacher because they are being prepared to teach in the basic school where they are expected to put into practice what their tutors taught them during their training. It was found that when tutors are digitally literate, it makes learning effective and fun. Again, tutors' digital literacy is of importance to the teacher trainee in that it prepares them to be able to fit into society as a modern-day teacher, acquire integration skills and use ICT to solve everyday classroom problems. The research also found that the new curriculum of the basic school poses serious challenge to students of the Colleges of Education in Ghana when they finally come out as teachers because the students do not learn some aspects of the new curriculum of the basic school such as programming and robotics.

Finally, the study unravelled that the integration of ICT into teaching and learning at the College of Education is challenged by a number of factors. Predominantly, students' focus on grades rather than imbibing practical knowledge, inadequate ICT infrastructure and poor internet connectivity are the challenges that impede the smooth and effective integration of ICT into teaching and learning.

Conclusions

Based on the findings of the research, it can be concluded that tutors' digital literacy level is high and they implement such skills in their lesson delivery. Again, tutors' digital literacy is imperative to prepare teacher trainees to fit into the modern digital age. From the findings, it can also be concluded that there are lapses with the ICT curriculum of the Colleges of Education in Ghana. For example, basic programming and robotics is learnt in basic schools but are not taught at the colleges of Education. Lastly, the effective integration of ICT into teaching and learning at the College of Education is challenged by students' overconcentration on making good grades (at the expense of imbibing practical knowledge), inadequate ICT infrastructure and poor internet connectivity.

Recommendations

The following recommendations are offered in light of the study's findings;

1. Stakeholders and curriculum developers need to be engaged for the amendment of the curriculum of Colleges of Education in Ghana to include topics which are learnt in basic schools (such as basic programming and robotics). This will enable pre-service teachers to comfortably teach such contents when they finally come out as teachers.
2. Students of the Colleges of Education in Ghana need to be oriented to appreciate and focus on the practices that can afford them ICT

integration skills during their training rather than just focusing on passing examination.

3. Colleges of Education in Ghana must be provided with adequate ICT infrastructure for the effective teaching and learning of ICT in college.

Suggestions for Future Studies

1. Future studies could explore how teachers in basic schools are integrating ICT into teaching and learning.
2. There could also be a wider quantitative study to examine the preparedness of teacher trainees towards the integration of ICT into teaching and learning.

REFERENCES

Acquah-Doughan, M. (2015). *Availability and utilisation of information and communication technology facilities in teaching social studies in public senior high schools in Sekondi-Takoradi metropolis* (Master's thesis, University of Cape Coast). Available at https://ir.ucc.edu.gh/xmlui/handle/123456789/2925

Adebi-Caesar, T. E. (2012). *Assessment of I.C.T situation in senior high schools, a case study in Lower Manya Krobo District.* Unpublished master's thesis, Kwame Nkrumah University of Science and Technology, Kumasi.

Adubifa, O. A. (2001). *Towards the introduction and application of formation and communication technologies in African universities.* Accra: Qualitype Printing & Graphics.

Aduwa-Ogiegbaen, S. E., & Iyamu, E. O. S. (2005). Using information and communication technology in secondary schools in Nigeria: Problems and prospects. *Journal of Educational Technology & Society, 8*(1), 104-112.

Afful-Dadzie, F. (2010). *Use of ICT by students and teachers in senior high schools in the Sekondi-Takoradi Metropolis.* Unpublished master's thesis, University of Cape Coast, Cape Coast.

Agélii Genlott, A., Grönlund, Å., & Viberg, O. (2019). Disseminating digital innovation in school–leading second-order educational change. Education and Information Technologies, 24, 3021-3039.

Agyei, D. D. & Voogt, J. (2011). ICT use in the teaching of mathematics: Implications for professional development of pre-service teachers in Ghana. *Education and Information Technologies, 16*(4), 423-439.

Ajzen, I. (2014). Attitude structure and behavior. In *Attitude structure and function* (pp. 241-274). Psychology Press.

Allen-Handy, A., Meloche, A., Brown, J., Frazier, A., Escalante, K., Walker, M., ... & Dia, J. (2021). Preserving History for the Persistent Legacy of Our School: A Youth-Led Participatory Heritage Project. *Preservation, Digital Technology & Culture*, *50*(1), 15-29.

Al Mulhim, E. (2014). The Barriers to the Use of ICT in Teaching in Saudi Arabia: A Review of Literature. *Universal Journal of Educational Research*, *2*(6), 487-493.

Al-Oteawi, S. M. (2002). *The perceptions of administrators and teachers in utilizing information technology in instruction, administrative work, technology planning and staff development in Saudi Arabia*. Ohio University.

Amenyedzi, F. W. K., Lartey, M. N., & Dzomeku, B. M. (2011). The Use of Computers and Internet as Supplementary Source of Educational Material: A Case Study of the Senior High Schools in the Tema Metropolis in Ghana. *Contemporary Educational Technology, 2*(2), 151-162.

Ampratwum, J., Offei, Y. N., & Ntoaduro, A. J. (2016). Barriers to the use of computer assistive technology among students with visual impairment in Ghana: The case of Akropong School for the Blind. *Journal of Education and Practice, 7*(29), 58-61.

Amuko, S., Miheso, M., & Ndeuthi, S. (2015). Opportunities and challenges: Integration of ICT in teaching and learning Mathematics in secondary schools, Nairobi, Kenya. *Journal of Education and Practice, 6*(24), 1-6.

Arkorful, V., Barfi, K. A., & Aboagye, I. K. (2021). Integration of information and communication technology in teaching: Initial perspectives of senior high school teachers in Ghana. *Education Information Technologies,* 1-17.

Avoke, S. K., & Hayford, S. K. J. (2017). Provision of Education for Individuals with disabilities in Ghana. In Michael L. Wehmeyer and James R. Patton (Eds.) *Handbook of International Special Education.* Westport, Connecticut: Praeger.

Ayebi-Arthur, K., Aidoo, D. A., & Wilson, K.B. (2009). A study on the use of the Internet in senior high schools in the Cape Coast metropolis of Ghana. *Ghana Journal of Education and Teaching, 5,* 131-141.

Banini, D. A. (2019). *Integrating technology into pedagogy at the basic level of education in Ghana* (Doctoral thesis, University of Sussex). Available at http://sro.sussex.ac.uk/id/eprint/85685/

Berhane A. T. (2012). Understanding the importance, benefits and barriers of ICT on teaching and learning in East African countries. *International Journal for e-Learning Security,* 2 (3/4).

Bingimlas, K. A. (2019). Barriers to the successful integration of ICT in teaching and learning environments: A review of the literature. *Eurasia Journal of Mathematics, Science and Technology Education*, *5*(3), 235-245.

Brás, P., Miranda, G. L., & Marôco, J. (2014). Teachers and technology: A complicated relationship. *GSTF Journal on Education (JEd), 2*(1), 1-11.

British Education Commission & Technology Agencies (BECTA). (2004). *A review of research literature on barriers to the uptake of ICT by teachers.* Assessed from http://www.BECTA.org.uk.

Buabeng-Andoh, C. (2012). Factors influencing teachers' adoption and integration of information and communication technology into teaching: A review of the literature. *International Journal of Education and Development using ICT, 8*(1), 136-155.

Buabeng-Andoh, C., & Yidana, I. (2015). Teachers' ICT usage in second-cycle institutions in Ghana: A qualitative study. *International Journal of Education Development Using ICT, 11*(2), 104-112.

Burns, N., & Grove, S. K. (2011). *Understanding nursing research building an evidence-based practice* (5th Ed.). Maryland Heights, MO: Elsevier Saunders.

Cohen, L., Manion, L., & Morrison, K. (2007). *Research methods in education* (6th Ed.). London: Taylor and Francis Group.

Craig, R. & Amernic, J. (2006). PowerPoint presentation technology and the dynamics of teaching. *Innovative Higher Education, 31,* 147–160.

Creswell, J. W. (2008). *Research design: Qualitative, quantitative, and mixed methods approaches* (3rd ed.). Los Angeles, CA: SAGE.

de Winter, J., Winterbottom, M. & Wilson, E. (2010). Developing a user guide to integrating new technologies in science teaching and learning: Teachers' and pupils' perceptions of their affordances. *Technology, Pedagogy and Education, 19*(2), 261-267.

Edumadze, J. K. E. (2015). The integration of Information and Communication Technology for teaching and learning at Ghanaian Colleges of Education: ICT tutors' perceptions. *African Journal of Teacher Education, 4*(2), 1-16.

Ewurah, S. M. (2017). The Concept of eGovernment: ICT Policy Guidelines for the Policy Makers of Ghana. *Journal of Information Security, 8*(2), 106-124.

Falloon, G. (2020). From digital literacy to digital competence: the teacher digital competency (TDC) framework. *Educational Technology Research and Development, 68*(5), 2449-2472.

Fau, S., & Moreau, Y. (2018). *Managing tomorrow's digital skills-what conclusions can we draw from international comparative indicators?* Available at https://unesdoc.unesco.org/ark:/48223/pf0000261853

Finger, G., & Trinidad, S. (2012). ICTs for learning: an overview of systematic initiatives in the Australian States and Territories. *Australian Educational Computing, 17*(2), 3-14.

Franco, I. B., & Derbyshire, E. (2020). SDG 4 quality education. In *Actioning the Global Goals for Local Impact* (pp. 57-68). Singapore: Springer.

Fu, J. (2013). Complexity of ICT in education: A critical literature review and its implications. *International Journal of education and Development using ICT, 9*(1), 112-125.

García-Sánchez, I. M., Gómez-Miranda, M. E., David, F., & Rodríguez-Ariza, L. (2019). Analyst coverage and forecast accuracy when CSR reports improve stakeholder engagement: The Global Reporting Initiative-International Finance Corporation disclosure strategy. *Corporate Social Responsibility and Environmental Management, 26*(6), 1392-1406.

Gee, J. (2007). What video games have to teach us about learning and literacy. New York: Palgrave MacMillan.

Ghavifekr, S., & Rosdy, W. A. W. (2015). Teaching and learning with technology: Effectiveness of ICT integration in schools. *International Journal of Research in Education Science, 1*(2), 175-191.

Ghavifekr, S., Kunjappan, T., Ramasamy, L., & Anthony, A. (2016). Teaching and learning with ICT tools: Issues and challenges from teachers' perceptions. *Malaysian Online Journal of Educational Technology*, *4*(2), 38-57.

Ghavifekr, S., Razak, A. Z. A., Ghani, M. F. A., Ran, N. Y., Meixi, Y., & Tengyue, Z. (2014). ICT integration in education: Incorporation for teaching & learning improvement. *Malaysian Online Journal of Educational Technology, 2*(2), 24-45.

Gilakjani, A. P. (2013). Factors contributing to teachers' use of computer technology in the classroom. *Universal Journal of Educational Research, 1*(3), 262-267.

Godhe, A. L., Lilja, P., & Selwyn, N. (2019). Making sense of making: critical issues in the integration of maker education into schools. *Technology, Pedagogy Education Information Technologies, 28*(3), 317-328.

Government of Ghana. (2004). *Meeting the challenges of education in the 21st century*. Accra: Adwinsa Publications.

Grabe, M., & Grabe, C. (2008). *Integrating technology for meaningful learning* (5th Ed.). Boston, MA: Houghton Mifflin Company.

Graziano, K. J., Herring, M. C., Carpenter, J. P., Smaldino, S., & Finsness, E. S. (2017). A TPACK diagnostic tool for teacher education leaders. *TechTrends, 61*(4), 372-379.

Hafifah, G. N., & Sulistyo, G. H. (2020). Teachers' ICT literacy and ICT integration in ELT in the Indonesian higher education setting. *Turkish Online Journal of Distance Education, 21*(3), 186-198.

Harris, J. & Hofer, M. (2017). Differentiating TPACK-based learning materials for preservice and inservice teachers. In *Society for Information Technology & Teacher Education International Conference* (pp. 2357-2366). Association for the Advancement of Computing in Education (AACE).

Heemskerk, I., Kuiper, E., & Meijer, J. (2014). Interactive whiteboard and virtual learning environment combined: effects on mathematics education. *Journal of Computer Assisted Learning, 30*(5), 465-478.

Henriques, M. H., & Brilha, J. (2017). UNESCO Global Geoparks: A strategy towards global understanding and sustainability. *Episodes Journal of International Geoscience, 40*(4), 349-355.

Hermans, R., Tondeur, J., Van Braak, J., & Valcke, M. (2008). The impact of primary school teachers' educational beliefs on the classroom use of computers. *Computers education Information Technologies, 51*(4), 1499-1509.

Hockly, N., Dudeney, G., & Pegrum, M. (2014). *Digital literacies*: Routledge.

Holden, R. J., & Karsh, B. T. (2010). The technology acceptance model: its past and its future in health care. *Journal of biomedical informatics, 43*(1), 159-172.

Ifinedo, P. (2012). Drivers of e-government maturity in two developing regions: focus on Latin America and Sub-Saharan Africa. *Journal of Information Systems and Technology Management, 9*(1), 05-22.

Jamieson-Proctor, R., Albion, P., Finger, G., Cavanagh, R., Fitzgerald, R., Bond, T., & Grimbeek, P. (2013). Development of the TTF TPACK survey instrument. *Australian educational computing, 27*, 26-35.

Janssens-Bevernage, A., Cornille, B., & Mwaniki, N. (2005). Integrating ICT in teacher training: Reflections on practice and policy implications: A case study of the learning resource centre at the Kenya technical teachers college. In F. Etta and L. Elder (Eds.), *At the Crossroads. ICT Policymaking in East Africa* (pp. 153-165). Nairobi: East African Educational Publishers.

Johnson, A. M., Jacovina, M. E., Russell, D. G., & Soto, C. M. (2016). Challenges and solutions when using technologies in the classroom.

Joseph, P. (2021). Use and challenges of ICT in secondary schools in Tanzania: A study of selected secondary schools in Mikindani Municipality, Tanzania. *African Journal of Accounting and Social Sciences*, *3*(1), 39-70.

Kayisire, D., & Wei, J. (2016). ICT adoption and usage in Africa: Towards an efficiency assessment. *Information Technology for Development, 22*(4), 630-653.

Khan, M. S. H., Hasan, M., & Clement, C. K. (2012). Barriers to the introduction of ICT into education in developing countries: The example of Bangladesh. *International Journal of instruction, 5*(2), 61-80.

Kihoza, P., Zlotnikova, I., Bada, J., & Kalegele, K. (2016). Classroom ICT integration in Tanzania: Opportunities and challenges from the perspectives of TPACK and SAMR models. *International Journal of Education and Development using ICT, 12*(1), 107-128.

Koehler, M., & Mishra, P. (2009). What is technological pedagogical content knowledge (TPACK)? *Contemporary Issues in Technology Teacher education, 9*(1), 60-70.

Kokoç, M., & Karal, H. (2019). A Study on Technological Pedagogical Content Knowledge Experiences of Primary School Teachers Throughout Blended Professional Development Programs. In *Handbook of Research on TPACK in the Digital Age* (pp. 302-327): IGI Global.

Kumari, V., & D'Souza, F. (2016). Secondary school teachers' digital literacy and use of ICT in teaching and learning. *International Journal of Computational Research and Development, 1*(1), 141-146.

Kutluca, T., & Gokalp, Z. (2011). A study on computer usage and attitudes toward computers of prospective preschool teacher. *International Journal on New Trends in Education and Their Implications, 2*(1), 1-17.

Law, N., Lee, Y. & Chow, A. (2002). Practice characteristics that lead to 21st century learning outcomes. *Journal of Computer Assisted Learning ,18,* 415-426.

Lehtinen, E. (2010). The potential of teaching and learning supported by ICT for the acquisition of deep conceptual knowledge and the development of wisdom. In E. De Corte & J. Fenstad (Eds.), *From information to knowledge; from knowledge to wisdom: Challenges and changes facing higher education in the digital age* (pp. 79-88). London: Portland Press.

Lei, H., Xiong, Y., Chiu, M. M., Zhang, J., & Cai, Z. (2021). The relationship between ICT literacy and academic achievement among students: A meta-analysis. *Children and Youth Services Review*, *127*, 106123.

Madej, K. (2003). Towards digital narrative for children: From education to entertainment, a historical perspective. *Computers in Entertainment 1*(1),

Mafang'ha, M. (2016). *Teachers' experience on the use of ICT to facilitate teaching: A case of Ilala District secondary schools* (Master's thesis, University of Tanzania). Available at https://core.ac.uk/download/pdf/79425244.pdf

Makgato, M. (2014). Challenges contributing to poor integration of educational technology at some schools in South Africa. *Mediterranean Journal of social sciences, 5*(20), 1285.

Malekani, A. A. (2018). Access to, use and challenges of ICTs in secondary schools in Tanzania: a study of selected secondary schools in Morogoro Municipality. *Information Impact: Journal of Information and Knowledge Management*, *9*(2), 44-57.

Mfum-Mensah, O. (2011). Education collaboration to promote school participation in northern Ghana: A case study of a complementary education program. *International Journal of Educational Development, 31*(5), 465-471.

Ministry of Education (2003). *The Ghana ICT for accelerated development (ICT4D) policy.* Assessed from https://moc.gov.gh/sites/default/files/downloads/Ghana-ICTAD%20Policy-Master-final-2.pdf

Ministry of Education. (2008). *ICT in Education Policy.* Accra: Ministry of Education.

Murithi, J., & Yoo, J. E. (2021). Teachers' use of ICT in implementing the competency-based curriculum in Kenyan public primary schools. *Innovation and Education, 3*(1), 1-11.

Murray, J. (2006). Toward a cultural theory of gaming: Digital games and the co-evolution of media, mind, and culture. *Popular Communication: The International Journal of Media and Culture, 4*(3), 185-202.

Natia, J., & Al-hassan, S. (2015). Promoting teaching and learning in Ghanaian Basic Schools through ICT. *International Journal of Education and Development using ICT*, *11*(2), 113-125.

Ngeze, L. V. (2017). ICT Integration in teaching and learning in secondary schools in Tanzania: Readiness and way forward. *International Journal of Information and Education Technology, 7*(6), 424-427.

Nzilano, J. L., & Kafyulilo, A. C. (2012). Development of Information and Communication Technology in Education in Tanzania: How is DUCE playing its role? *Journal of Education, HumanitiesSciences, 1*(2).

Okan, Z. (2003). Edutainment: Is learning at risk? *British Journal of Educational Technology*, *34*(3), 255–264.

Oliver, M. (2006). New pedagogies for e-learning? *Research in Learning Technology*, *14*(2), 133-134.

Olufemi, V. A., Olukayode S. A. & Oladele, D. O. (2013). The challenges toward implementation of Information and Communication Technology (ICT) in secondary schools in Ondo State, Nigeria. *International Journal of Innovation and Applied Studies*, *2*(3), 259-264.

Omboto, C. M., Kanga, A., & Njageh, A. R. K. (2022). Myth or reality: Digital literacy programme implementation in primary special schools in Nairobi, Kenya. *European Journal of Education*, *5*(2), 51-66.

Opoku, M. P., & Mprah, W. K. (2017). Decade of inclusive education in Ghana: perspectives of special educators. *8*(1), 4-20.

Ott, M. & Pozzi, F. (2011). Towards a new era for cultural heritage education: Discussing the role of ICT. *Computer in Human Behaviour*, *27*, 1365–1371.

Özcan, M. (2022). Evaluation of prospective teachers' digital literacy levels and mobile learning attitudes. *Journal of Educational Technology and Online Learning*, *5*(2), 367-378.

Palinkas, L. A., Horwitz, S. M., Green, C. A., Wisdom, J. P., Duan, N., & Hoagwood, K. (2015). Purposeful sampling for qualitative data collection and analysis in mixed method implementation research. *Administration and policy in mental health and mental health services research, 42*(5), 533-544.

Peralta, H. & Costa, F.A. (2007). Teachers' competence and confidence regarding the use of ICT. *Educational Sciences Journal, 3*, 75-84.

Polit, D. F., & Hungler, B. P. (1995). Cited in Amedahe, F. K. (1994). Attitudes of basic education teachers toward the use of continuous assessment in Ghana. Journal of Institute of Education. 3(1), 8 – 20.

Pongsakdi, N., Kortelainen, A., & Veermans, M. (2021). The impact of digital pedagogy training on in-service teachers' attitudes towards digital technologies. *Education and Information Technologies, 26*(5), 5041-5054.

Prestride, S. (2012). The beliefs behind the teacher that influences their ICT practices, Griffith University Brisbane Australia. *Journal of Computer Education, 58*(2012) 449-458.

Quaicoe, J. S., & Pata, K. (2020). Teachers' digital literacy and digital activity as digital divide components among basic schools in Ghana. *Education Information Technologies, 25*(5), 4077-4095.

Reddy, P., Sharma, B., & Chaudhary, K. (2022). Digital literacy: A review in the South Pacific. *Journal of Computing in Higher Education, 34*(1)83-108.

Resnick, M. (2004). Edutainment? No thanks. I prefer playful learning. *Associatzione Cicita on Edutainment, 1*(1), 2-4.

Rhoda, C., & Gerald, K. (2000). Internal Consistency Reliabilities for 14 computers. Attitude scale. *Journal of Education technology, 14*(3), 23-25.

Rohatgi, A., Scherer, R., & Hatlevik, O. E. (2016). The role of ICT self-efficacy for students' ICT use and their achievement in a computer and information literacy test. *Computers & Education, 102,* 103-116.

Salehi, H. & Salehi, Z. (2012). Challenges for using ICT in education: Teachers' insights. *International Journal of e-Education, e-Business, e-Management and e-Learning, 2,* (1), 40-43.

Schmidt, D. A., Baran, E., Thompson, A. D., Mishra, P., Koehler, M. J., & Shin, T. S. (2009). Technological pedagogical content knowledge (TPACK) the development and validation of an assessment instrument for preservice teachers. *Journal of research on Technology in Education, 42*(2), 123-149.

Schoepp, K. (2005). Barriers to technology integration in a technology-rich environment. *Learning and teaching in higher education: Gulf Perspectives, 2*(1), 1-24.

Sedgwick, P. (2014). Cross sectional studies: advantages and disadvantages. *BMJ, 348.* https://doi.org/10.1136/bmj.g2276

Selwyn, N. (2010). Looking beyond learning: notes towards the critical study of educational technology. *Journal of Computer Assisted Learning, 26,* 65–73.

Selwyn, N., Banaji, S., Hadjithoma-Garstka, C. & Clark, W. (2011). Providing a platform for parents? Exploring the nature of parental engagement with school learning platforms. *Journal of Computer Assisted Learning 27,* 314–323.

Sicilia, C. (2005). *The challenges and benefits of teacher's practice in constructivist learning environment supported by technology.* Unpublished master's thesis, McGill University, Montreal.

Sim, C. H. & Lau, B. T. (2014). *Teachers' perceptions of the use of ICT as an instructional tool in Mathematics and Science.* Assessed from https://www.semanticscholar.org/paper/Teachers%E2%80%99 perceptions-of-the-use-of-ICT-as-an-tool- Sim/dc619f82d1d031d9a33eee19a75723ce 4c809ef6

Suleman, Q., Hussain, I., ud Din, M. N., & Shafique, F. (2017). Effects of Information and Communication Technology (ICT) on students' academic achievement and retention in Chemistry at secondary level. *Journal of Education and Educational Development*, *4*(1), 73-93.

Tinio, V. L. (2003). *ICT in Education.*

Tondeur, J., Valcke, M. & Van-Braak, J. (2008). A multidimensional approach to determinants of computer use in primary education: Teacher and school characteristics. *Journal of Computer Assisted Learning*, *24*(6), 494–506.

Twiner, A., Coffin, C., Littleton, K., & Whitelock, D. (2010). Multimodality, orchestration and participation in the context of classroom use of the interactive whiteboard: a discussion. *Technology, Pedagogy and Education*, *19*(2), 211-223.

Venkatesh, V. & Morris, M. G. (2000). Why do men ever stop asking for direction? Gender social influence and their role in technology acceptance and usage behavior. *Management Information System Quarterly Journal, 24*(1), 115-139.

Wise, S., Greenwood, J. & Davis, N. (2011). Teachers' use of digital technology in secondary music education: Illustrations of changing classrooms. *British Journal of Music Education, 28,* 117-134.

Wong, A. F., Quek, C. L., Divaharan, S., Liu, W. C., Peer, J., & Williams, M. D. (2016). Singapore students' and teachers' perceptions of computer-supported project work classroom learning environments. *Journal of research on technology in education*, *38*(4), 449-479.

Yeboah, W., Sarpong, P. A., & Appiah, B. (2020). An Assessment of Tutor Characteristics and Student ICT Competencies in Colleges of Education in Ghana. *European Journal of Education Studies, 7*(10), 389-398.

Yidana, P. (2018). Examination of Ghana's ICT in education policy within the context of globalization. *Journal of Communications, Media & Society*, *5*(1), 120-142

Yildrim, S. (2007). Current utilization of ICT in Turkish basic education schools. A review of teacher's ICT use and barriers to integration. *International Journal of Instructional Media, 34*(2), 171-186.

Yunus, M. M., Salehi, H., & Kashefian-Naeeini, S. (2011). The impact of high-stakes tests on the teachers: A case of the Entrance Exam of the Universities (EEU) in Iran. In *Proceedings of the International Conference on Humanities, Society and Culture* (pp. 221-22).

Yusuf, H. O., Maina, B., & Dare, M. O. (2013). Assessment of the availability, utilization and management of ICT facilities in teaching English language in Secondary Schools in Kaduna State, Nigeria. *Advances in Language Literary Studies, 4*(1), 20-26.

Zieger, L. & Tan, J. (2012). Improving parent involvement in secondary schools through communication technology. *Journal of Literacy and Technology 13*(1), 30–54.

APPENDICES

APPENDIX A: INTERVIEW GUIDE FOR THIRD YEAR STUDENTS

I am a student from the University of Cape Coast undertaking research on the topic **THE IMPACT OF TUTORS' DIGITAL LITERACY ON ICT INTEGRATION OF PRE-SERVICE TEACHERS: A CASE STUDY OF OLA COLLEGE OF EDUCATION**. With regards to this, you have been selected to take part in this study. Kindly respond to the questions as contained in the interview guide as honestly as possible and note that the information you provide will be treated with great confidentiality. Also, your participation in this study is completely voluntary. You can also ask any question for more clarification.

Q1. Digital Literacy Skills Levels of ICT Tutors in The Colleges of Education in Ghana.

1. What are some of the digital expertise you see your tutors exhibit during teaching and learning?

Q2. Relevance of Tutors' Digital Literacy Skills on ICT Integration.

1. How effective does your tutor implement digital literacy lesson delivery?
2. Which specialized areas of ICT does your tutor exhibit in his or her teaching?
3. Which computer applications does your ICT tutor often use in teaching?

Q3. Factors which influence Tutors' Digital Literacy Skills level.

1. How important is learning ICT at the colleges of education?

2. Why should your tutor integrate digital literacy into teaching and learning?
3. How relevant is the ICT curriculum of the Colleges of Education to ICT education at the basic schools?
4. What challenges do tutors face in OLA College of Education in teaching ICT that makes ICT integration difficult?
5. Will you say ICT has become the common denominator in education? Why?

APPENDIX B: INTERVIEW GUIDE FOR ICT TUTORS

I am a student from the University of Cape Coast undertaking research on the topic. **THE IMPACT OF TUTORS' DIGITAL LITERACY ON ICT INTEGRATION OF PRE-SERVICE TEACHERS: A CASE STUDY OF OLA COLLEGE OF EDUCATION.** With regards to this, you have been selected to take part in this study. Kindly respond to the questions as contained in the interview guide as honestly as possible and note that the information you provide will be treated with great confidentiality. Also, your participation in this study is completely voluntary. You can also ask any question for more clarification.

As an ICT tutor of this school, I would like to talk with you about the teaching and learning process so far as ICT implementation is concern. This interview will be recorded purely for academic exercise and it will take only some few minutes.

Thank you.

Let me first congratulate you for the good work done in ensuring that ICT is effectively taught and learnt.

Background information

a. What is your highest professional qualification in ICT education?

b. How long have you been teaching ICT?

c. What does digital literacy entail?

Q1. Digital Literacy Skills Levels of ICT Tutors in The Colleges of Education in Ghana

a. Do you have any specialisation? Programming, Networking? Etc.

b. i. Are you conversant in using MS Office suit or other computer applications?

ii. if yes, how have you been using it?

c. What digital literacy skills do you have?

d. What is your level of digital literacy skills?

Q2. Relevance of Tutors' Digital Literacy Skills on ICT Integration

a. How important is learning of ICT to your students?

b. How relevant is tutors' digital literacy to ICT integration in OLA CoE?

c. How relevant is the ICT curriculum of CoE to ICT Education in Ghanaian basic

Schools?

d. What benefits are there for your students for being digitally literate?

e. What challenges do you think makes it difficult for your students in integrating ICT when they eventually come out as teachers

Q3. Factors that influence Tutors' Digital Literacy Skills level

a. What would you say motivated you to become an ICT tutor?

b. What do you believe are the compelling factors in ICT education?

c. What ICT skills do you expect your students to learn and master for their effective teaching and learning at the basic schools?

UNIVERSITY OF CAPE COAST
COLLEGE OF EDUCATION STUDIES
FACULTY OF SCIENCE AND TECHNOLOGY EDUCATION
DEPARTMENT OF MATHEMATICS AND I.C.T EDUCATION

Telephone: 0332096951
Telex: 2552, UCC, GH
Telegrams & Cables: University, Cape Coast
Email: dmicte@ucc.edu.gh

University Post Office
Cape Coast, Ghana

Your Ref:

Our Ref: DMICTE/P.3/V.3/091

Date: 19th May, 2022

TO WHOM IT MAY CONCERN:

Dear Sir/Madam,

RESEARCH VISIT

The bearer of this letter, **Mr Edward Acquah,** with registration number ET/MIT/18/0005 M.Ed. (Information Technology) student of the Department of Mathematics and ICT Education, College of Education Studies, University of Cape Coast.

As part of the requirements for the award of a master's degree, he is required to undertake a research visit at your outfit with the purpose of collecting data on the topic "**THE IMPACT OF TUTORS' DIGITAL LITERACY ON ICT INTEGRATION OF PRE-SERVICE TEACHERS: A CASE STUDY OF OLA COLLEGE OF EDUCATION.**"

I would be grateful if you could give him the necessary assistance he may need.

Thank you for your usual support.

Yours faithfully,

Dr (Mrs) Christina Boateng
HEAD