UNIVERSITY OF EDUCATION, WINNEBA

SCHOOL OF GRADUATE STUDIES

DEPARTMENT OF SPECIAL EDUCATION

ICT KNOWLEDGE AND COMPETENCIES OF STUDENTS WITH VISUAL IMPAIRMENT IN THE UNIVERSITY OF EDUCATION, WINNEBA.

EBENEZER OFORI ATTA

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A THESIS IN THE DEPARTMENT OF SPECIAL EDUCATION, FACULTY OF EDUCATIONAL STUDIES, SUBMITTED TO THE SCHOOL OF GRADUATE STUDIES, UNIVERSITY OF EDUCATION, WINNEBA IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF THE MASTER OF PHILOSOPHY (SPECIAL EDUCATION) DEGREE

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DECLARATION

Candidate's Declaration

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

SIGNATURE.....

DATE.....

Supervisor's Declaration

I, Professor Samuel Kwaku Hayford (Ph.D), hereby declare that the preparation and presentation of this work was supervised in accordance with the guidelines for supervision of Thesis as laid down by the University of Education, Winneba.

SIGNATURE.....

DATE.....

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DEDICATION

I dedicate this work to my wife, Miss Felicia Yeboah and my five lovely children, namely Charles Arthur, Kofi Baffoe Ofori-Atta, Kwabena Buabeng Ofori-Atta, Nhyiraba Kojo Ofori-Atta and Kwame Adom Ofori-Atta Junior for their inspirations, financial and moral support. Also, to my mother, Miss Elizabeth Barfu and my Brother Mr. Anthony Kofi Baffoe,

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ABSTRACT

This study investigated the knowledge and competencies of students with visual impairment in the University of Educagtion, Winneba about information and communication technology (ICT). The study adopted the case study research design, where 33 students with visual impairment were randomly sampled from a population of 88 students with visual impairment. Descriptive and inferential statistical methods were used to analyse the data. The results of the study indicated that the participants were knowledgeable in some aspects of ICT; specifically, in activities that fall in the category of basic computer operations while they lacked knowledge and competence in other areas, including activities that were categorized under software and applications, word processing, email and other communication platform, and web browsing and online. Also, the study revealed that the competencies of the participants were related directly with their ICT knowledge. Again, the study found that there were several challenges that students with visual impairment in the University faced in acquiring ICT knowledge and competencies, such as poor internet connectivity, lack of technical support, lack of personnel support, and inaccessibility of ICT tools. Again, the study reported that if strategies such as enhanced accessibility of ICT tools, adequate personnel and technological support were put in place, the challenges that students with visual impairment encounter would be eliminated or reduced drastically. The study concluded that students with visual impairment who participated in the study were knowledgeable and competent in some areas of ICT. A major recommendation therefore was that students should be trained by competent ICT personnel who understand the technological needs of students with visual impairment.

CHAPTER ONE

INTRODUCTION

1.0. Background to the study

Knowledge about information and communication technology (ICT) plays a major role in the education of learners including students with special needs, including students with visual impairment. ICT integration into education for students with special needs has become a global phenomenon in the 21st century. Thus, the United Nations Convention on the Rights of People with Disabilities (UNCRPD) places considerable emphasis on the accessibility of ICT. Foe instance, Article 9 of the UNCRPD particularly requires member states including Ghana to:

> (1) … promote access for persons with disabilities to new ICT and systems, including the Internet., and (2) promote the design, development, production and distribution of accessible ICT and systems at an early stage, so that these technologies and systems become accessible at minimum cost (Indongo & Mufune, 2011, p. 51; UNESCO, 2015, p. 10).

In line with the UNCRPD, the Government of Ghana repositioned itself to preparing persons with disabilities and students with skills in ICT as part of government's commitment to building a better Ghana through technology and innovation (Biztech Africa, 2012). This repositioning was meant to equip persons with disabilities with ICT skills for the contemporary world.

The integration of ICT into education is anticipated to create new possibilities for learners with visual impairment in a way that allows them to achieve their true potential (Hasselbring & Glaser, 2000). In Ghana, some special schools for the blind and universities

that have students with visual impairment run ICT courses for such students. These efforts are aimed at helping students with visual impairment to acquire the requisite knowledge and skills for using ICT tools, such as personal computers (PCs), mobile phones, tablets, touch screens, printers, scanners, Internet, e-learning services, hardware and software applications. The University of Education, Winneba, for example, has a resource center for students with disabilities, where ICT-related services are provided to ensure the smooth operation of such ICT devices by students with visual impairment. Also, the Department of ICT Education of the Universtiy of Education, Winneba runs an introductory course in ICT for all students, including those with visual impairment with the objective to train them in the use of ICT tools to facilitate learning.

Inspite of these efforts, there are challenges that make the acquisition and use of ICT by students with visual impairment stressful. Some of these challenges are inadequate training programmes for ICT lecturers in teaching ICT to students with visual impairment (Teye, 2014), and the excessive cost of funding ICT deployment projects (Gole & Shinsky, 2013). These challenges significantly inhibit the acquisition of ICT knowledge and competency by students with visual impairment, and subsequently affect the use of technology in learning.

According to Teye (2014), there is the need for the introduction of some strategies to overcome the challenges students with visual impairment encounter in the use of ICT. Some of the strategies include, (a)increasing accessibility to ICT infrastructure, such as specialized computer laboratory, relevant software and hardware devices; and (b) the employment of well-trained ICT instructors who have the competence in assisting with the training of the students with visual impairment.

The Government of Ghana, through the Ministry of Education, has reiterated that ICT plays a key role in broadening access to education to students with visual impairment, and considers it as a key priority area (Ministry of Education, 2002). The concern of the researcher was therefore to investigate the ICT knowledge and competencies of students with visual impairment in the University of Education, Winneba to determine whether they could use ICT in learning to enhance their participation and empowerment.

1.1. Statement of the problem

ICT is one of the courses taught at all levels of education. However, students with visual impairment, who would normally have benefited more from ICT knowledge and competencies, encounter some difficulties in the acquisition of these competencies that will enable them to become effective users of ICT tools and devices. A study conducted by Teye (2014) revealed that students with visual impairment in the University of Education, Wineba are faced with a number of challenges that impede their ability to acqure ICT knowledge and competence. As of now, no study has specifically established the knowledge and competencies of students with visual impairment in the University. It is within this context that the researcher sought to investigate ICT knowledge and competence of students with visual impairment.

1.2. Purpose of the study

The purpose of the study was to find out what knowledge and skills students with visual impairment in the University of Education, Winneba have in the use of ICT. The specific objectives were to:

- Establish the level of knowledge of students with visual impairment in the use of ICTin the University.
- Describe the competency levels of students with visual impairment in using ICT as a tool for learning in the university.
- Discuss the challenges students with visual impairment face in the use of ICT for learning in the university.
- Describe strategies that can enhance knowledge and competencies of students with visual impairment in using ICT for learning and development.

1.3. Research questions

The following research questions were raised to guide the study:

1. What knowledge do students with visual impairment in the University of Education, Winneba have in the use of ICT?
2. What level of competence do students with visual impairment have in the use of ICT for learning in the University?
3. What challenges do students with visual impairment face in the use of ICT for learning in the University?
4. What strategies can be adopted to help students with visual impairment to improve their knowledge and competencies in using ICT in the University?

1.4. Significance of the Study

This study is significant because it would reveal the knowledge and competencies of students with visual impairment in the use of ICT. The findings could be used by the

Department of ICT Education to develop strategies to support such students to become more competent users of ICT so as to enhance their participation in learning. Also, the Department of Special Education would use the report to identify the gaps in ICT knowledge and competencies of students with visual impairment in order to support the Department of ICT Education to assist the students to improve. Furthermore, the report of the study would be beneficial to students with visual impairment because they would receive requisite support from lecturers in the Department of ICT Education and Department of Special Education to become more competent users of ICT, which would enhance participation in learning and empowerment. Finally, the findings of the study would be added to the existing literature for any other researchers interested in similar studies.

1.5. Delimitation

Even though, there are various categories of students with disabilities in the University of Education, Winneba, this study focused on only students with visual impairment in the University. Again, while students with visual impairment were enrolled in other universities in the country, only students with visual impairment in the University of Education, Winneba participated in the present study..

1.6. Operational definition of terms

- **Information and Communication Technology (ICT):** refers to the study, design, development, implementation, support or management of computer-based information systems, particularly software applications and computer hardware.

- **ICT Competencies**: having the knowledge and skills to manipulate and use computer applications to perform a specific task to improve academic performance (booting and shutting down computers including the use of Job Access With Speech (JAWS), Nonvisual Video Access (NVDA), screen readers, screen magnifiers, saving and locating documents on the computer etc.)
- **ICT knowledge:** this refers to the ability to use computer hardware components, software applications and the use of the internet to enhance academic performance.
- **Students with visual impairment:** is an umbrella term referring to individuals who have lost their sight partially or totally and with or without being able to perceive light to use their vision to do what the "normal" people can use the eye sight for.

1.7. Structure of the Study

This study was organized into five chapters. The chapter one deals with the introduction to the main study, which discussed the background to the study, the statement of the problem, the purpose of the study, and research questions. Also, the significance of the study, delimitation, limitation, the operational definition of terms used in the study and the structure of the study were stated in this chapter. The chapter two presented the relevant related literature review based on the key themes raised from the research questions. Chapter three covers the methodology used for the study. This include research methodology, research design, population, sample size and sampling techniques, as well as instrumentation, procedure for data collection, validity and reliability issues, the pre-test, ethical considerations, and the analysis of data. Chapter four focused on the results

and the discussion of the findings, while chapter five covers the summary, conclusion and recommendations of the study. Contrribution to knowledge, as well as suggestions for further research are also presented in chapter five.

CHAPTER TWO

LITERATURE REVIEW

2.0. Introduction

This chapter presents a review of related literature for the study. The following are the subheadings under the literature review:

1. Theoretical framework
2. Students with visual impairment
3. Knowledge of students with visual impairment in using ICT
4. Competencies of students with visual impairment in using ICT
5. Challenges students with visual impairment face in using ICT
6. Strategies for improving ICT knowledge and competence of students with visual impairment.
7. Summary

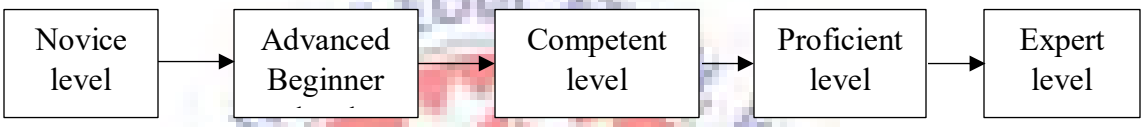
2.1. Theoretical framework

A number of theories were applicable to the study on ICT knowledge and competencies of students with visual impairment in the use of ICT. However, the researcher adopted the principles of the Dreyfus and Dreyfus (1980) Model of Skill Acquisition to support this study.

2.1.1 Dreyfus model of skill acquisition

Dreyfus and Dreyfus (1980) Model of Skill Acquisition addresses the issue of how students acquire skills through external instruction and experience. From the model, when individuals acquire a skill through external instruction they normally go through a number of developmental levels,displayed in Figure 1.

Figure 1: Model of skills acquisition



Source: *Dreyfus and Dreyfus (1980).*

According to Dreyfus and Dreyfus (1980), a student at the novice level appears to have inadequate understanding, and approaches tasks unintentionally. Generally, the instruction process starts by breaking down the task environment into context-free features which the students can identify without the benefit of knowledge of a particular situation in the instructional domain. The student shows a firm observation to the rules and plans that have been imparted to them, and have very little taught of the situation. They do not use any form of unrestricted judgment. In order to progress, the novice needs monitoring, either by self-observation or instructional feedback. This is to ensure that the student's behaviour is brought more into conformity with the rules and plans that rule involved in the activities. A student needs supervision to complete tasks at this level (Dreyfus & Dreyfus, 1980).

Dreyfus and Dreyfus (1980) also emphasized that when a student gets to the Advanced beginner level, he/she gains a working understanding of key aspects of practice, and tends to observe actions as a series of steps is achieved. Again, he/she can complete simpler tasks on his or her own without supervision. Also, he or she is able to complete some tasks using his or her own judgment, but with supervision needed for the entire work. At this level, he or she can confront complex situations, but is able to achieve to some extent.

More so, students at the competent level have a good working and background understanding of their skills. They see actions, at least, partly in context, and are able to finish work individually to a standard that is acceptable, though it may lack modification. They are able to achieve most tasks using their own judgment. Also, the students deal with complex situations through deliberate analysis and planning, realizing that competence comes after they have had considerable prior experience coping with real situations in which they note recurrent meaningful patterns (Dreyfus & Dreyfus,1980).

At the level of proficiency, students display a deep understanding, see actions holistically, rather than as separation into parts (Dreyfus & Dreyfus, 1980). At this level, the students see and appreciate what is most important in a situation, and can also notice situations of deviation from the normal pattern. They can attain a high standard of competence routinely, while decision-making becomes less difficult.

Finally, students at the expert level have an authoritative or deep understanding of the skills they have acquired and implement. They need not to rely on rules and guidelines. They deal with normal matters intuitively, and are able to go beyond existing interpretations to acquire excellence with ease. At this point, students are able to take

responsibility for going beyond existing standards, and create their own interpretations. Furthermore, they are able to understand complex situations. Also, they have the ability to see the overall idea of a situation, and alternative approaches and visions of what may be possible.

The Dreyfus model is used fairly widely to provide a means of measuring and supporting progress in the development of skills, and also to provide a definition of an acceptable level for the assessment of skills. The model suggests that as students become skilled, they depend less on abstract principles, and more on concrete experiences (Lambert & Orrell, 2011). It further concludes that any skill-training procedure must be based on some model of skill acquisition at each level of training, so that it can address the appropriate issues involved in facilitating advancement and attainment of skills.

The justification for choosing this theory is based on the fact that ICT usage in the teaching and learning process requires some skills on the part of both teachers and students. These skills are based on the persons' knowledge and usage experience over time, which results in some desired level of expertise in the use of ICT. Thus, skill acquisition is a process of moving from one level to another. The Dreyfus model of skill acquisition is considered as appropriate for the study, given that it provides a framework that underpins this process.

With the Dreyfus model of skill acquisition, the study will be placed within a framework that will make it possible to investigate the ICT knowledge and skills that the participants in the study (students with visual impairment) possess, and the capacity to utilize technology in learning. In its totality, the model supports the suggestion that the acquisition of ICT knowledge and skills is not an end in itself, but rather a means showing

the level that must be experienced in order to attain proficiency and expertise, while improving upon one's performance with experience (Bottino, 2003). This definition informs the purpose of the study by ensuring that the levels of ICT knowledge and skills of the participants is not considered as the end points of what they can truly attain, but rather as snapshots of their current competency levels, which are subject to modification at a particular point in time. This understanding supports the choice of research design. Again, it provides a context on how best students with visual impairment could be guided to acquire skills in the use of ICT for learning and self-development.

2.2. Students with visual impairment

Visual impairment is often used as an umbrella term, but not all visual impairment are the same (Johnson-Jones, 2017). The term visual impairment covers deficiencies ranging from partial sight to blindness, with many different causes, including cataracts, glaucoma, corneal scarring, age-related macular degeneration, and diabetic retinopathy (Foster & Resnikoff, 2005). Pascolini and Mariotti (2010) have also indicated that the main causes of visual impairment globally, is the result of uncorrected refractive errors, cataract, and glaucoma. Also, visual impairment range from mild to severe (American Foundation for the Blind, 2012).

The National Dissemination Center for Children with Disabilities (2012) describes visual impairment as the consequence of a functional loss of vision, rather than the eye disorder itself. It is important to note however, that the degree of impairment, age of onset, particular eye condition, and aspect of the visual system affected, can determine how much correction is possible through glasses, contacts, medicine, or surgery (Johnson-Jones,

2017). In similar light, Douglas and McLinden (2005) and Douglas, McCall, McLinden, Pavey, Ware and Farrell (2009) described visual impairment as a term that outlines the wide spectrum of the loss of visual function, including visual acuity, accommodation, field of vision, colour vision, and adaptability to light.

However, the population of students with visual impairment is extremely diverse (Johnson-Jones, 2017). These students display a wide array of vision difficulties and a variety of adaptations to their vision loss. More so, Keil (2002) estimated that for all students with visual impairment, 50% have other disabilities in addition to their visual impairment. Ravenscroft, Blaikie, Macewen, O'Hare, Creswell, and Dutton (2008) even estimated a higher value of 71%. It is therefore very important to consider a variety of factors when designing an appropriate educational programme for students with visual impairment.

2.3. Knowledge of Students with Visual Impairment in using ICT

ICT has become the most critical resource for social and economic development over the past few decades and has given a tremendous boost in supporting new modes of delivery in training, teaching and learning (Samuel & Zaitun, 2005). Hakkarainena, Ilomaki, Lipponena, Muukkonena, Rahikainenb, Tuominena, et al. (2006) found that being able to use ICT tools such as computer, mobile phones, braille translators, scanners, printers, television, radio, audio recorders, software, internet and others such as videoconferencing, world wide web, and e-learning effectively, having a qualified education, getting a job and communication skills have become critical indicators of a good quality of life. Thus, knowledge and competencies in using ICT is increasingly required for education and employment, as well as for many activities of daily life. Bransford,

Brown, and Cocking (2000) compared the performance of experts and novices, on learning and transfer into practice, established that in order to develop competency in an area, learners must have a deep foundation of knowledge and be able to organize that knowledge in ways that facilitate retrieval and application as an emerging principle. The findings of Bransford, et al. (2000) showed the need for individuals to have a deeper knowledge and competency in using ICT as a tool to develop their social and economic lives, which would enable them to boost their academic and career success.

Applying this concept to ICT competency, Oliver (2000) argues that students must possess a wide variety of ICT knowledge for both academic and career success. Therefore, students with visual impairment in the University of Education, Winneba, need to have ICT knowledge and competencies to improve their academic success, and to promote their social and economic inclusion in order to reduce dependency on others.

2.3.1 *Computer knowledge of students with visual impairment*

One of the most important aspects of computer usage for students with visual impairment to manage within the ever-changing world of ICT is computer knowledge, which plays a significant role if students are to be more successful in life (Teye, 2014). According to Teye, computers in general have become powerful tools for extending educational opportunities to students including those with visual impairment in any educational system.

Computer knowledge has enabled changes in the way students acquire knowledge and has facilitated communication, increased access to information and supported deeper understanding of issues by developing problem-solving capabilities. It has a remarkable

potential to broaden the lives and increase the independence of students with visual impairment in using ICT as a tool for learning. For example, being able to boot a computer, shut down a computer, create folders, save files on the computer, use the mouse effectively, master the keyboard, identify and to locate icons on the desktop and so on would go a long way to enable students, who are visually impaired, not to rely on their sighted peers in order to access information that is not Braille, because with ICT knowledge and competencies, they can access the same news and academic materials as their sighted peers.

Numerous reasons account for the inability of students with visual impairment in the Univerity to use computers. Paramount among these reasons is the lack of competence of students in using computers, which results from their deficiency or insufficient knowledge and skills in using computers to enhance their academic progress (Bordbar, 2010; Peralta & Costa, 2007) and inadequate experience in using computers (Askar & Umay, 2001; Ozcelik & Kurt, 2007). A study conducted by Douglas and Long (2003) to examine behaviours of 10 adults with visual impairment in carrying out a copy-typing task found that the participants were inefficient in activities such as touch-typing and the use of shortcut keys. Douglas and Long therefore recommended the use of more proactive and creative strategies for improving skills and work techniques and adjusting positions of equipment and furniture.

Also, Teye (2014) investigated the computer competencies of students with disabilities in the University of Education, Winneba. The study involved 25 students with hearing impairment and 21 students with visual impairment. The findings were that 56.5% of the participants reportedly had some knowledge about computers. For example, they were able to boot a computer, shutdown a computer, and identify different types of icons

on a computer. However, some critical aspect of knowledge about computers were not mentioned by Teye in his study. These included the knowledge about combining multiple keys to perform specific tasks, knowledge about typing, editing and formatting text documents, as well as the knowledge and ability to save, open, and transfer files from one storage location to another. These issues are very important components of knowledge and competence in ICT that every student must possess. Therefore a study that seeks to determine participants' knowledge and competence in ICT must focus on these and other relevant issues that bother on helping participants to attain some desirable level of self-efficacy in ICT.

The role that computers and supporting accessories play in the teaching and learning process shows the need for students with visual impairment to accept and to manage with the ever-changing procedure and stage of computer usage in acquiring knowledge and skills in ICT for their academic programmes (Vidhya & Meena-Kumari, 2015). This to some extent would enable them to grab the spreading of educational opportunities in the era of ICT usage in the educational system going forward.

2.3.2 Knowledge of students with visual impairment about software

Computer software is one of the most important tools used in teaching ICT to students with visual impairment in today's world. A research conducted by User Agent Accessibility Guidelines (UAAG) cited in Mishra, Sharma and Tripathi (2010) indicated that the integration of persons with disabilities into social life and the school setting for effective communication and to enhance academic life, may depend on the use of software

such as Window-Eyes, JAWS, TOBII Eye tracking system, iCommunicator, Head-Mouse Extreme, Math Daisy and Text help system.

In many of the researches that have been carried out on the use of switches by children with visual impairment, the teaching of touch-typing, the use of screen magnification software, the use of software for developing spelling skills, and the use of concept keyboard and tactile overlays for teaching early tactile reading to students with visual impairment have been noted as being very critical for learning to use computers (Douglas & Long, 2003; Lancioni, 2007; Sales, Evans, Musgrove, & Homfray, 2006).

2.3.3. Knowledge of students with visual impairment about the Internet

The use of visual imagery in learning has increased dramatically, due to the graphical user interface, and the convergence of voice, video, and data into a common digital format. Advances in such standards, allow for the use of visual imagery to communicate ideas. Burmark (2002) claimed that teaching visual literacy can enhance students' learning and also improve students' options in the workplace; and further argued that to print materials and use internet sites effectively, an image-rich curriculum can reach more students and teach them more quickly and meaningfully than traditional written student reports, text-based, and verbal instruction. According to Hasselbring and Glaser (2000), being able to use computer and Internet effectively, having an educational qualification, getting a job and having communication skills have become prerequisites for improved quality of life. Thus, the use of computers and the World Wide Web is increasingly required for education and employment, as well as for many activities of daily life. While these changes have improved society in many respects, they can also hinder the

progress of students with visual impairment who may have significant difficulty processing the visual cues presented by modern graphical user interfaces (Chiang, Cole, Gupta, Kaiser, & Starren, 2005).

A study conducted by Hackett and Parmanto (2006) about usability for web site accessibility, involved six computer users with visual impairment (two men and four women, aged 40 and older). In the study, six think-aloud assessments were conducted to compare access with the standard web display, with the goal of improving the design of access by identifying usability issues. The results showed that the adults with visual impairment were more satisfied with transformed website. This was because the transformed websites offered the participants an alternateive means of accessing the content of the websites. Also, Bayer and Pappas (2006) found that especially navigation and screen reading posed problems for blind internet users. Another study related to access and use of web by visually impaired students recommends web-site designers to be sensitive to the needs of visually-impaired users when preparing their information sites (Jones, 2004).

2.4. Competencies of students with visual impairment in using ICT

ICT in education has undeniably brought about a transformation in teaching and learning processes (Rather & Kuraishy, 2015), and is expected to expand educational results and also improve the quality and effectiveness of teaching and learning (Jaffer, Ng'ambi, & Czerniewicz, 2007). Nevertheless, Oliver (2000) argues that the possession of an inclusive diversity of ICT competencies is required for both academic and career success. Students with visual impairment need to have some basic ICT competencies to

embark on activities such as searching for information, submission of assignments and communication in higher education like the University of Education, Winneba. Students, including those with visual impairment however, have a variety of capabilities subject to the type and/or quality of their ICT competencies (Teye, 2014). These competencies help improve an individual's capabilities of using ICT tool like computers, mobile phones, braille translator, printers, scanners, hard and software applications, databases, and other technologies to attain a variety of objectives (Association of Colleges & Research Libraries [ACRL], 2005).

Elder and Koehn (2009) have indicated that absence of competencies may lead to a delay in learning or increase in frustration among students. For this reason, some basic ICT competencies are required in order for students with visual impairment to survive in higher education. For example, being able to boot and shut down computers, mastering the keyboard to type their own work, submitting their assignments on time using the internet, searching for information for their academic work, saving files on their computers for future use, creating folders on their computers to store information and data, using videoconferencing to chat with friend and relatives who are far and near; and also using social media such as whatsapp, twitter, tango, Instagram, imo, facebook amoung others, to communicate with friends and families (De Wit, Heerwegh, & Verhoeven, 2012).

Several studies have been, conducted to examine the level of knowledge and competencies in ICT among different individuals. One of such studies conducted by Peterson and Palmer (2011) on level of technology competence among 1500 pre-service students established that majority of participants felt that they were competent enough to integrate technology into their teaching, and to use such technology in their future teaching

as well. Also, Albion (2007) conducted a study involving 516 student teachers about their technology competence in finding information on the internet. The findings revealed that the participants exhibited high levels of confidence and competence because of their high ICT knowledge and familiarity with the help of assistive technologies. This implied that when an individual's knowledge and skill level in ICT is high, they normally feel competent and confident in using the technology.

A related study found that students with higher computer literacy were more inclined to use computers and online library resources (Tella & Mutula, 2008). Furthermore, in a survey of 257 students, Yu, Kim and Roh (2001) discovered that the ICT knowledge and competencies of the participants were not sufficient. They argued that the lack of knowledge about computers creates anxiety on its use, whereas increasing knowledge and familiarity with computers is important for ICT usage. Finally, they advocated for the provision of some fundamental knowledge and competencies in ICT, to facilitate learning. Also, in a study involving 26 students, Edwards, Portman and Bethea (2012) found that the level of ICT knowledge and competence of students increased based upon their completion of a computer course where the needed ICT tools were available. The results indicate that ICT competency is a developmental skill which can be enhanced with knowledge acquired from an introductory computer course.

Edwards et al. (2012) confirmed the study by Wu and Yeh (2012) on 443 students from the Departments of Chinese Literature, Sociology, and Computer Science, National Taiwan Univesity, which revealed that the Computer Science students were more confident to master ICT competencies than students of other subject fields because of their access to available resources. According to Wu and Yeh (2012), Computer Science students depend

more heavily on computers, and therefore are more computer literate because of the subject knowledge. This outcome implies that people, who take courses in ICT-related fields, are more likely to use ICT for their daily activities, including teaching and learning. It is clear that people's ICT competencies depend on the type and/or quality of their functional competencies to acquire more knowledge for computer usage.

According to the Association of College and Research Libraries (2005), functional competencies enhance an individual's capabilities of using ICT resources such as computers, software applications, databases, and other technologies to achieve a variety of goals. Elder and Koehn (2009) have shown that the lack of competencies may lead to a delay in learning or increase in frustration among students. For this reason, some basic ICT competencies are highly required in order for both teachers and students including those with visual impairment to be able to cope with the current trends in education (De Wit, Heerwegh, & Verhoeven, 2012). Several studies have investigated the level of ICT competencies possessed by different professionals and individuals in the educational sector (Masood, Khan, & Waheed, 2010; Nwachuku, 2004).

Similarly, Callinan (2005) observed that students with visual impairment' lack of ICT competencies on one hand, and their unfamiliarity with library computer systems on the other, has created some difficulty for them in finding course-related materials in library electronic catalogues. These findings agreed with earlier conclusions made by researchers such as Majid and Abazova (1999), and Shelstad and Clevenger (1996), who reported that individuals with higher computer self-efficacy appeared to be more competent in computer-related activities than those with low computer self-efficacy.

Also, Danner and Pessu (2013) investigated the ICT usage habits and perceived skillfulness of 100 university students in Nigeria. They found that there was a low level of ICT usage among the students, as a result of their low level of computer competencies. This confirmed the outcome of a study conducted by Ozoemelem (2010) which also found that there was a low level of skillfulness in the use of ICT among Nigerian university students due to lack of access to ICT tools.

Snoeyink and Ertmer (2001) suggest that the first stage of competencies training should focus on the basic operations of computer technology and software applications, emphasizing that once teachers have acquired the basic competencies, only then should they move on to differentiated pedagogical training according to their experience and competencies in using computers. In this way, differing amounts of competencies training could be delivered according to individual teacher's needs, leading to an improvement in their computer competency. According to Kaminski, Seel, and Cullen (2003), in order to provide effective solutions to help individuals achieve information technology fluency and competence, there is the need to determine their preferred method of learning about technology.

A study by Davis (1999) reveled that students learn ICT competencies with methods that best suit their learning styles. Davis reported that students felt trial and error, credit classes, and peer support were more effective than faculty support, online help, printed documentation and workshops. The findings of Davis seem to suggest that faculty support is not always valued by learners who seek to gain ICT competencies. It will be interesting to establish the views of students with visual impairment regarding which method of skill acquisition they prefer.

Khalid, Nawawi, and Roslan (2009) conducted a survey on the conditions that have influenced the use of ICT in secondary schools in Malaysia, based on eight conditions suggested by Ely (1999). These conditions are: 1) commitment, 2) leadership, 3) presence of knowledge and competencies, 4) rewards or incentives, 5) availability of resources, 6) dissatisfaction with the status quo, 7) participation, and 8) time. The study found that only three out of the eight conditions, including the presence of knowledge and competencies for using ICTs, influenced the decision to implement educational technology innovations. The finding appears to suggest that the commitment and determination of those included, strong leadership, together with a high level of technical and pedagogical knowledge and competencies, are conditions that facilitate the implementation of these education technology innovations.

2.5. Challenges students with visual impairment face in using ICT

The challenges to successful and effective use of ICT tools are as a result of several factors such as limited financial resources (Fifield & Fifield, 1997), high costs of equipment, lack of knowledge and support from teachers and lecturers teaching students with visual impairment ICT (Alper & Raharinirina, 2006), and eligibility issues for possessing ICT devices.

A national survey conducted in the United States of America on abandonment of technology by adults with various disabilities showed that almost one-third of ICT tools such as assistive technology devices were unused due to numerous factors: (a) lack of consideration and willingness to use the devices from the individuals with disability needs; (b) technology tools selected by family members, not the users; (c) complicated design; (d)

unreliable equipment; (e) insufficient funding for the assistive technology devices; and (f) lack of technical support.

Johnson (2011) reported that a lack of knowledge and awareness among people with disabilities, reluctance to use the devices, poor device performance, changes in needs or priorities, and feelings of stigmatization are major reasons for underused assistive technology devices such as ICT tools. Also, Kapperman, Sticken, and Heinze (2002) indicated that between 59 to 71 percent of students with visual impairment who had potential to use reading devices in elementary schools and high schools in Illinois, did not have opportunities to adopt the assistive technology devices. This presents major challenges to students with visual impairment in using ICT, and is somehow confirmed by Copley and Ziviani (2004), who identified six barriers to effective use of ICT devices among students with multiple disabilities. These include: (a) lack of appropriate staff training and support, (b) negative staff attitudes, (c) inadequate assessment and planning processes, (d) insufficient funding, (e) difficulties procuring and managing equipment, and (f) time constraints.

Soderstrom and Ytterhus (2010) researched into the symbolic values and use of assistive technologies from the world of ICT in the daily lives of 11 young Norwegians who were visually impaired. The outcome of the study showed that participants who are visually impaired rejected the use of ICT assistive technologies to improve their academic and social life. The participants who were partially sighted and were capable of participating in online interactions with their peers without ICT assistive technologies also reject them. The participants who were blind, however, did not have the option of participating in online activities without ICT assistive technologies and, consequently, they

accepted to use ICT assistive technologies. This showed that it is very important and necessary to put in place regulations that will ensure that students with visual impairment make use of assistive technology to develop their ICT competencies.

People with visual disabilities face special barriers in using the ICT aside from those related to material access and computer related trainings. Bayer and Pappas (2006) mentioned technical accessibility problems as one of the barriers that people with visual impairment face that needs to be tackled. They found that navigation and screen reading posed problems for the individuals with visual impairment on the internet usage. Bayer and Pappas further noted that there is a lack of computer training for persons withg visual impairment, and documented that the lack of training is at a crisis level.

Students with visual impairment in principle, are supposed to do a course in introduction to computer in Level 100. This course could be highly beneficial to these students, as it will help them to acqure skills and competencies for using ICT for educational purposes in the university. Despite the availability of a growing number of technology-enhanced and sophisticated assistive devices, they face a number of accessibility problems or challenges (Burzagli, Bill, Gabbanini, Paolo, & Enrico, 2004). Sicilia (2005) postulated that lack of access to ICT resources is a complex barrier to the acquisition of knowledge and competencies, and has noted that the difficulty associated with having access to ICT tools such as computers, software and internet are examples of such barriers.

2.5.1 *Accessibility of ICT tools by students with visual impairment*

The potential of accessible ICTs through the use of computers should be fully explored by national educational authorities and ministries with a view to updating national and regional policies to promote their use as a tool for achieving inclusive education. According to Bingimlas (2009), citing the British Educational Communications and Technology Agency [BECTA], 2004), the inaccessibility of ICT resources is not always merely due to the non-availability of the hardware and software or other ICT materials. It may be the result of factors such as poor organization of resources, poor quality hardware, inappropriate software, or lack of personal access. Toprakci (2006) found that fewer numbers of computers, and the oldness or slowness of ICT systems greatly affected the use of computers in schools. Also, Albirini (2006) indicated that insufficient computers and technological resources are some of the greatest impediments to technology integration and use in schools.

Students with visual impairment have to access knowledge via ICT to keep pace with the latest developments (Plomp, Pelgrum, & Law, 2007). ICTs also allow for the creation of digital resources like digital libraries where the students, teachers as well as professionals can access research material and course material from any place at any time (Bhattacharya & Sharma, 2007; Cholin, 2005). Such facilities allow the networking of academics and researchers and hence sharing of scholarly material. This avoids duplication of work (Cholin, 2005) by students including those with visual impairment.

2.5.2 *Support given during teaching and learning of ICT*

Williams, Jamali, and Nicholas (2006) asserted that students with cognitive and sensory impairment usually have specific information and communication needs, which, if well identified, can be supported with appropriate ICTs. In addition to enabling such people to use information related to their individual needs (Hakkarainena, et al, 2006), ICT and assistive technologies more generally can compensate for the impairment that people have, thus, enabling them to lead more fulfilled lives (Sandhu, Saarnio, & Wiman, 2001).

Li-Tsang, Chan, Lam, Hui-Chan, and Yeung (2004) also believed that ICTs could be tools for the empowerment of learners with special educational needs to explore their environments and develop their potentials in ways previously denied to them. Typical ICTs available for people with visual impairment in developed countries include the following: text to voice software for computers and mobile phones, Braille readers and embossers, and light on dark screens. Besides, there are numerous design features within computer hardware and software that can make them more user-friendly for people with disabilities (Hevner, March, Park, & Ram, 2004).

Williams, et al. (2006) content that an adaptation of ICT tools and software contents for learners with special educational needs fall within the social model of disability, and identifies the nature of the technology, but not the disability, as the cause of the unequal access and seeming exclusion of information technology for development of persons with special needs from the digital revolution. Additionally, the authors observed the overwhelming lack of research into the usability of ICTs provided for users with special educational needs, and accordingly suggested that greater attention be paid to it to enable

users with special educational needs to benefit significantly from such resources. Liu, Cornish, and Clegg (2007) have underscored the need for ICTs to be adapted to meet special educational needs in six key areas of need: emotional and social development, cognition and learning, behavioral, sensory, and communication and interaction.

However, very little research has yet been undertaken on the role of ICTs in supporting the learning needs of people with disabilities in the low income countries of the world. Recognizing this, the UK's Department for International Development appointed a major review of ways in which experiences from the developed countries of the world might be used to support people with special educational needs in Africa (Casely-Hayford & Lynch, 2003).

2.6. Strategies to help students with visual impairment in acquiring ICT knowledge and competence of using ICT

The use of ICT helps to eliminate geographical barriers as learners can log on from any place (Cross & Adam, 2007; Bhattacharya & Sharma, 2007; Mooij, 2007; Sanyal, 2001; UNESCO, 2002). It also provides new educational approaches (Sanyal, 2001). It can provide speedy dissemination of education to target disadvantaged groups (Chandra & Patkar, 2007; UNESCO, 2002). In simple terms, screen readers read the information that is displayed on a computer screen, and the text which is typed on the keyboard, in a human voice. A braille display also makes the same information appear on a braille line for individuals with visual impairment to read with their fingers (Singh, 2012). There are some computer applications specially marketed for use by people with visual impairment to minimize the challenges they face. These are designed to make the use of ICT tools as easy as possible for persons with visual impairment, but they can only achieve this by focusing

on some very basic tasks such as limited word processing and note taking. So most students with visual impairment use everyday computer applications such as Word, Internet Explorer and Outlook, and actually can do most of the tasks sighted people can.

Brush, Glazewski, and Hew (2008) opined that, the use of computer as a tool for students with visual impairment is intended to help in discovering learning topics, solve problems, and provide solutions to the problems in the learning process. This makes knowledge acquisition more accessible, and concepts in learning areas understood while engaging students with visual impairment in the application of ICT (computer usage). Castro Sánchez and Alemán (2011) also contended that the more frequently students with visual impairment are engaged in meaningful use of computers, the more they build new knowledge through accessing, selecting, organizing, and interpreting information and data. Based on learningthe use of computers, students with visual impairment are more capable of using information and data from various sources, and critically assessing the quality of the learning materials.

2.7. Summary of literature review

The related literature reviewed shows that ICT plays a major role in the education of learners including students with special needs (e.g., students with visual impairment) and has become a global concern in the 21st century to integrate ICT into the educational setting. The literature reviewed for this study started with the theoretical framework which informed the entry point of perspectives that underline issues of ICT knowledge and competencies of students with visual impairment. The review further focused on (a) students with visual impairment; (b) the knowledge of students with visual impairment in

ICT; (c) the competencies of students with visual impairment in using ICT; (d) the challenges students with visual impairment face in using ICT; and (e) the strategies that can be adopted to help students with visual impairment to acquire ICT knowledge and competencies. The literature review highlighted a number of barriers that make it difficult for students with visual impairment to acquire ICT knowledge and competence. Also, the literature review revealed that very little research has been conducted in Ghana on the competencies of students with disabilities in using computers and ICT tools, with no study yet on the ICT knowledge and competence of students with visual impairment, thus, presenting a gap which this study sought to fill.

CHAPTER THREE

METHODOLOGY

3.0. Introduction

This chapter presents the methods used for data collection of the study. These include research design, population, sample size, sampling technique, instrumentation, validity and reliability, procedure for data collection, ethical considerations, and the methods of data analysis.

3.1. Research Design

This study adopted the case study research design. Avoke (2005) defines a case study as the development of comprehensive and interactive knowledge about a single 'case' or a small number of related cases. Avoke explains that the case study design is a strategy which involves an empirical investigation of a particular contemporary phenomenon within its real or natural context. Furthermore, Avoke noted that a phenomenon is seen as the process of events, persons or things of interest to the researcher, while a case is a particular instance of the phenomenon.

This research adopted a case study because the study sought to investigate the ICT knowledge and competencies of students with visual impairment at the University of Education, Winneba. The adoption of this research design allowed the researcher to obtain firsthand information through a range of data collection techniques, including a test and focused group interviews. Another reason for choosing the case study design is because it provides more realistic responses, and is a very flexible design to adopt (Dampson & Danso-Mensah, 2012). The researcher further adopted the case study with the use of

quantitative and qualitative data analysis. The reason is that the quantitative and qualitative analyses could help to provide a more complete understanding of the study (Creswell, 2009). Looking at the two approaches, it was thought that sampling the views of respondents (quantitative approach) to generalize results to a wider population in the first phase, and subsequently, using focus group interviews (qualitative approach) to collect detailed views from the respondents, through would help in dealing with the biases that might occur when using a single approach in research.

3.2. Population

The population for this study included all 88 undergraduate students with visual impairment in the University of Education, Winneba. The breakdown is presented in Table 1 below:

Table 1: Population of the study

Level	Male F (%)	Female F (%)	Total F (%)
100	21 (23.9)	10 (11.4)	31 (35.2)
200	8 (9.1)	4 (4.5)	12 (13.6)
300	22 (25.0)	9 (10.2)	31 (35.2)
400	11 (12.5)	3 (3.4)	14 (15.)
Total	**62 (70.5)**	**26 (29.5)**	**88 (100.0%)**

Source: Field Data (2018).

3.3. Sample Size

Thirty-three students with visual impairment were randomly selected to participate in the study. Table 2 shows a breakdown of the sample.

Table 2: Sample size for the study

Level	Male F (%)	Female F (%)	Total F (%)
100	8 (24.2)	4 (12.1)	12 (36.4)
200	3 (9.1)	2 (6.1)	5 (15.2)
300	8 (24.2)	3 (9.1)	11 (33.3)
400	4 (12.1)	1 (3.0)	5 (15.2)
Total	**23 (69.7)**	**10 (30.3)**	**33 (100.0%)**

Source: Field Data (2018).

3.4. Sampling technique

In this study, the simple random sampling technique was used to sample 33 students to participate in the study. Random sampling, like other probability techniques are designed to ensure that cases studied are representative of a larger population in which the researcher is interested (Taylor, Bogdan, & De Vault, 2016). This sampling technique is conducted where each member of the population has an equal opportunity to become part of the sample. This strategy was used to ensure that pure chance dictated the selection of each respondent for the study.

In order to randomly select the participants, the researcher made a list of their index numbers in ascending order. Serial numbers were assigned to each member of the population. A random numbers table, adopted from Leedy and Ormrod (2005, p. 200, attached as Appendix C) was used to select the sample. With the aim of selecting an entry

block within the table, the researcher used any 2-digit number (number 37 was used) to determine the entry row and column numbers. A coin was tossed to determine which of the two numbers, 3 and 7, was to be used for selecting the row, and which one was to be used for selecting the column. The researcher decided that if the coin came down with the head on top, the first digit (number 3) would designate the row number, and the second digit (number 7) would designate the column number. After tossing, the coin came down with the head on top, therefore the researcher selected the block which intersects at row number 3 and column number 7 as the entry block.

The researcher then picked all numbers in the block ranging between 1 and 40, and moved downward to the next block to again pick all numbers between 1 and 40, until a total of 33 numbers were picked from the table. Every number which had been picked already from a previoius block was skipped. This was done to give every number the opportunity of being selected only once. The researcher then checked the serial numbers of the population to the numbers that were picked from the random numbers table, and selected the students whose index numbers appeared on the list which was picked from the table.

3.5. Instruments for data collection

The following instruments were used to collect data for the study:

- Test
- Focused Group Interview

3.5.1 *Test*

The researcher developed an instrument to measure the participants' level of competence in the use of ICT tools. This instrument was developed in order for the researcher to obtain firsthand information of the practical ICT skills of the participants. The instrument contained 46 test items which were grouped under five categories; namely, (1) basic computer operations; (2) software and applications; (3) word processing; (4) email and other communication platforms; and (5) web browsing and online research. These groupings were used in developing the instrument because it constituted a set of knowledge and skills that are deemed important and worthy of note by any person who is to be considered as knowledgeable and competent in ICT (Apeanti & Essel, 2015; Uimueka, Altuna, & Ateu, 2010). The section on basic computer operations focused on the knowledge and competence of the participants in performing functions such as booting and shutting down of computers, connecting and ejecting external storage media, and activities that fall under file management. The next category, which was software and applications, also focused on knowledge and competence of participants in the installation and use of software and specific applications on computers.

Also, the category on word processing dealt with the knowledge and competence in the use of Microsoft Office Word and other word processing applications for tasks such as creating, editing and appropriately formatting word documents. The section on email and other communication platforms concentrated on the knowledge and competence of the participants in the use of email systems and other communication platforms like whatsapp and facebook for communication purposes. The last category, i.e., web browsing and online research, specifically dealt with participants' knowledge and competence in accessing the

internet and searching for information on specific websites and online library portals. It also focused on the ability of participants to evaluate online information for accuracy, relevance and appropriateness.

3.5.2 *Focused Group Interview*

A semi-structured focus group interview guide was used to collect data from the participants. In all there were three groups, with each group made up of eight students. A semi-structured focused group interview was used because it offers sufficient flexibility to approach different respondents differently while still covering the same areas of data collection (Hayford, 2013). According to Hayford, the semi-structured focused group interview, when employed, enables respondents to shift the agenda and contribute their own line of thought whenever they wish to do so.

The focus group interview strategy was chosen because it encourages participants to speak out so as to help the researcher to have a broad perspective of the range of views expressed by the participants, in order to generate a collective view of the issue under investigation (Cohen, Marion, & Morrison, 2007). Again, the focus group interview was chosen because it creates a platform for a face-to-face interaction between the researcher and a group of participants with the focus on finding out the participants' perspectives on their lives, experiences or situations as expressed in their own words (O'Donoghue, 2007) about variables raised in each of the research questions.

3.6. Procedure for Data Collection

The researcher first distributed copoes of a letter of introduction from the Department of Special Education of the University of Education, Winneba, to all the particupants that sought permission for the researcher to conduct the study with the participants. Subsequently, a familiarization visit was made to the Resource Centre for Students with Special Needs (RCSSN), in UEW, to inform participants about the intention and purpose of the research. The participants were assured of the necessary confidentiality and anonymity. Furthermore, the mode for the test activities and the focused group interviews, as well as how to record the focused group interview data, including the date, time, and venue for the focused group interviews were discussed and agreed upon between the researcher and the participants. Each focused group interview session lasted between 35 to 40 minutes, in order not to take much of the participants' time. The test activities and the focused group interviews were conducted at the RCSSN from the 16th to 18th of April, 2018. The data collection processes started at about 10:00am and ended at about 11:00am on each day. All the focused group interviews were recorded by the researcher using a smartphone, and transcribed for the analysis.

In the interviews, the researcher included probes and prompts to aid further exploration of his own line of questioning. The probes and prompts helped to explore and develop the views of the participants, and to prevent participants from going off the main line of questioning (Acheampong, 2017). The focused group interview items were based on two major variables in the study, involving the challenges students with visual impairment face in using ICT as a tool to enhance their academic performance, and the

strategies to improve upon the knowledge and competencies of students with visual impairment in using ICT.

3.7. Validity

To ensure that both the test items and the focused group interview items had the adequate validity, several procedures were adopted. Firstly, a content-related evidence was used by the researcher for both the test items and interview items, which were carefully designed and built on the key themes raised in the research questions. Secondly, the items were given out to three senior lecturers in the Department of ICT Education for expert judgment on the clarity of statements, appropriateness of language, and clarity of directions of the test items. Suggestions offered by these experts, in terms of corrections were incorporated into the revision of the instrument. Thirdly, the items were taken to the research supervisor to further probe the appropriateness of the items, and all the corrections and directions offered were complied with. Similarly, the interview guide was also given to experts in the Department of Special Education and the research supervisor to review and approve. All these steps were taken to ensure that the instruments would provide valid data.

3.8. Reliability

To determine the reliability of the test instrument, a pilot-test was conducted on a sample of 15 students with visual impairment at the University of Education, Winneba, who were not part of the participants sampled for the study. The reliability coefficient was calculated to determine the internal consistency of the items in the test instrument. It was

found out from the calculation that the Cronbach's alpha co-efficient obtained was 0.97, which is greater than the standard value of 0.80, accepted for social science research (Field, 2009; Hof, 2012). Therefore, the test instrument was deemed to be reliable to be used for this study. Table 3 provides the details of the test of reliability of the instrument.

Table 3: Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	Number of Items
0.971	0.970	46

Source: Result of SPSS Analysis

3.9. The Pre-test

The test instrument was pre-tested on 15 students with visual impairment who were not part of the sample. The purpose of the pre-testing was to establish the validity and reliability of the test instrument by checking for clarity of items, instructions and layout as well as to gain feedback on the instrument (Cohen, et al., 2007). The pre-test was conducted to determine whether the test instrument would be understood by the sample from whom data would be collected in the study. Results from the pre-test informed the researcher on whether the participants understood the items in the instrument. This offered the researcher an opportunity to modify the instrument by making changes to items which needed further clarification, and also re-ordering the items to have a natural sequence of the activities.

3.10. Ethical Considerations

Ethical issues in social science research are of high relevance and therefore require due consideration. The ethical consideration in research is about creating a relationship which maintains mutual respect and responsibility, in which participants are pleased to

honestly respond, in order to obtain valid results. As a result of the above, the researcher, before the commencement of the data collection, sought approval witha letter of introduction to the RCSSN. This was done to gain access and use the facilities at the Centre for the data collection exercise. Also, the letter was presented to the lecturers in the Department of ICT to introduce the researcher to them. The researcher also visited the participants to explain the purpose of the study and also to assure them of the needed confidentiality and anonymity.

Again, the participants who took part in the test of knowledge and competency were informed and assured of the fact that the results of the test were solely for research purposes, and was not going to be used for any form of assessment. Hence the researcher encouraged the participants to conduct the test to the best of their competence, without any exaggerated performances. Participants were assured of their protections and privacy, and were also reminded of their rights to withdraw from the study should they feel the need to do so.

3.11. Analysis of Data

The data analysis was done in two fold. The first aspect focused on data collected with the test items, and the second aspect was based on the focused group interview data.

3.11.1. *Test data*

To answer research questions one and two which sougt to examine the participants' knowledge and competencies in using ICT tools, data were collected by using test items. The data were then put through appropriate descriptive statistical analysis where frequencies, percentages, and mean scores were used to describe data on the basis of the knowledge and competence of the participants to the test items, which were categorized under specific categories. The test items, which were in the braiile format, were numbered 1 to 46 for easy analysis. The amount of time participants spent on each activity was also recorded and used for the analysis. This was done to find out the speed at which participants could perform the activities, which was then used to determine their competence on the specific activity. Appropriate tables were used where necessary to clearly present the data. The results were subsequently discussed and supported with evidence from related literature.

3.11.2. *Focused Group Interview* data

To allow for the identification of the various viewpoints that were expressed and how each opinion reflected the major themes raised in research questions three and four, the responses from each focused group were played back repeatedly. Each major theme that emerged from the data was identified and noted. The various opinions expressed were then compared and categorized according to the emerging themes within the data. Unique

codes were assigned to the responses by using the key words in each theme. The data was then analyzed thematically, and where necessary, verbatim expressions of responses were presented to buttress the findings. This approach was adopted with reference to the suggestion by Lune and Berg (2017, p. 41), who noted that "qualitative data need to be reduced and transformed (coded) in order to make them more readily accessible, understandable, and to draw out various themes and patterns".

3.12. Limitations

There was difficulty scheduling appointments with some of the students with visual impairment for the data collection, especially the test activities. This was because some of the participants had different schedules for academic and social activities. This delayed the data collection for some time. However, this challenge was overcomed by scheduling a meeting with the participants on a Saturday where everybody was available to participate in the study. Also, the pre-test was severely delayed due to the frequent changes in appointments between the researcher and the students who were selected for the pre-test. Again, this challenges was resolved by rescheduling the meeting date with the participants of the pre-test. In spite of all the limitations mentioned, the outcome of the study was not significantly affected.

CHAPTER FOUR

RESULTS AND DISCUSSION OF FINDINGS

4.0: Introduction

This chapter presents the results and discussions of the findings of the data analyses. The chapter is divided into two sections: the first section presents the results of the analysis of the quantitative data, which were collected with the test instrument, whiles the second section presents the results of the qualitative data collected through focused group interviews. The data were analyzed in accordance with each research question posed.

4.1: Analysis of quantitative data

The quantitative data were analyzed based on each set of activities performed by the participants. In the analysis, demographic data of the participants, which included age, gender, and type of visual impairment, were presented first;followed by the results of the test activities performed by the participants, which were categorized into various levels of knowledge and competencies, ranging from "No Knowledge" = 0, "Novice" = 1, "Advanced Beginner" = 2, "Competent" = 3, "Proficient" = 4, and "Expert" = 5. The results of the frequency, percentage and mean scores of the performances of the participants in the test items were used for the analysis.

4.1.1: *Demographic data*

The demographic data of the participants were collected. These data included details on age, gender, and the type of visual impairment. Table 4 shows the demographic information on participants.

Table 4: Demographic information of the participants (n=33)

Variable		Frequency	Percentage
Age	Below 20 years	2	6.1%
	20 – 25 years	16	48.5%
	26 – 30 years	10	30.3%
	31 – 35 years	3	9.1%
	36 – 40 years	2	6.1%
	Above 40 years	0	0.0%
Gender	Male	23	69.7%
	Female	10	30.3%
Type of Visual Impairment	Low Vision	14	42.4%
	Blind	19	57.6%
Total		**33**	**100.0%**

Source: *Result of SPSS Analysis (2018).*

Thirty-three participants were involved in the study. This was made up of 2 (6.1%) participants whose ages were below 20 years, 16 (48.5%) participants aged between 20 and 25 years, 10 (30.3%) participants aged between 26 and 30 years, 3 (9.1%) participants aged between 31 and 35 years, and 2 (6.1%) participants aged between 36 and 40 years. The participants' demographic data implied that majority of the participants were in the age range of 20 and 30 years, which represented 78.8% of the participants, and suggested that the participants were fairly young people. The outcome showed that 45% of them were older students. Granting that learners normally completed junior high school by the age of 15 years, and senior high school by the age of 19 years, it is expected that majority of the students should be within the ages of 20 yeares and 25 years. Also, it was found that majority of the participants were male (23, representing 69.7%) while the remaing 10

(30.3%) were female. Again, the data showed that out of the 33 particiapnts who were involved in this study, 42.4% were students with low vision while the remaining 57.6% were students with blindness. Thus the majority of the participants were blind.

4.1.2: Research Question 1

What knowledge do students with visual impairment in the University of Education, Winneba have in the use of ICT?

To answer this research question, the frequency, percentages, and mean scores of the participants' performances in the test were used. These items sought to address issues concerning the knowledge that students with visual impairment have about ICT. Specifically, five areas of ICT knowledge and competencies were measured. These were on "*Basic Computer Operations", "Software and Applications", "Word Processing", "Email and Other Communication Platforms", and "Web Browsing and Online Research"*. The performances of the participants in the test on Basic Computer Operations are presented in Table 5. The researcher used only two response levels for this research question, the number 0 was assigned to responses that indicated no knowledge of a particular activity, and 1 for knowledge in that activity. Therefore, a mean score greater than 0.5 were interpreted to mean knowledgeable whiles mean scores less than 0.5 were interpreted to mean participants were not knowledgeable in the activitiy in question.

Table 5: Knowledge in Basic Computer Operations (n=33)

Variable	Responses

Basic Computer Operations	No Knowledge F (%)	Knowledgeable F (%)	Mean*	Intepretation
1. Start or boot a computer	10 (30.3)	23(69.7)	0.70	Knowledgable
2. Restart a computer.	16 (48.5)	17 (51.5)	0.52	Knowledgable
3. Shut down a computer.	14 (42.4)	19 (57.6)	0.58	Knowledgable
4. Use the keyboard to scroll through a document.	12 (36.4)	21 (63.6)	0.64	Knowledgable
5. Insert and eject removable drives from USB Ports.	15 (45.5)	18 (54.5)	0.55	Knowledgable
6. Scan removable drives for viruses.	22 (66.7)	10 (30.3)	0.45	No Knowledge
7. Format a removable drive (pen drive).	25 (75.8)	8 (24.2)	0.24	No Knowledge
8. Determine the storage capacity of a drive.	26 (78.8)	7 (21.2)	0.21	No Knowledge
9. Create and name files and folders.	25 (75.8)	8 (24.2)	0.24	No Knowledge
10. Access files from different storage locations on a computer.	16 (48.5)	17 (51.5)	0.52	Knowledgable
11. Delete files from a computer.	16 (48.5)	17 (51.5)	0.52	Knowledgable

Source: *Result of SPSS Analysis (2018).* ***Key***: F = Frequency; % = Percentage
*Mean Score > 0.5 = Knowledgeable
*Mean Score < 0.5 = No Knowledge

From the results, 69.7% of the participants were knowledgeable in starting or booting a computer, compared to 30.3% who indicated that they could not start or boot a computer. Also, with respect to knowledge on restarting a computer, 51.5% of the participants indicated that they have this know-how, whiles the remaining 48.5% stated

that they have no knowledge on restarting a computer. Again, 57.6% of the participants showed that they had knowledge in shuting down a computer, with 42.4% having no knowledge for this activity. Also, on the use of the keyboard to scroll through a document and the ability to insert and eject removable drives from USB ports, it was revealed that 63.6% and 54.5% of the participants, respectively, were knowledgeable, compared to 36.4% and 45.5% of participants, respectively, who indicated that they had no knowledge for these activities.

These outcomes showed that majority of the participants were knowledgeable about the basic computer operations of booting, restarting, shuting down of computers, using the keyboard for scrolling, and inserting and ejecting USB drives from ports. This finding agrees with the viewpoint of De Wit et al. (2012), who stated that in order for students with visual impairment to survive in higher education, they must seriously acquire the basic competencies of being able to boot and shut down computers, master the keyboard, use the internet, search for information for their academic work, save files on their computers for future use, create folders on their computers to store information and data, and also use social media such as whatsapp, twitter, tango, instagram, imo, facebook for communication purposes. The results, however, showed that majority of the participants were not knowledgeable in scanning removable drives for viruses (66.7%), as well as formating a removable drive (75.8%). Also, 78.8% of the participants indicated that they were not knowledgeable in determining the storage capacity of a drive, compared to 21.2% of the participants who indicated that they were knowledgeable in determining the storage capacity of a drive. Similarly, the results showed that 75.8% of the participants lacked

knowledge in creating and naming files and folders, while 24.2%. of the participants were knowledgeable in such activities.

Furthermore, the results showed that, with respect to accessing files from different storage locations on a computer, a small majority of the participants (51.5%) indicated that they were knowledgeable, 48.5% stated that they were not knowledageable. Similar results were obtained for the activity of deleting files from a computer, where 51.5% showed that they were knowledgeable, compared to 48.5% who indicated that they were not knowledgeable. These outcomes proved that most of the participants were not knowledgeable in the activities of accessing files from different locations, as well as deleting files from a computer. In summary, the findings from Table 5 suggest that, the majority of participants were knowledgeable in many of the activities that were categorized under basic computer operations.

Also, the performances of the participants in the test on the use of software and applications are presented in Table 6.

Table 6: Knowledge in the use of Software and Applications (n=33)

Variable	Responses			
Software and Applications	**No Knowledge F (%)**	**Knowledgeable F (%)**	**Mean***	**Intepretation**
1. Install new software on a computer.	26 (78.8)	7 (21.2)	0.21	No Knowledge
2. Use software such as JAWS or NVDA on a computer.	16 (48.5)	17 (51.5)	0.52	Knowledgable
3. Update software to current version.	27 (81.8)	6 (18.2)	0.18	No Knowledge
4. Playing music and video with a computer.	16 (48.5)	17 (51.5)	0.52	Knowledgable
5. Create backup copies of a document.	21 (63.6)	12 (36.4)	0.36	No Knowledge
6. Open and switch between more than one application at a time.	20 (60.6)	13 (39.4)	0.39	No Knowledge
7. Use a computer software to record audio files.	22 (66.7)	11 (33.3)	0.33	No Knowledge
8. Play audio files after recording.	13 (39.4)	20 (60.6)	0.61	Knowledgable

Source: *Result of SPSS Analysis (2018).* ***Key***: F = Frequency; % = Percentage
*Mean Score > 0.5 = Knowledgeable
*Mean Score < 0.5 = No Knowledge

It emerged from the results that majority of the participants were only knowledgeable in three out of the eight activities. These included the use of software such as Job Access with Speech (JAWS) or Nonvisual Video Access (NVDA) on a computer, where 51.5% of the participants were knowledgeable, compared to 48.5% were not knowledgeable; playing music and video with a computer, also with 51.5% of the

participants being knowledgeable, compared to 48.5% who were not knowledgeable; and playing audio files after recording, which had 60.6% of the participants indictaing that they were knowledgeable, while the remaining 39.4% showed that they were not knowledgeable.

On the other hand, the results on the remaining five activities under software and applications showed that majority of the participants were not knowledgeable in these activities. The results showed that 78.8% of the participants were not knowledgeable in installing new software on a computer. Also, it emerged that 81.8% of the participants were not knowledgeable in updating computer software to its current version, whiles 63.6% of the reespondents were found not to be knowledgebale in creating backup copies of documents. Again, with respect to opening and switching between more than one application at a time, and using a computer software to record audio files, the results indicated that majority of the respodents (60.6% and 66.7% respectively) were not knowledgeable. Overall, the outcome showed that majority of the participants lacked knowledge in activities that involved the use of software and other applications. These outcomes recorded suggested that majority of the participants were not knowledgeable in the use of software and applications.

Again, the result obtained from the participants in the test on word processing activities is presented in Table 7.

Table 7: Knowledge in Word Processing activities (n=33)

Variable	Responses			
Word Processing	**No Knowledge F (%)**	**Knowledgeable F (%)**	**Mean***	**Intepretation**
1. Enter and edit text in Microsoft Office Word.	19 (57.6)	14 (42.4)	0.42	No Knowledge
2. Insert and delete text in a document.	20 (60.6)	13 (39.4)	0.39	No Knowledge
3. Cut, copy and paste text into a document.	24 (72.7)	9 (27.3)	0.27	No Knowledge
4. Change text format and styles in a document.	30 (90.9)	3 (9.1)	0.09	No Knowledge
5. Bolden, Italicize and Underline text in a document.	25 (75.8)	8 (24.2)	0.24	No Knowledge
6. Create indentations in a text document.	30 (90.9)	3 (9.1)	0.09	No Knowledge
7. Number and bullet text in a document.	29 (87.9)	4 (12.1)	0.12	No Knowledge
8. Save a document.	31 (93.9)	2 (6.1)	0.06	No Knowledge
9. Open a document.	22 (66.7)	11 (33.3)	0.33	No Knowledge
10. Close a document.	17 (51.5)	16 (48.5)	0.48	No Knowledge
11. Rename a document.	17 (51.5)	16 (48.5)	0.48	No Knowledge
12. Print a document.	23 (69.7)	10 (30.3)	0.30	No Knowledge

Source: *Result of SPSS Analysis (2018).* ***Key***: F = Frequency; % = Percentage

*Mean Score > 0.5 = Knowledgeable

*Mean Score < 0.5 = No Knowledge

The results showed that majority of the participants were not knowledgeable in word processing activities. These were observed in the results that were obtained for all the twelve activities under word processing. The results revealed that for entering and editing text in Microsoft Office Word, 57.6% were not knowledgeable, compared to the remaining 42.4% who indicated that they were knowledgeable in this activity. Also, it was found that 60.6% of the participants had no knowledge in inserting and deleting text in a document, while 72.7% of the participants also were not knowledgeable in cutting, copying and pasting text into a document. Again, the results showed that 90.7% of the participants were not knowledgebale in changing the format of text and styles in a document, as well as creating indentations in a text document.

Furthermore, it was observed from the results that majority of the participants (75.8%) lacked knowledge on how to bolden, italicize and underline text in a document. Also, for numbering and bulleting text in a document, the results indicated that 87.9% of the participants were not knowledgeable in performing such activities. Again, it was found out from the results that majority of the participants (93.9%) were not knowledgeable in saving a documents, whiles 66.7% were also not knowledgeable in opening a document. Also, 51.5% of the participants were found not to be knowledgeable in closing a document, and also in renaming a document. Finally, the results showed that as many as 69.7% of the participants were not knowledgeable in printing a document. From the results obtained, it was deduced that majority of the participants were not knowledgeable in word processing activities.

Furthermore, the outcome of the test of participants' knowledge in the use of email and other communication platforms is presented in Table 8.

Table 8: Knowledge in using email and other communication platforms (n=33)

Variable	Responses			
Email and other communication platforms	**No Knowledge F (%)**	**Knowledgeable F (%)**	**Mean***	**Intepretation**
1. Compose and send an email.	27 (81.8)	6 (18.2)	0.18	No Knowledge
2. Read the content of an email.	27 (81.8)	6 (18.2)	0.18	No Knowledge
3. Send a document as an attachment to an email.	27 (81.8)	6 (18.2)	0.18	No Knowledge
4. Download a document attached to an email.	27 (81.8)	6 (18.2)	0.18	No Knowledge
5. Send messages using WhatsApp.	25 (75.8)	8 (24.2)	0.24	No Knowledge
6. Send messages using Facebook.	26 (78.8)	7 (21.2)	0.21	No Knowledge
7. Attach files to a WhatsApp message.	25 (75.8)	8 (24.2)	0.24	No Knowledge
8. Download pictures, audio, videos from WhatsApp messages.	25 (75.8)	8 (24.2)	0.24	No Knowledge

Source: *Result of SPSS Analysis (2018).* ***Key***: F = Frequency; % = Percentage
*Mean Score > 0.5 = Knowledgeable
*Mean Score < 0.5 = No Knowledge

Results for activities that were categorized under *email and other communication platforms* showed that majority of the participants were not knowledgeable in all the activities. This was observed from the outcome that 81.8% of the participants lacked knowledge about composing and sending an email, reading the content of an email, sending a document as an attachment to an email, and downloading a document attached to an email. Also, the results showed that 75.8% of the participants were not knowledgeable about sending messages using WhatsApp, attaching files to a WhatsApp message, as well

as downloading pictures, audio, and videos from WhatsApp messages. It was also found that 78.8% were not knowledgeable in sending messages using facebook. These outcomes suggest that majority of the participants were not knowledgeable in any of the activities that were tested under the use of email and other communication platforms. This indicated that majority of the participants did not engage in such activities, and therefore were not having any experiences in that regard. Finally, Table 9 showed the results of participants' knowledge on web browsing and online research.

Table 9: Knowledge in Web Browsing and Online Research (n=33)

Variable	**Responses**			
Web Browsing and Online Research	**No Knowledge F (%)**	**Knowledgeable F (%)**	**Mean***	**Intepretation**
1. Access the Internet.	24 (72.7)	9 (27.3)	0.27	No Knowledge
2. Use a web browser to access a website (www.uew.edu.gh)	27 (81.8)	6 (18.2)	0.18	No Knowledge
3. Search for information using google.	31 (93.9)	2 (6.1)	0.06	No Knowledge
4. Save a web page unto a computer.	23 (69.7)	10 (30.3)	0.30	No Knowledge
5. Download information from the internet.	28 (84.8)	5 (15.2)	0.15	No Knowledge
6. Evaluate online information for accuracy and relevance.	25 (75.8)	8 (24.2)	0.24	No Knowledge
7. Make reference to an online source of information.	30 (90.9)	3 (9.1)	0.09	No Knowledge

Source: *Result of SPSS Analysis (2018).* ***Key***: F = Frequency; % = Percentage
*Mean Score > 0.5 = Knowledgeable
*Mean Score < 0.5 = No Knowledge

From the results, it was found that majority of the participants (72.7%) were not knowledgeable about how to access the Internet, compared to the remaining 27.3% who have knowledge about how to access the Internet. Also, it was revealed that as many as 81.8% of the participants were not knowledgeable about using a web browser to access a website (for e.g., www.uew.edu.gh), with only 18.2% having that knowledge. Again, the results showed that 93.9% of the participants lacked knowledge about how to search for information using a search engine such as google, whiles 69.7% of the participants were not knowledgeable in saving a web page unto a computer. It was also found that 84.8% of the participants indicated that they lacked knowledge about how to download information from the internet, compared to 15.2% who have the knowledge for this activity. Furthermore, the results showed that 75.8% and 90.9% of the participants were not knowledgeable about evaluating online information for accuracy and relevance, and making reference to online sources of information respectively.

These results showed that the participants were not knowledgeable about the activities involved in web browsing and online research. Overall, the results showed that the participants were knowledgeable in some activities, while lacking knowledge in other activities. The outcome clearly supported the study by Haneefa and Syamili (2014), which found that 97.8% of the participants reported that they lacked competence, and therefore needed training in the use of the internet, although their analysis showed that a majority (86.0 %) of the students were computer literates. It therefore suggested that students with visual impairment needed critical training in the use of the internet, in order to enhance their ICT knowledge and competence.

Overall, the findings of this study confirmed that of a survey conducted by Hozmi (2008) in which a computer literacy programme was evaluated using 25 students with various disabilities, including deaf-blindness, visual impairment and hearing impairment. In the survey report, Hozmi (2008) noted that the participants had some degree of knowledge in some specific areas of ICT, while they lacked knowledge in other areas of ICT competence. The study also concluded that the participants reported a strong desire to further develop their knowledge and competence in ICT, confirming the position of the Dreyfus and Dreyfus (1980) model of skill acquisition, to the effect that access to knowledge, and regular training opportunities helps students to build upon their competencies.

4.1.3: Research Question 2

What is the level of competence of students with visual impairment in the use of ICT for enhancing their academic performance in the University?

Again, the use of the frequency, percentages, and mean scores of the participants' performances in the test were used to answer research question two, which sought to explore the levels of comptence of students with visual impairment in the use of ICT. The levels of ICT competence which were measured were *"Novice", "Advanced Beginner", "Competent", "Proficient",* and *"Expert"*. Also, the average time spent on each test item was recorded and used for the analysis. The time was recorded and used to determine the amount of time it took for the participants to perform each activity in the test, for the purpose of measuring their competencies. The time scale used for the analysis was

"Expert" = 1, Proficient" = 2, "Competent" = 3, "Advanced Beginner" = 4, "Novice" = 5, and "No Competence" = 6. Therefore, a mean time score was used to determine the appropriate interpretation for participants' level of competence in the activities. The performances of the participants in the test of competence in Basic Computer Operation are presented in Table 10.

Table 10: Competence in Basic Computer Operations (n=33)

Variable	Level of Competence							
Basic Computer Operations	**Expert** F (%)	**Proficient** F (%)	**Competent** F (%)	**Advanced Beginner** F (%)	**Novice** F (%)	**No Competence** F (%)	**Mean Time***	**Interpretation**
1. Start or boot a computer	0	2 (6.1)	5 (15.2)	4 (12.1)	12 (36.4)	10 (30.3)	3.30	Competent
2. Restart a computer.	0	0	1 (3.0)	3 (9.1)	13 (39.4)	16 (48.5)	4.00	Advance Beginner
3. Shut down a computer.	0	0	1 (3.0)	2 (6.1)	16 (48.5)	14 (42.4)	3.21	Competent
4. Use the keyboard to scroll through a document.	0	0	2 (6.1)	9 (27.3)	10 (30.3)	12 (36.4)	3.33	Competent
5. Insert and eject removable drives from USB Ports.	0	0	3 (9.1)	7 (21.2)	8 (24.2)	15 (45.5)	3.76	Advance Beginner
6. Scan removable drives for viruses.	0	0	1 (3.0)	4 (12.1)	6 (18.2)	22 (66.7)	5.27	Novice
7. Format a removable drive (pen drive).	0	0	0	0	8 (24.2)	25 (75.8)	5.55	Novice
8. Determine the storage capacity of a drive.	0	0	4 (12.1)	0	3 (9.1)	26 (78.8)	5.76	Novice
9. Create and name files and folders.	0	0	2 (6.1)	2 (6.1)	4 (12.1)	25 (75.8)	5.55	Novice
10. Access files from different storage locations on a computer.	0	0	1 (3.0)	4 (12.1)	12 (36.4)	16 (48.5)	3.91	Advance Beginner
11. Delete files from a computer.	0	0	1 (3.0)	4 (12.1)	12 (36.4)	16 (48.5)	4.09	Advance Beginner

Source: *Result of SPSS Analysis (2018).* ***Key***: F = Frequency; % = Percentage

*Mean Time Score 1 = Expert, 2 = Proficient, 3 = Competent, 4 = Advanced Beginner, 5 = Novice, 6 = No Competence

From the results, which was based on the average time used by the participants to perform a specific activity, and also based on the time scale (1 = Expert, 2 = Proficient, 3 = Competent, 4 = Advanced Beginner, 5 = Novice, 6 = No Competence) it was revealed that 36.4% of the participants did not have any competence in booting a computer. Out of the remaining number of participants who had some level of competence in booting a computer, majority of them (36.4%) were found to be at the *Novice* level of competence, whiles 12.1% and 15.2% of the participants were at the *Advanced Beginner* and *Competent* levels respectively. For shutting down a computer, it was obsereved that majority of the paricipants (42.4%) had no competence in this activity, whiles 48.5% of the participants were at the *Novice* level. Also, for using the keyboard to scroll through a document, the result indicated that 36.4% of the participants lack competence, 30.3% were novices in this activity, 27.3% of the participants were advanced beginners, while 6.1% were competent.

Again, for inserting and ejecting removable drives from USB ports, it was revealed that 45.5% of the participants had no competence for this activity. However, 24.2% of participants were at the novice level of competence, whiles 21.2% and 9.1% were at the advanced beginner and competent levels respectively. Furthermore, the result showed that 66.7% of the participants did not have any competence in scanning removable drives for viruses, whiles 18.2% and 12.2% of the remaining participants were novices and advanced beginners respectively for this activity. Furthermore, it was noted that 75.8% of the participants did not have competence in formatting removable drives, whiles the remaining 24.2% whio could perform this activity were at the novice level. Also, 78.8% of participants could not determine the storage capacity of a drive, compared to 21.2% who could perform this activity.

Also, the results indicated that majority of the participants (75.8%) had no competence in creating and naming files and folders. However, 6.1% of the participants were competent in performing this activity, another 6.1% could perform this activity at the advanced beginner level, while 12.1% of participants were at the novice level as far as this activity was concerned. When asked to access files from different storage locations on a computer, majority of the participants (48.5%) were found to have no competence in performing this activity. Out of the remaining number of participants were able to perform the activity, it was observed that 3.0% were at the competent level, 12.1% were at the advanced beginner level, whiles 36.4% were at the novice level. Finally, when participants were asked to delete files from a computer, it was found out that 48.5% of the participants could not perform this activity. However, it was noted that 3.0% were at the competent level, 12.1% were at the advanced beginner level, whiles 36.4% were at the novice level when it came to deleting files from a computer.

These outcomes suggest that for activities under Basic Computer Operations, majority of the participants had no competence at all. However, for those who possessed some level of competence, majority of them were found to be at the bottom of the competency scale. This finding corroborated that outcome of a study conducted by Yu et al. (2001), which reported that the ICT competence of many students was not sufficient. It also agreed with the findings of Callinan (2005) who indictaed that students with visual impairment lack ICT competence. Overall, the results of this study suggest that regular customized training for the students with visual impairment would be necessary to help them move from their current low level of competence to a higher level.

Table 11: Competence in using Software and Applications (n=33)

Variable	Level of Competence							
Software and Applications	**Expert** F (%)	**Proficient** F (%)	**Competent** F (%)	**Advanced Beginner** F (%)	**Novice** F (%)	**No Competence** F (%)	**Mean Time***	**Interpretation**
1. Install new software on a computer.	0	0	2 (6.1)	2 (6.1)	3 (9.1)	26 (78.8)	5.82	Novice
2. Use software such as JAWS or NVDA on a computer.	0	0	0	2 (6.1)	15 (45.5)	16 (48.5)	3.60	Advance Beginner
3. Update software to current version.	0	3 (9.1)	0	1 (3.0)	2 (6.1)	27 (81.8)	6.30	No Competence
4. Playing music and video with a computer.	0	0	7 (21.2)	1 (3.0)	9 (27.3)	16 (48.5)	3.96	Advance Beginner
5. Create backup copies of a document.	0	0	2 (6.1)	6 (18.2)	4 (12.1)	21 (63.6)	5.00	Novice
6. Open and switch between more than one application at a time.	1 (3.0)	0	5 (15.2)	3 (9.1)	4 (12.1)	20 (60.6)	5.09	Novice
7. Use a computer software to record audio files.	0	3 (9.1)	4 (12.1)	1 (3.0)	3 (9.1)	22 (66.7)	5.15	Novice
8. Play audio files after recording.	0	1 (3.0)	5 (15.2)	5 (15.2)	9 (27.3)	13 (39.4)	3.88	Advance Beginner

Source: *Result of SPSS Analysis (2018).* ***Key***: F = Frequency; % = Percentage

*Mean Time Score 1 = Expert, 2 = Proficient, 3 = Competent, 4 = Advanced Beginner, 5 = Novice, 6 = No Competence

With respect to activities categorized under *Software and Applications*, it was found out that majority of the participants were at the Novice level of competence.in four out of eight activities. These activities included installing new software on a computer, creating backup copies of a document, openning and switching between more than one application at a time, and using a computer software to record audio files. For instance, in installing new software on a computer, the test revealed that majority of the participants (78.8%) did not have any competence in performing this activity, whiles 6.1% of the participants were found to be at competent level and advanced beginner level respectively. The remaining 9.1% were also at the novice level of competence. These results show that installing software on computers is an activity that many students with visual impairment may experience difficulties in doing. Hence there is the need for training sessions for students with disabilities on software installation, since it is a major activity to be performed in their use of ICT.

Again, the results showed that majority of the participants were at the Advanced Beginner level with respect to three activities including using software such as JAWS or NVDA on a computer, playing music and video with a computer, and playing audio files after recording. This is evident from the result obtained for the specific activities. For instance, for using screen reading software such as JAWS and NVDA, it was found that 48.5% of the participants have no competence in performing this activity, whiles 45.5% and 6.1% exhibited competence in performing this task, but were found to be at the novice and advanced beginner levels respectively. This result showed that even though some of the participants were able to use screen reading software, their levels of competence were low. It is important to note that the use of screen reading software is critical for students

with visual impairment, since it is provides a medium through which they interact with the computer and its applications. Therefore, it is highly important for students with visual impairment to have competence in using such software,if they are to become active users of ICT.

Also, when the participants were tested on the competence in playing audio files after recording, it emerged that majority of them (60.6%) had some level of competence for this activity. Out of this majority, 3.0% showed that they were proficient in the activity, whiles 15.2% exhibited that they could perform the task at the competence level and andvanced beginner level respectively. It was also found that 27.3% of the participants were at the novice level of competent in the activity. Finally, it was noted that 39.4% of the participants could not perform the activity of playing audio recordings. This outcome suggested that some students with visual impairment are not able to use ICT tools such as audio recorders and computers to playback audio recordings of lectures. This impied that they must be trained on the use of such activities, in order to help them make use of ICT tools for their acadmic activities, including recording and playing back audio tapes.

For the activity of updating software from a previous version to its current version, the results indicated that majority (81.8%) of the participants do not have any competence at all. Only 18.2% of the participants exhibited some level of competence in this activity. Of this number, 9.1% were proficient, 3.0% were advanced beginners, and 6.1% were nvices. These outcomes gives an indication that the level of competence of the participants in the use of software and applications vary from activity to activity. Furthermore, the results of participants' levels of competence in word processing activities is presented in Table 12.

Table 12: Competence in Word Processing activities (n=33)

Variable	Level of Competence							
Word Processing	**Expert** F (%)	**Proficient** F (%)	**Competent** F (%)	**Advanced Beginner** F (%)	**Novice** F (%)	**No Competence** F (%)	**Mean Time***	**Interpretation**
1. Enter and edit text in Microsoft Office Word.	0	3 (9.1)	4 (12.1)	0	7 (21.2)	19 (57.6)	4.66	Advance Beginner
2. Insert and delete text in a document.	0	1 (3.0)	3 (9.1)	4 (12.1)	5 (15.2)	20 (60.6)	4.88	Advance Beginner
3. Cut, copy and paste text into a document.	0	1 (3.0)	1 (3.0)	5 (15.2)	2 (6.1)	24 (72.7)	5.48	Novice
4. Change text format and styles in a document.	0	0	0	1 (3.0)	2 (6.1)	30 (90.9)	6.60	No Competence
5. Bolden, Italicize and Underline text in a document.	0	0	4 (12.1)	0	4 (12.1)	25 (75.8)	5.60	Novice
6. Create indentations in a text document.	0	0	0	1 (3.0)	2 (6.1)	30 (90.9)	6.52	No Competence
7. Number and bullet text in a document.	0	0	2 (6.1)	1 (3.0)	1 (3.0)	29 (87.9)	6.42	No Competence
8. Save a document.	0	0	0	0	2 (6.1)	31 (93.9)	6.69	No Competence
9. Open a document.	0	0	2 (6.1)	0	9 (27.3)	22 (66.7)	5.24	Novice
10. Close a document.	0	0	1 (3.0)	0	15 (45.5)	17 (51.5)	4.12	Advance Beginner
11. Rename a document.	0	0	2 (6.1)	2 (6.1)	12 (36.4)	17 (51.5)	3.97	Advance Beginner
12. Print a document.	0	0	3 (9.1)	0	7 (21.2)	23 (69.7)	5.27	Novice

Source: *Result of SPSS Analysis (2018).* ***Key***: F = Frequency; % = Percentage

*Mean Time Score 1 = Expert, 2 = Proficient, 3 = Competent, 4 = Advanced Beginner, 5 = Novice, 6 = No Competence

Under *Word Processing*, the result indicated that majority of the participants were at the Advanced Beginner level in four out of the 12 activities. These activities included entering and editing text in Microsoft Office Word, inserting and deleting text in a document, closing a document, and renaming a document. For instance, when tested on the level of competence in typing and editing text in Microsoft Word, it was found that more than half of the participants (57.6%) had no competence, whiles 9.1% were proficient in the activity. Also, 12.1% of the participants were observed to be at the competent level, and the remaining 21.2% of the participants were at the novice level of competence. This result showed that majority of those who could perform the activity were at the lowest level of competence, which suggested that there must be strategies in place to help students with visual impairment to enhance their skills.

Again, for inserting and deleting text in a document, it emerged that 60.6% of the participants had no competence in perfoming this activity, whiles 15.2% were novices in doing this activity. It was also found that 3.0% of the participants were at the proficient level, 9.1% were at the competent level, and 12.1% were found to be at the advanced beginner level. Still further, it was obsereved that about half of the participants (51.5%) had no competence in closing a document, whiles 3.0% of them could perform this activity at the competent level, and the remaining 45.5% also completed the task at the novice level. Also, for renaming documents, it was found that 51.5% of the participants were not competent at all in performing this task. However, 6.1% of the remaining pariticpants were able to perform the activity at the competent level and advanced beginner level, and the remaining 36.4% performed the task at the novice level.

Also, it was found that majority of the participants were at the novice level of competence for the activity of cutting, copying and pasting text into a document. This was observed from the results of the test which indictated that 72.7% of participants had no competence in this activity. However, 3.0% of the participants were found to be at the proficient level and competent level respectively, whiles 15.2% and 6.1% were also observed to be at the advanced beginner level and the novice level respectively. This result suggested that the activities of cutting, copying and pasting text were not activities that majority of the participants were competent in performing. Furthermore, it was revealed that when it came to boldening, italicizing and underlining text in a document, as much as 75.8% of the participants had no competence at all, whiles 12.1% of the participants were able to perform the task at the competent level and novice level respectively.

Similar, majority of the participants were found not to have any competence at all in four other activities, namely changing text format and styles in a document, creating indentations in a text document, numbering and bulleting text in a document, as well as saving a document. For changing text format and styles in a document, it was revealed that 90.9% of the participants had no competence, whiles 6.1% of them were at the novice level of competence. The remaining 3.0% were found to be at the advanced beginner level of competence. Also, for creating indentations in a text document, the results showed that 90.9% of the participants did not exhibit any competence at all. Again, 6.1% of the participants were found to be novices in the activity, whiles the remaining 3.0% were noted to be at the advanced beginner level of competence. Still further, it was observed that majority of the participants had no competence in activities involving numbering and bulleting text in a document. This was revealed by the result which indicated that 87.9%

of participants did not have any competence at all, followed by 3.0% of the participants who were found to be at the novice level of competence. Also, another 3.0% were noted to be at the advanced beginner level, whiles the remaining 6.1% were at the competent level. Finally, for the activity of saving a document, the results showed that 93.9% of the participants were not competent at all, whiles the remaining 6.1% were found to be at the novice level in saving a document.

These outcomes shed some light on the level of competence of the participants in the most frequently done activity by students, which is word processing, and corroborated the findings of Teye (2014) which revealed that the majority of students with disabilities, especially those with visual impairment, do not have the requisite skills for word processing. This current finding implies that much work needed to be done in this category of ICT competence, to improve upon the performance of majority of the students with visual impairment. Also, the results of participants' levels of competence in the use of email and other communication platforms is presented in Table 13.

Table 13: Competence in using Email and other communication platforms (n=33)

Variable	Level of Competence							
Email and other communication platforms	**Expert** F (%)	**Proficient** F (%)	**Competent** F (%)	**Advanced Beginner** F (%)	**Novice** F (%)	**No Competence** F (%)	**Mean Time***	**Interpretation**
1. Compose and send an email.	0	0	3 (9.1)	1 (3.0)	2 (6.1)	27 (81.8)	6.30	No Competence
2. Read the content of an email.	0	0	0	4 (12.1)	2 (6.1)	27 (81.8)	6.30	No Competence
3. Send a document as an attachment to an email.	0	0	2 (6.1)	1 (3.00	3 (9.1)	27 (81.8)	6.21	No Competence
4. Download a document attached to an email.	0	0	1 (3.0)	3 (9.1)	2 (6.1)	27 (81.8)	6.18	No Competence
5. Send messages using WhatsApp.	0	0	0	1 (3.0)	7 (21.2)	25 (75.8)	5.58	Novice
6. Send messages using Facebook.	0	0	2 (6.1)	0	5 (15.2)	26 (78.8)	5.94	Novice
7. Attach files to a WhatsApp message.	0	0	2 (6.1)	1 (3.0)	5 (15.2)	25 (75.8)	5.73	Novice
8. Download pictures, audio, videos from WhatsApp messages.	0	0	0	3 (9.1)	5 (15.2)	25 (75.8)	5.69	Novice

Source: *Result of SPSS Analysis (2018).* ***Key***: F = Frequency; % = Percentage

*Mean Time Score 1 = Expert, 2 = Proficient, 3 = Competent, 4 = Advanced Beginner, 5 = Novice, 6 = No Competence

Table 13 showed results for activities that were categorized under *email and other communication platforms.* From the results, it was found out that, majority of the participants were at the Novice level of competence in four out of the eight activities in this category. These activities were sending messages using WhatsApp, sending messages using facebook, attaching files to a WhatsApp message, and downloading pictures, audio, videos from WhatsApp messages. In reference to sending messages using WhatsApp, it was observed that 75.8% of the participants had no competence in performing this activity, whiles 21.2% of the participants were at the novice level of competence. The remaining 3.0% were found to be at the advanced beginner level of competence in sending messages using WhatsApp.

Also, the results showed that 78.8% of the participants were not competent in sending messages using facebook. Out of the remaining number, 15.2% were at the novice level of competence, whiles 6.1% were found to be competent in performing this activity. Again, the result of the test conducted to determine participants' competence in attaching files to a whatsapp messages revealed that 75.8%, which formed majority of the participants, didi not have any competence at all, while 15.2% were noted to be at the novice level of competence. Also, 3.0% of the participants were found to be at the advanced beginner level, while the remaining 6.1% were at the competent level. Similar results were found for the activity involving the downloading of pictures, audio, videos from WhatsApp messages. It was observed that 75.8% of the participants were not competent at all, whiles 15.2% were noted to be at the novice level of competence, and the remaining 9.1% were at the advanced beginner level of competence. This outcome suggest that even though some of the participants were active users of social media applications such as WhatsApp and

Facebook, their level of competence in using these applications were relatively low (Novice Level).

Also, it was revealed that majority of the participants do not have any level of competence in four other activities under the category of *email and other communication platforms*. These activities included composing and sending an email, reading the content of an email, sending a document as an attachment to an email, as well as downloading a document attached to an email. When the participants were asked to compose and send an email, the result indicated that 81.8% of them were not competent. Also, 6.1% were found to be at the novie level of competence, 3.0% at the advanced beginner level, and the remaining 9.1% at the competent level. Again, in testing for participants' competence in reading the content of an email message, it was observed that 81.8% of them did not exhibit any competence at all, whiles 6.1% and 12.1% of the participants were found to be at the novice level and advanced beginner level respectively.

Also, the test on sending a document as an attachment to an email revealed that 81.8% of participants were not competent for this activity. It was also observed that 9.1% and 3.0% of the participants were at the novice level and the advanced beginner level respectively, whiles the remaining 6.1% were at the competent level. Furthermore, the results from the test on determing participants' level of competence in downloading a document attached to an email revealed that most of the participants (81.8%) were not competent in performing the activity. Also, it was found that 6.1% and 9.1% were at the novive level and the advanced beginner level respectively, whiles the remaining 3.0% were at the competent level.

This result suggest that majority of the participants do not send or receive email messages, and are therefore not enhancing their knowledge and competence in that regard. This outcome however contradicts Teye (2014) which reported that majority of students with disabilities, including those with visual impairment knew how to send and receaive email messages. Perhaps, this outcome is so because of some challenges they may be encountering in accessing the Internet.

Finally, the results of participants' levels of competence in web browsing and online research is presented in Table 14.

Table 14: Competence in Web browsing and online research (n=33)

Variable	Level of Competence							
Web Browsing and Online Research	**Expert F (%)**	**Proficient F (%)**	**Competent F (%)**	**Advanced Beginner F (%)**	**Novice F (%)**	**No Competence F (%)**	**Mean Time***	**Interpretation**
1. Access the Internet.	0	2 (6.1)	0	1 (3.0)	6 (18.2)	24 (72.7)	5.61	Novice
2. Use a web browser to access a website (www.uew.edu.gh)	0	1 (3.0)	0	0	5 (15.2)	27 (81.8)	6.06	No Competence
3. Search for information using google.	0	0	0	2 (6.1)	0	31 (93.9)	6.64	No Competence
4. Save a web page unto a computer.	0	1 (3.0)	4 (12.1)	5 (15.2)	0	23 (69.7)	5.55	Novice
5. Download information from the internet.	0	0	0	1 (3.0)	4 (12.1)	28 (84.8)	6.15	No Competence
6. Evaluate online information for accuracy and relevance.	0	1 (3.0)	3 (9.1)	3 (9.1)	1 (3.0)	25 (75.8)	5.79	Novice
7. Make reference to an online source of information.	0	0	2 (6.1)	1 (3.0)	0	30 (90.9)	6.52	No Competence

Source: *Result of SPSS Analysis (2018).* ***Key***: F = Frequency; % = Percentage

*Mean Time Score 1 = Expert, 2 = Proficient, 3 = Competent, 4 = Advanced Beginner, 5 = Novice, 6 = No Competence

From table 14, the results showed that for activities under the *Web Browsing and Online Research* category, majority of the participants were at the Novice level of competence in three out of the seven activities. These activies included accessing the Internet, saving a web page unto a computer, and evaluating online information for accuracy and relevance. In respect of accessing the Internet, it was revealed that 72.7% of participants were not competent in accessing the internet. Menwhile, 18.2% of the participants were at the novice level of competence, whiles 3.0% and 6.1% of the remaining participants were found to be at the advanced beginner level and the proficient level respectively.

Also, it was observed that for saving a web page unto a computer, 69.7% of the participants were not competent, whiles 15.2% were at the novice level of competence. Out of the remaining number, 12.1% and 3.0% were at the competent and proficient levels respectively. Furthermore, when participants were tested on evaluating online information for accuracy and relevance, it was found out that75.8% of them were not competent, whiles 3.0% were at the novice level of competence. Also, 9.1% of the participants were noted to be at the advanced beginner level and another 9.1% at the competent level, while the remaining 3.0% were found to be at the proficient level.

On the other hand, it was also revealed that majority of the participants do not have any competence in four other activities in this category. These activies included using a web browser to access a website (for e.g. www.uew.edu.gh), searching for information using google, download information from the internet, and also making reference to an online source of information. For the activity of using a web browser to access a website, it was observed that 81.8% of the participants were not competent in this task. Also, 15.2%

were found to be at the novice level of competence, while the remaining 3.0% were at the proficient level of competence. Similar findings were made for the activity of searching for information using google. It was found that 93.9% of the participants were not competent at all in this activity, whiles the rmaining 6.1% were at the advanced beginner level of competence. Furthermore, it was noted that when tested for competence in downloading information from the internet, 84.8% of the participants were found not to be competent. Of the remaining number, 12.1% and 3.0% were observed to be at the novice level and the advanced beginner level respectively. And finally, the test on participants' competence in making reference to an online source of information revealed that most of the participants (90.9%) were not competent, while 3.0% and 6.1% of them were at the advanced beginner level and competent level respectively. The results indicated that whereas some of the participants were slightly competent (Novice Level) in some activities involved in web browsing and online research, others also do not have any level of competence at all. In sum, the results showed that the participants' knowledge in some activities had a direct effect on their level of competence in other activities.

From the analysis of the data collected on the ICT competence of the participants, it was revealed that majority of the participants had some ICT knowledge which directly reflected on their level of competence in ICT, and further gave credence to the view that ICT knowledge is crucial for the attainment of ICT competence (Technology Informatics Guiding Education Reform, n.d). Also, this finding corroborated the findings of other studies by Cretchley (2007), Jih (2004), Oliver (2000), and Peterson and Palmer (2011), all of which reported that ICT knowledge had a strong influence on the ICT competencies of students with disabilities. Furthermore, the results of this study confirmed the outcomes

of the studies conducted by Albion (2007), and Lambert, Gong, and Cuper (2008), in which students who rated themselves as knowledgeable in the use of ICT tools were actually found to be also competent in theuse of such ICT tools.

It is instructive to note that perhaps the participants' understanding of how computers operate influenced their ability to operate them more easily (Teye, 2014; Tella & Mutula, 2008). This assertion also confirmed the views of Yu, Kim and Roh (2001), who stated that when there is an increase in students' knowledge and familiarity with ICT, they appreciate the importance of using computers, and further enhance their competence in using computers and other ICT tools, thereby enhancing their levels of competence, and also confirming the position of Edwards, Portman and Bethea (2012) and McFadden and Jencius (2000) which stated that the provision of instruction on ICT and computer literacy enables students to become active and competent users of computers and other ICT tools.

4.2: Analysis and discussion of qualitative data

This section analyses data that emerged from the focus group interactions with the students. The data has been analysed under themes from each of the main variables of the research questions three and four:

4.2.1: Research Question 3

What challenges do students with visual impairment face in the use of ICT in the University?

To answer this research question, the focused group interview data collected were used. The themes identified from interactions with the focus groups regarding the challenges students with visual impairment face in the use of ICT were: inaccessibility of ICT tools, lack of personnel support, lack of technological support, and poor internet connectivity.

Inaccessibility of ICT tools

In expressing views about how accessible ICT tools are to students with visual impairment, the students revealed that ICT tools are inaccessible to them. The participants expressed their dissatisfaction with the nature of ICT tools for learning in the university. Some of the students remarked these ways:

> *The location of the ICT lab is a challenge and we find it difficult before accessing it. When you are going to the ICT lab at South campus, you struggle before getting there as a visually impaired individual. There are lots of uncovered gutters at the South campus which makes movement very uncomfortable for us when going for ICT lectures. The environment is not accessible, and the lab too is not accessible.* (Verbatim expression by a student in Group 1).

> *When you look at the location of the main ICT lab, climbing the staircase to the lab itself is a big issue for the visually impaired*. (Verbatim expression by a student in Group 2).

Another student stated:

> *I will say it is not accessible because, last semester like where we went for ICT, there is a gutter right in front of the ICT lab. When you get there, you have to cross that gutter before you get in. And looking at the distance from North campus to South campus and you even struggle and walk till you get there.* (Verbatim expression by a student in Group 3).

It was evidently clear from the comments of the students that, the environment of the ICT laboratories are not friendly and the distance from the north campus to the south campus, which is far away from the students with visual impairment, made it inaccessible to them. The students were dissatisfied with the farness of the ICT laboratories in the university. The result observed above confirmed the outcome of Oira's (2016) study which reported that the location of computers in laboratory centres and the location of the laboratory centres make access impossible for regular class routines by students with visual impairment.

The participants further revealed the inaccessibility of ICT tools in the laboratories. The inadequacy of ICT tools and improper arrangement of furniture at the laboratories were other issues that emerged regarding the accessibility of the ICT tools.

Two students noted:

> *The accessibility is very poor. For instance, when you get into the lab you will see the seeing colleagues sitting beside the working computers, whilst we the visually impaired will be sitting beside the spoiled ones. And it is not pleasant at all.* (Verbatim expression by a student in Group 2).

> *We suffer a lot to get to the ICT lab because the environment and the lab itself are not accessible at all. Before getting to the lab, there are lots of uncovered gutters around. The room size too is not big enough to accommodate over 200 students including the visually impaired students per every lecture. Less than 30 working computers for the 200 students.* (Verbatim expression by a student in Group 1).

One other student added:

> *I must say that the furniture in the laboratories are not well arranged with spaces so that we can easily move to take our seat. The tables and chairs are tightly packed together in the room such that you find it difficult to move or call for assistance from a sighted colleague.* (Verbatim expression by a student in Group 3).

From the analysis of the students' comments, it was obvious that ICT tools in the university's laboratories are not accessible to student with visual impairment. It was evident that the students with visual impairment find it difficult to locate their way to the ICT laboratories and to use the equipment or tools in the laboratories. The results agreed with the findings of Eligi and Mwantimwa (2017), which suggested that poor access to ICT facilities, such as poor access to the needed ICT tools by students with visual impairment affected their learning process. This implied that the scarcity or lack of ICT facilities makes the learning process very challenging for students with visual impairment. It also give credence to the findings of Burger (2013) which reported that the shortage of ICT technology remains a significant barrier which is observed in all areas of development. Eligi and Mwantimwa further noted that, the shortage of ICTs in many learning institutions

is still a major barrier that prevents the attainment of full benefits in the learning process for the visually-impaired students.

It could be deduced from the comments of the participants that, they are displeased with the arrangements of chairs and tables at the ICT laboratories and it is only the sighted colleagues who benefit from using the few working machines at the laboratory. The participants further revealed that, the amount of free spaces in the computer laboratories appears not to be big enough, causing them so much struggling to move about freely in the laboratories.

Lack of personnel support

This theme elicited data on unhappiness about the support given to students with visual impairment during teaching and learning of ICT in the university with their sighted colleagues. The students expressed their dissatisfaction for not receiving support from the personnel teaching them ICT and those at the laboratory when they go for lectures. Three students commented that:

> *We are not receiving any support from those teaching us ICT and from those at the lab. When we go there, all that they've been telling us is that, they don't have the software for the visually impaired. Yet, they do have the software for our seeing colleagues to use the computers at the lab without us. Meanwhile, we are all paying the same ICT user fees* (Verbatim expression by a student in Group 3).

> *We normally call some of the lecturers to help us get some machines to work with but all they keep telling us is that they cannot do anything about it without the software for the visually impaired. We go there only to sit down and be watching our seeing colleagues to do what they are teaching them*

> *and when it is* time, *we come back to continue our lectures for the day* (Verbatim expression by a student in Group 1).

> *The sad aspect of it is that, they don't even have time to come and assist us to also do the 'clicking' like our sighted colleagues. We just go there to sit and listen to them whilst our sighted colleagues will be using the computers without us doing nothing. In fact, we just go there and come back without receiving any support from the lectures we attended* (Verbatim expression by a student in Group 2).

Another student added:

> *Even though the school is having good personnel to teach the ICT course, yet, they also do not have the experience in teaching we the visually impaired. But we have one supporting staff at the resource centre who have been helping us small, small to acquire some basic knowledge and skills in ICT.* (Verbatim expression by a student in Group 1).

From the analysis of the students' comments, it was clear that the personnel teaching ICT to the students with visual impairment together with those at the laboratories are not giving them the needed attention and support during teaching and learning of ICT. This outcome is consistent with the view of Alper and Rahrinna (2006), which noted that lack of knowledge and support from teachers of students with visual impairment is a major challenge to their ability to acquire ICT skills and competence. However, a study conducted by Ampratwum, Offei and Ntoaduro (2016) revealed that teachers of students with visual impairment offer the needed support for their students in ICT lessons, and have as a result improved upon the ICT competencies of their students. It therefore implies that when

teachers provide support for their students with visual impairment during ICT lessons, the students' knowledge and competencies can be enhanced significantly.

It again appears that the needed attention and support is given only to the sighted counterparts, while the students with visual impairment are left unattended to, despite the fact that the school has good personnel to teach ICT to the sighted colleagues. The participants further revealed the lack of trained and experienced personnel to assist them learn ICT in the university and their refusal to support them when they go for lectures which is affecting them in acquiring the needed skills in using ICT tools. Two students commented as follows:

> *The personnel are good in teaching ICT, but they do not support us when we go for ICT lecture because they don't know anything about special education and for that matter the visually impaired. They don't have any training about disabled. So, all what they say is click here or there. They don't know that we do not have eyes to follow what they say. Sometimes they go to the board and point at the object they want us to click. How possible in our case?* (Verbatim expression by a student in Group 1).

> *The personnel that are teaching us ICT are also not helpful because they are not trained as to how to handle students with visual impairment. Even if we go there, they sometimes say that they don't know how to deal with us because they don't have knowledge about us. I think the school is having lecturers teaching ICT to students, but they are not giving we the visually impaired the needed support in learning ICT and also to acquire the needed skills we need in the course of our study* (Verbatim expression by a student in Group 3).

One other student remarked:

> *When we go to the lab, those teaching ICT to us ought to have enough time and patient to support us learn the basics in the use of ICT such as keyboard before taking us into other things, because most of us the visually impaired do not have the basic ICT knowledge and skills before coming into this university. Therefore, will need special training in order to catch up with the sighted colleagues once the learning of the ICT is concerned, but they do not support us in any way at all.* (Verbatim expression by a student in Group 2).

Another student indicated that:

> *The personnel teaching ICT in the university are good and we cannot doubt that. But, to attend to us like the way they attend to the sighted is the problem. Instead of them guiding us to use the computer, they rather move to the sighted colleagues who are using the computer because they can see, leaving us unattended to. They don't pay attention to us since I started attending lectures. We don't benefit anything from going to that ICT lab. Rather, going there makes us incur debt, with high risk moving from North campus to South campus* (Verbatim expression by a student in Group 1).

It seemed clear that there is lack of trained personnel to teach ICT to students with visual impairment as depicted by the comments from the students, hence their interest in paying attention to the sighted colleagues instead of supporting them to acquire the basic ICT knowledge and skills. This result supports the outcome of Abner and Lahn (2002) who found in their survey that lack of knowledge among teachers of learners with visual impairment in general, did not make them feel competent to teach assistive technology.

It also seemed that the personnel teaching ICT are inexperienced to teach students with visual impairment and as a result used the unavailability of ICT tools such as software

needed to teach them as an excuse for not supporting them to learn ICT despite the fact that, the school has good personnel to teach ICT course to the sighted counterparts and not students with visual impairment in the university. This obstacle arises because many education institutions cannot boast of sufficient and competent professionals and devices capable of assisting students with visual impairment acquire the requisite ICT skills for their educational needs (Burzagli, et al., 2004). Again, the students' comments obviously show that they do not have the interest to go for ICT lectures at south campus because they do not benefit from anything, rather they are exposed to high risk when moving from north to south campus.

This outcome is consistent with the study conducted by Fuller, Healey, Bradley, and Hall (2004), which noted that students with disabilities at higher education level encountered challenges such as a lack of suitable computer programmes for their education, as well as difficulty for students with visual impairment to reach their campus. The result suggested that there are no arrangements for transportation services for students with visual impairment from one campus to another, confirming the report by Fatima, Bashir, Malik, Safder, and Dur-e-Nayab (2014), which indicated that 95.0% of students with visual impairment, who participated in their survey, responded that they were not provided with transportation facilities to and from their campuses.

Lack of technological support.

Per the technological support, the focus group interaction with students revealed that the computers at the ICT laboratories do not have any screen readers on them. A student had this to say:

> *Even though the school has the ICT centre or the lab which visually impaired students also go to, we just go there, sit there because none of the machine at the ICT lab have JAWS or other screen readers on them. Therefore, we are not able to use the computers at the laboratories.* (Verbatim expression by a student in Group 2).

Two students added:

> *When we go for ICT lectures, you realize that, there is no JAWS or speech software on the computers, and whatever they teach benefit only the sighted and not we the visually impaired students because there are no JAWS or any other speech software installed on the computers at laboratories for us to use.* (Verbatim expression by a student in Group 1).

> *Just as my other colleagues have already said, the machines are not having any speech software to enable us to partake in the activities at the laboratories. we find it difficult to use the computers because there are no JAWS and the NVDA that we can be using them.* (Verbatim expression by a student in Group 3).

Evidence from the comments of the students depict that the needed software for students with visual impairment to use ICT tools are not installed on the computers at the ICT laboratories. This result is similar to Gill (2009), which indicated that students with

visual impairmentencountered a number of difficulties in acquiring ICT skills, including the unavailability of accessible materials and technical tools.

It was again revealed from the comments of the students that the computers at the laboratories are not enough and there is no specialized computer laboratory fully installed with JAWS or any other speech software for the students with visual impairment to use in the university. Two students commented that:

> *The challenge that we are facing in ICT lab, there are no computers for us and the few computers available at the lab, there are no JAWS for we the visually impaired to get use of them to learn* (Verbatim expression by a student in Group 3).

> *The challenges that we the visually impaired are facing in using ICT in UEW include we not having a specialized ICT lab on our own. We are not learning the ICT well because there is no specialized ICT lab to take us through. I am saying this because there are no computers at the ICT lab for us to use and the few working computers at the lab are been used by our seeing colleagues when we go for ICT lecturers at the south campus.* (Verbatim expression by a student in Group 2).

One students remarked:

> *My greatest challenge in the use of ICT in this university is that, we do not have a specialized computer lab for we the visually impaired in this university and we have been going for ICT lectures with our sighted colleagues and it is not helping us. We should be able to have our own computer lab for the teaching and learning of ICT from the sighted colleagues* (Verbatim expression by a student in Group 1).

It could be deduced from the comments of the students that, they are displeased with the unavailability of JAWS or any other speech software on the computers. It could also be seen that the students have severally registered their displeasure for not having their own specialized computer laboratory in the university. These findings supported the report by Wyclife and Nyambura (n.d), which indicated that limitations such as lack of, or limited availability of specialised disabled friendly hardware and software resources can impede the process and progress of developing ICT competencies among students with visual impairment.

Furthermore, the results confirmed the viewpoint of Gronlund, Lim, and Larsson (2010), which stated in a study conducted in Tanzania and Bangladesh, that the requisite teaching and learning materials for students with special needs to effectively promote their education, were lacking. These results gave a clear indication that students with visual impairment do not receive the necessary logistical and material support that would help them develop ICT competencies. This outcome also confirmed the result of the study by Fatima et al. (2014), which stated that a large number of respondents (95%) reported that they were not provided with laptops, installed with JAWS software to enable them to complete their assignments.

Poor internet connectivity

On this subject matter, it was revealed by the students that the university's internet connectivity is not in a good state. The responses suggested that the internet connectivity in the university was poor. This was noted by one student who commented that:

> *The Wi-Fi of the university does not reach our halls unless you walk through a distance before accessing it, and if you do not get anyone who will help*

> *you, then it means you cannot access it and this is a great challenge to us as visually impaired* (Verbatim expression by a student in Group 2).

Another student noted:

> *There is a new software that can help the visually impaired to browse the internet called googlebraille.org. But because of the poor internet connection we can use it. Something must be done about the internet service to make it available for us to take the advantage of using the googlebraille.org to better of our academic work on campus* (Verbatim expression by a student in Group 1).

A third student remarked:

> *The internet in the school is very, very poor. The Wi-Fi is not working and when you want to do something with your personal laptops, phone and others, you cannot, unless you bundle your modem before you can access the internet. Yet, the school claims to have free Wi-Fi to be used by students. The internet facility in the university is very, very poor.* (Verbatim expression by a student in Group 3).

It is clear from the students' comments that the internet connectivity in the school is poor, such that they cannot even use their phones, laptops and others to access it unless they bundle their data before they could access the internet. The views expressed in these statements suggested that the internet facility in the school appears not to be helping them better of their academic work on campus as they could have used the googlebraille.org software if the internet connectivity on campus is good. This outcome confirmed the study of by Williams, et al., (2006), and the UK Department for Education and Skills (DfES, 2001) which found that access to the internet is lower for people with disabilities than for the general population.

This finding raises some issues which require critical attention, because the internet can be very beneficial and essential for persons with disailities (Knight, Heaven, & Christie, 2002). In order to develop ICT skills competencies of students with visual impairment, and also to provide equal opportunities for them in their academic pursuit and to provide a chance for them to feel a sense of belongingness to society, these students must have immediate access to the internet, to enable them communicate with other students who are visually impaired (Belcastro, 2006).

4.2.2: Research Question 4

What strategies can be put in place to help students with visual impairment to acquire knowledge and competencies in using ICT in the University?

The analysis of data under the subject matter above focused on the strategies that can be put in place to help students with visual impairment in acquiring knowledge and competencies in using ICT in the University. The themes identified from the interactions with the focus groups manifested in areas such as enhanced accessibility of ICT tools, adequate personnel support, and adequate technological support.

Enhanced accessibility of ICT tools

In expressing views about the strategies that must be put in place to assist students with visual impairment acquire knowledge and competence in using ICT, the students mentioned that ICT tools and related facilities at the University must be made accessible to them. For example, one of the students remarked that:

> *Another ICT lab must be constructed at the north campus. Because there are many us, students with visual impairment at the north campus but there*

> *is no lab over there. Because of that, we always have to move to the south campus which is not good for us. I think that if the university can provide another ICT lab here for us, it will be very helpful.* (Verbatim expression by a student in Group 3).

Another student stated:

> *We need to have our own ICT lab here at the north campus. Also, the lab should be equipped with computers and other ICT tools that we can access without any difficulties. Otherwise it will end up to be the same problem like what we go through now.* (Verbatim expression by a student in Group 1).

Another student also noted that:

> *I think there must be more laptops with JAWS or NVDA installed on it for us that we can take to our hostels so that we can be practicing at home. Also, the arrangement of the chairs and desks at the lab is not good for us, so something must be done about it. At least they must be arranged in a way that we the visually impairmed can walk through without bumping into them.* (Verbatim expression by a student in Group 4).

It was clear from the comments of the students that, the distance to the ICT laboratory at the south campus is a major challenge for them. The students were also not satisfied with the situation where the computers in the ICT are not accessible to them because they do not have the appropriate software installed for them to use. The participants further revealed that the inaccessibility of the ICT laboratory could be resolved by providing them with laptop computers that will be available to them on regular basis. The result therefore suggested that the students wanted an ICT laboratory that is close to them, and also had all the needed software and other facilities to use. The results agreed with the study by Oira (2016), that the locations of ICT laboratories make access

impossible for students with visual impairment, and therefore must be sited at eaily accessible locations.

Also, the result confirmed the findings of Alsharidah (2017) that the limited availability of ICT tools had subsequently led to a lack of access to these ICT tools. From the analysis of the students' comments, it was obvious that one of the ways by which ICT tools would be made accessible to students with visual impairment was by providing them with more computers and other ICT tools. It could be deduced from the comments of the participants that, they will be very pleased with any arrangement that will help to reduce or eradicate completely the challenges that they face in acquiring ICT knowledge and competence.

Adequate personnel support

It was observed from the comments of the participants that when they are provided with adequate personnel support during the teaching and learning of ICT in the university, the objective of acquiring ICT knowledge and competence would be achieved, just as with their sighted colleagues. Some of the students expressed these opinion in the following comments:

> *As far as I am concerned, we are not receiving any support from those teaching us ICT at the lab. They only focus of our sighted colleagues all the time, without doing anything for us. Sometimes they tell us that they don't know what to do for us. Others too give us excuses, but I know that it is all because they don't know how to handle us. I think it will be good if the university can employ somebody who understands disability and can teach the ICT very well so tha that person will be our ICT lecturer.* (Verbatim expression by a student in Group 1).

> *It is important for the university to get us people who can help us with the ICT because the people at the lab right now are not doing anything to assist us. Even though sometimes they try their best to provide some assistance, you can see that it is not enough. Right now, the only way out is to employ an expert in ICT who also can work with the JAWS or other screen readers, so that he or she will be teaching us how to use it.* (Verbatim expression by a student in Group 1).

Another student added:

> *In fact, we have to be honest and say that the people at the ICT lab are good. But when it comes to teaching the ICT to people like us, they find it very difficult. As I said earlier, we have one supporting staff at the resource centre who has been helping us to acquire some basic knowledge and skills in ICT. But sometimes he is also busy with other things and so he cannot be available all the time.* (Verbatim expression by a student in Group 1).

From the analysis of the students' comments, it was revealed that the personnel teaching ICT to students with visual impairment and other staff in the laboratories are not knowledgeable enough about the methodologies involved in teaching ICT to students with visual impairment. As a result, they are unable to effectively support the students,by giving them the needed attention and support during teaching and learning of ICT. This findingsuggests that it is essential for teachers of students with visual impairment to be highly knowledgeable and competent in teaching ICT, as noted by Ampratwum, Offei and Ntoaduro (2016) who reported that teachers of students with visual impairment offer the needed support for their students in ICT lessons because of their competence in teaching

them ICT. The outcome of this study also confirmed the viewpoint and recommendation made by Teye (2014, p. 93) to the effect that:

> *Management of the University of Education, Winneba should consider recruiting qualified and competent ICT personnel to take charge of the technology needs of students with disabilities. This would create an opportunity for these students to have access to a technical person who has the understanding and ability to assist them with their computer and technology-related needs*.

The comments made by the participants in relation to the need for personnel support suggested that it is important for the university to take steps to recruit or train the personnel at the ICT laboratory to understand the needs of the students with visual impairment, regarding ICT knowledge and competencies. This corroborates the viewpoint of Abner and Lahn (2002), considering the fact that lack of knowledge among teachers of learners with visual impairment made the teachers feel incompetent to teach them.

Adequate technological support

From the participants' comments on the strategies that could be employed to help them acquire ICT knowledge and competence, it was observed that the provision of adequate technological support would be very useful for the students with visual impairment in tackling the challenges they encounter in acquiring ICT knowledge and competence.

One participant stated that:

> *The computers in the ICT lab must have JAWS or other screen readers installed on them, so that those of us who know how to use it can use the computers at the lab.* (Verbatim expression by a student in Group 4).

Another student added:

> *Because there is no JAWS or speech software on the computers, whatever they teach is only done by our sighted colleagues. The best way for we the visually impairmed to use the computers in the lab is when JAWS or NVDA or other screen readers are installed on the computers. So they have to do that for us. Once they install it for us, we will know how best to manage ourselves.* (Verbatim expression by a student in Group 1).

One other student remarked that:

> *The ICT lab itself does not have JAWS installed on the computers. But as for the computers that we use at the resource centre, there is JAWS and NVDA on them, so some of us are able to use the computers. So I will say that we have some , but not enough for us. Therefore I will suggest that some of the computers in the lab should also have the software on it for us to use.* (Verbatim expression by a student in Group 3).

The comments above suggest that the students undoubtedly relied on screen reading software and other assistive software for using computers. Therefore, it was necessary for such software to be made available to them if they were expected to use computers for their education. This suggested that technological support, in terms of computer software, is very critical to the successful use of computers by students with visual impairment. This result confirmed the outcome of a study by Eligi and Mwantimwa (2017) which reported that assistive technology has been used by blind and partially-sighted people to help

increase their independence and boost their social inclusion when it comes to educational access. It also agreed with Gronlund, et al. (2010) who indicated that assistive technologies, including screen readers and screen magnification software, are powerful tools for fostering the learning of the students with visual impairment all over the world through simplified access and retrieval of information, communicating with friends, and sharing of information as sighted people do.

Furthermore, it could be deduced from the comments of the students that, they were not satisfied with the unavailability of JAWS or any other speech software on the computers. This finding supports findings byEligi and Mwantimwa (2017) that 58% of students with visual impairment, who participated in their study, were not satisfied with the ICT facilities available to them. This implied that students with visual impairment hardly received adequate technological support, resulting in situations where the available facilities were too inadequate to enhance their effective learning of ICT. Also, the comments showed that even though some efforts have been made to provide some technological support to the students with visual impairment, the facilities remain inadequate to satisfy the needs of all these students.

Overall, the outcome of this study suggested that the strategies that are required by students with visual impairment are not too difficult to implement. Therefore, it is very important that steps are taken to provide for those students to enable them continue to feel positive and passionate about acquiring ICT knowledge and competence, and to take advantage of the numerous benefits that ICT affords them.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.0 Introduction

The purpose of the study was to find out what knowledge and skills students with visual impairment in the University of Education, Winneba have in the use of Information and Communications Technology (ICT). The study specifically sought to:

- Investigate the knowledge students with visual impairment have in the use of Information and Communications Technology in the University.
- Explore the competency levels of students with visual impairment in using Information and Communications Technology as a tool to enhance their academic and social lives in the University.
- Ascertain the challenges students with visual impairment face in the use of Information and Communications Technology to enhance their academic performance in the university
- Determine the strategies that can help students with visual impairment in acquiring knowledge and competencies in using ICT in the University.

The Dreyfus Model of Skill Acquisition theory propounded by Dreyfus and Dreyfus (1980) was used to guide the study. Thirty-three students with visual impairment participated in the study, which collected data using focused group interviews and a test. Data from the focused group interviews were analysed using themes that emerged from the participants' responses whereas data from the test items were analysed with the help of

Statistical Package for Social Sciences (SPSS) version 21.0, to determine the means, standard deviations, and weighted mean.

5.1 Summary of findings

The following were the major findings of this study:

- Students with visual impairment at the University of Education Winneba were knowledgeable in some aspects of ICT. These knowledge were exbihited in areas including basic computer operations and word processing. However, there were other areas where the students were found to lack some knowledge. These included the use of software and other applications, communication via email and other social media platforms, as well as web browsing and online research.
- The ICT knowledge of students with visual impairment reflected the level of ICT competence on the students with visual impairment. This was observed from the amount of time it took for the students with visual impairment to perform and complete selected activities.
- Several challenges were found to prevent the acquisition of ICT knowledge and competence by students with visual impairment in the University of Education, Winneba. These included inaccessibility of ICT tools, lack of personnel support, lack of technological support, and poor internet connectivity. However, these challenges were found to be challenges that could be eliminated or reduced if appropriate interventions are implemented.
- Some important strategies that could be employed to help students with visual impairment to overcome the challenges they encountered in acquiring ICT

knowledge and competence included an enhanced accessibility to ICT tools, and the availability of personnel and technological support.

5.2 Conclusion

Information and Communication Technology (ICT) plays a major role in the education of learners including students with special needs, for example, students with visual impairment. The integration of ICT into education for students with special needs especially students with visual impairment has become a global phenomenon in this 21st century. Thus, the need to be trained for them to acquire the basic knowledge and competence in using ICT to enhance their academic and social lives. It is therefore very important for students with visual impairment to be knowledgeable and competent in using ICT tools in order to enjoy the various advantages that ICT offers them in their education. While there are numerous challenges the students with visual impairment encounter in acquiring ICT knowledge and competencies, there are equally appropriate strategies that can be employed to tackle these challenges faced by students with visual impairment at the University of Education, Winneba.

It is therefore concluded that when students with visual impairment are offered the appropriate personnel and technological support, as well as enhanced accessibility to ICT tools, their knowledge and competence is using ICT can be greatly enhanced.

5.3 Recommendations

Based on the findings of the study, the following recommendations were made:

- Students with visual impairment should be taught basic skills in ICT such as Software and Applications, Email and Other Communication Platforms, and Web Browsing and Online Research. This is to enable them gain and improve upon their ICT knowledge and competencies.

- Management of the University of Education, Winneba should take a critical look at the provision of a specialized ICT laboratory at the North campus and the assistive technological tools and materials for students with visual impairment. This is to cater for ICT training sessions and activities for these students instead of risking their lives to attend ICT lectures at the South campus.

- Management of the University of Education, Winneba should consider training ICT personnel in teaching ICT to students with visual impairment to take charge of the technology needs of these students. This would create an opportunity for the students with visual impairment to have access to personnel who have the understanding and ability to assist them with their ICT related needs to teach them ICT. Also, students with visual impairment at the University of Education, Winneba should also make use of the available ICT laboratories and facilities in the university, to help them improve their ICT knowledge and competencies.

- Technical ICT personnel at the ICT laboratories should consciously encourage and motivate students with visual impairment to develop the interest to use ICT tools available at the ICT laboratories in the University of Education, Winneba. This will help in enhancing their knowledge and skills for ICT tools.

5.4 Contributions to knowledge

Evidence from the literature reviewed showed that several studies on ICT knowledge and ompetence have been conducted with various categories of participants In some cases, these studies focused on teachers, students, and even on students with disabilities. However, there is little or no study that was specifically directed at investigating ICT knowledge and competencies among students with visual impairment, through the use of a test that objectively determined the knowledge and competences of students with visual impairment.

This study contributes to knowledge by revealing that the ICT knowledge and competencies of students with visual impairment at the University of Education, Winneba, is not a function of the type of disabilities. It also showed that the challenges that hindered the smooth acquisition of ICT knowledge and competencies are not unsurmountable. Again, the findings of the study provide a context for stakeholders and policy makers within which the ICT knowledge and competency needs of students with visual impairment could be addressed and met. Also, this study gives support to already existing research findings on the issues that are paramount in ICT knowledge and competencies discourse, and goes a step further to provide information specifically on students with visual

impairment and the issues that influence their ICT knowledge and competencies at University of Education, Winneba.

5.5 Suggestions for further research

This study offers an indication of selected variables that affect the ICT knowledge and competencies of students with visual impairment. Future studies could include an organised check of all aspects of ICT knowledge and competencies of students with visual impairment and the impact for using ICT as a tool for their educational and professional development purposes. Further research could also be conducted to compare the ICT knowledge and competencies between students with low vision and students with blindness in the University of Education, Winneba. Also, a study to investigate the ICT knowledge and competencies of male and female students with visual impairment could also be conducted to determine the role, if any, that gender plays.

Lastly, a study could also be conducted to compare the performances of students with hearing impairment and students with visual impairment in use of ICT in the University of Education, Winneba in enhancing their academic and social developments.

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APPENDIX A

TEST OF ICT KNOWLEDGE AND COMPETENCE

UNIVERSITY OF EDUCATION, WINNEBA

FACULTY OF SCHOOL OF GRADUATE STUDIES

DEPARTMENT OF SPECIAL EDUCATION

Introduction

This test is designed to collect data for academic purposes only. You are required to perform some practical activities with a computer, under the observation of the researcher. Your honest and truthful performance of the activities will be greatly appreciated. Your name or identification number is not required and will not at any time be associated with your performance**.** Your performance will be kept completely confidential**.** You are at liberty to withdraw from the study at any time you so desire without any adverse repercusions. Thank you for taking time to participate in this study.

Key: *1 = Novice Level,* *2 = Advance Beginner Level,* *3=Competent Level,*
4 = Proficient Level *5 = Expert Level*

SECTION A: Demographic Data

Age: Below 20 [ ] 20 – 25 [ ] 26 – 30 [ ]

31 – 35 [ ] 36 – 40 [ ] 40 and above [ ]

Gender: Male [ ] Female [ ]

Type of Visual Impairment: Low Vision [ ] Blind [ ]

SECTION B: Test of ICT Knowledge and Competence

Basic Computer Operations	**Yes**					**No**	**Time (s)**
	1	**2**	**3**	**4**	**5**		
1. Start/Boot a computer							
2. Restart a computer.							
3. Shut down a computer.							
4. Use the keyboard to perform specific task (such as scroll through a document).							
5. Insert and eject CDs/DVDs from CD/DVD ROM Drives, or flash drives from USB Ports.							
6. Scan flash drives (pen drives) for viruses.							
7. Format a flash drive (pen drive).							
8. Determine the storage capacity of a flash drive.							
9. Create and name files and folders.							
10. Access files at different storage locations on a computer (such as desktop, my documents)							
11. Delete files from a computer.							
Software and Applications	**Yes**					**No**	**Time (s)**
	1	**2**	**3**	**4**	**5**		
12. Install new software on a computer (such as VLC, Mozilla, SMADAV).							

13. Use software such as JAWS or NVDA on a computer.							
14. Update software to current version.							
15. Use VLC media player to play music and video.							
16. Create backup copies of a document.							
17. Open and switch between more than one application at a time.							
18. Use a computer software to record audio files (locate sound recorder on the taskbar).							
19. Play audio files after recording.							
Word Processing	**Yes**					**No**	**Time (s)**
	1	**2**	**3**	**4**	**5**		
20. Enter and edit text in Microsoft Word, Notepad, or WordPad.							
21. Insert and delete text in a document.							
22. Cut, copy and paste text into a document.							
23. Change text format and styles in a document.							
24. Bolden, Italicize and Underline text in a document.							
25. Create indentations in a text document.							
26. Use numbering and bulleting in a text document.							
27. Save a document.							
28. Open a document.							
29. Close a document.							
30. Rename a document.							

31. Print a document.							
Email and other communication platforms	**Yes**					**No**	**Time (s)**
	1	**2**	**3**	**4**	**5**		
32. Compose and send an email message.							
33. Read the content of an email message.							
34. Send a document as an attachment to an email message.							
35. Download a document attached to an email.							
36. Send messages using WhatsApp							
37. Send messages using Facebook							
38. Attach files to a WhatsApp message.							
39. Download pictures, audio, videos from WhatsApp messages							
Web Browsing and Online Research	**Yes**					**No**	**Time (s)**
	1	**2**	**3**	**4**	**5**		
40. Access the Internet.							
41. Use a web browser to access the university website (www.uew.edu.gh)							
42. Search for information using google.							
43. Save a web page unto a computer.							
44. Download information from the internet.							
45. Evaluate online information for accuracy, relevance and appropriateness.							
46. Make reference to an online source of information.							

APPENDIX B

FOCUSED GROUP INTERVIEW GUIDE FOR STUDENTS WITH VSUAL IMPAIRMENT

Place: …… **Date:** ……

Duration: ……. **Time:** ……

Challenges students with visual impairment encounter in the use of ICT tools in the University of Education, Winneba.

1) What challenges do students with visual impairment face in the use of ICT in the University?

   Prompts:

   a) What type of ICT tools do the personnel teaching you ICT use in the University?

   b) How accessible are the ICT laboratories, the personnel, as well as the equipment/applications to you?

   c) What can you say about access to the Internet and other ICT equipment and applications you use in the University?

Strategies that can be put in place to help students with visual impairment to acquire knowledge and competence in using ICT in the University of Education, Winneba.

2) What strategies do you think must be put in place to help you overcome the challenges you encounter in acquiring knowledge and competence in using ICT?

Prompts:

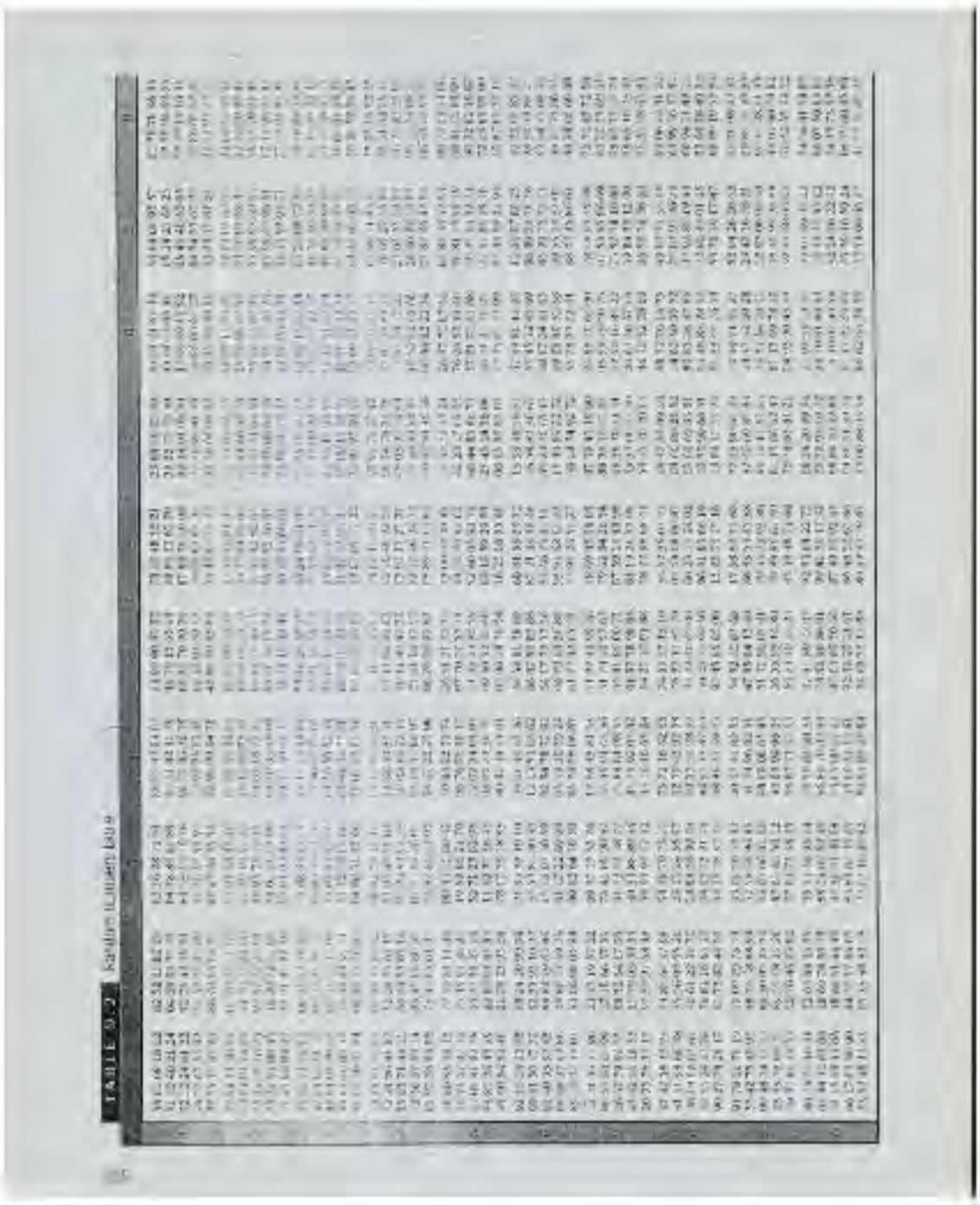
a) What would you say about the personnel and support staff who teach you ICT in the University?

b) How about the ICT tools and devices that you use in learning ICT?

c) What can you say about your experiences in terms of the location of the ICT laboratories in ther university?

APPENDIX C

TABLE OF RANDOM NUMBERS



APPENDIX D

DEPARTMENT OF SPECIAL EDUCATION

UNIVERSITY OF EDUCATION, WINNEBA

OFFICE OF THE HEAD OF DEPARTMENT

Our Ref: November 22, 2017

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Dear Sir/Madam,

LETTER OF INTRODUCTION

I write to introduce to you, Ebenezer Ofori Atta, an M.Phil student of Department of Special Education of the University of Education, Winneba, with registration number 8160150002.

He is currently working on his thesis on the topic *"**ICT knowledge and competencies of students with visual impairment in the University of Education, Winneba**"*.

I should be grateful if you could give him with the needed assistance to enable him to collect data from you school. This forms part of the requirements to complete the programme.

Counting on your cooperation.

Thank you.

Yours faithfully,

Esau Yao Yekple (PhD)