UNIVERSITY OF CAPE COAST

UTILISATION OF INFORMATION COMMUNICATION TECHNOLOGY

IN THE TRAINING AND EDUCATION OF STUDENTS WITH VISUAL

IMPAIRMENT IN TERTIARY INSTITUTIONS IN GHANA

CHARLES DERKYE

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BY

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Faculty of Educational Foundations of the College of Education Studies,

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Award of Master of Philosophy Degree in Special Education

MAY 2019

DECLARATION

Candidate's Declaration

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

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

Name: …………………………………………………………………………

Supervisors' Declaration

We hereby declare that the preparation and presentation of the thesis were supervised in accordance with the guidelines on supervision of thesis laid down by the University of Cape Coast

Principal Supervisor's Signature…………………   Date…………..……

Name: …………………………………………………………………………

Co-Supervisor's Signature……………………..   Date…………...……

Name: …………………………………………………………………………

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ABSTRACT

The study examined the utilisation of information communication technology in the training and education of students with visual impairment in tertiary institutions in Ghana. The study employed the cross-sectional descriptive survey design using questionnaire for data collection to provide answers to the research questions. The study population included resource persons and all students with visual impairment across three Public Universities in Ghana namely: University of Cape Coast, University of Ghana and University of Education, Winneba. In all, 20 resource persons and 116 students with visual impairment were valid to participate in the study. Data were analysed using Means, frequencies and standard deviation. The study revealed that ICT tools are available but inadequate in the three tertiary institutions in Ghana. It was established that ICT tools were fairly accessible in some locations in the various tertiary institutions. Again, it was revealed that ICT tools (hardware and software) are difficult to be used by students with visual impairment and that the students lacked the necessary skills to utilise ICT tools. It was further revealed that utilisation of ICT in the training and education of students with visual impairment has been hindered by various barriers of which inadequate training opportunities was the leading barrier. Students with visual impairment believed that ICT will assist them to learn independently and suggested that more ICT tools should be procured. It was recommended to the Ministry of Education and tertiary institutions to procure more ICT tools. Also, students should be introduced to more ICT skills.

KEY WORDS

Assistive technology

Educational technology

Information Communication Technology

Training and education

Utilisation

Visual impairment

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DEDICATION

To all students with visual impairment and resource persons

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LIST OF ACRONYMS

CCTV   Closed Circuit Television

IDEA   Individuals with Disability Education Act

JAWS   Job Access with Speech

NVDA   Non Visual Desktop Access

            United Nations Educational, Scientific and Cultural Organisation

UNESCO

CHAPTER ONE

INTRODUCTION

Background to the Study

Vision is a pivot through which the individual appreciates his or her environment. It is an essential part of human existence as it plays vital roles in the life of an individual by enabling him or her to be aware of near and far objects (Eguavoen, 2016). Thus, any hindrance to vision results in total or partial loss of sight and places such a person at a great disadvantage such that many of the concepts which sighted persons acquire easily have to be taught deliberately to individuals with visual impairment. Three-quarters of what we learn in life according to Adediran (2004) are acquired through the organ of sight while Keefer (2011) suggests that because 80% of a child's learning relies on his vision acuity, early detection and treatment are needed. According to Smith (2007), the loss of vision affects the individual in significant ways limiting mobility, access to printed information and independent living and use of new technology such as Information and Communication Technology (ICT). Students with visual impairment may, in fact, face difficulties in "utilisation" of ICT tools and, depending on the severity of visual impairment, the types of obstacles encountered may vary considerably.

Globally, the estimated number of people with visual impairment is 285 million, 39 million of this number are blind and 246 million have low vision (World Health Organisation, 2012). The incidence and demographics of

blindness vary greatly in different parts of the world. In most industrialised countries, approximately 0.4% of the population is blind, while in developing countries it rises to 1% (WHO, 2012). It is estimated by the World Health Organisation (WHO) that 87% of the world's blind live in developing countries for which Ghana is part. Over the last decades, visual impairment and blindness caused by infectious diseases have been greatly reduced (an indication of the success of international public health action), but there is a visible increase in the number of people who are blind or visually impaired from conditions related to longer life expectancies (Velázquez, 2010).

Throughout history, education has played a vital role in developing an individual's ability and talent in any society, be it in Africa, Europe, America and the world over (Banyah, 2001). This makes the individual to be relevant in both the public and private sectors. As a result, the education sector will be proud of available skills for the development of the nation's economy. This is why the attainment of higher education through which quality assurance would be assured for the overall development of humanity and for many nations across the globe is desirable. However, there are global challenges which must be met in order to attain this goal. The visually impaired need higher education to minimize the effect of their disability and develop their potentials adequately. People with visual impairments do not need pity and sympathy. They can never live comfortably on these and as such what they need is improved opportunities for qualitative education so that they can have increased versatility in employment. Quality education in the 21st century cannot be done without the knowledge and utilisation of various ICT tools. According to UNICEF (2003), education is a social benefit regarded as the

right of every citizen. Individuals must be given equal opportunities and access to education.

The term "information literacy" is not more than 50 years old and dates back when Paul Zurkowski elaborated the concept of premium learning and articulated the need for information to solve problems or make decisions (Horton, 2013). During 1960s and early 1970s, information was beginning to be viewed as a commodity, necessary for solving problems and making decisions. It is clearly argued by scholars and information professionals that learning how to search and retrieve information; organize and arrange it in appropriately convenient ways; communicate and use it effectively for the intended users; index and archive information for future use or possibly discard it if no longer needed, are all imperative in the information society.

The Constitution of the Republic of Ghana (1992) Article 25 (1) states that "all persons shall have the right to equal educational opportunities and facilities, with a view of achieving the full realisation of that right: Basic education shall be free, compulsory and available to all". The education of an individual with disability was re-echoed in the Disability ACT 2006; ACT 715 Education of a Child with Disability Article 17, which states The Minister of Education shall by Legislative Instrument designate schools or institutions in each region which shall provide the necessary facilities and equipment that will enable persons with disability to fully benefit from the school or institution. In the field of education, the basic concept of "Non – discrimination" entails the ability of all people to have "equal opportunity in education, regardless of their social class, ethnicity, background or physical disabilities" (Klironomos, Antona, Basdekis, & Stephanidis, 2006). Students

with visual impairment have, the right to expect the same standard of education as their schoolmates and, in this view, they also have the right to access and use mainstream educational tools, including ICT based ones.

Rapid advances in information technology have dramatically transformed the world during the past several decades and the basic requirements of education for the future have changed. Knowledge has become the most critical resource for social and economic development (Altbach, Reisberg, & Rumbley, 2010). One's ability to use computer and Internet effectively, having a qualified education, getting a job and communication skills have become prerequisites for human life quality. Thus, accessing and using 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 present an obstacle for visually impaired people who may have significant difficulty processing the visual cues presented by modern graphical user interfaces (Chiang, Cole, Gupta, Kaiser & Starren, 2005). It is however observed that, people with visual impairment face special barriers in using the Internet, aside from those related to material access and computer-related trainings (Puffelen, 2009).

ICT tools are worldwide considered powerful tools to foster learning (Hitchcock & Stahl, 2003) but, at the same time, it is well known that, due to the widespread use of ICT tools, "disadvantaged or excluded groups, including the visually impaired face the danger of further marginalization ". In fact, "with the advent of the digital computer, and its broad penetration, the disabled face serious problems in utilising computing devices"

(Stephanidis & Savidis, 2001, p. 33). Anderson (2006) underscores that, in the field of education, while technologies are beneficial and have been shown to help with educational tasks, their design and usability are an issue for students with visual impairment.

Ghana introduced ICT into the school curriculum in September 2007 following the recommendations of the ICT4AD document and the Anamuah-Mensah National Education Review Committee Report (2002). Both documents highlight the importance of integrating ICT into the curriculum at all levels. As a result, the government and other institutions have invested huge sums of money in procurements of computers and establishment of computer labs in most tertiary institutions, but it is still unclear whether these computers are being used effectively. Thus the question of whether the student with visual impairment need any further support to be able to effectively use ICT in their daily training and education routines remains unanswered.

ICT (Information and Communication Technologies) is defined as a Diverse set of technological tools and resources used to communicate, and to create, disseminate, store and manage information (Huda, Tabassum, & Ahmed, 2009). ICT has become a very important part of the educational delivery and training processes. ICT to a great extent facilitates the acquisition and absorption of knowledge, and hence can provide extraordinary opportunities to developing countries for enhancing their educational systems particularly for the underprivileged constituency, and thereby for raising the level of quality of life of their people. The new communications technologies promise to reduce the sense of isolation, and open access to knowledge in ways unthinkable (Mishra, 2010).

There is enough evidence that ICT can support learning in a number of ways (UNESCO, 2012). The use of ICT can, for example, facilitate communication between educators and learners, increase access to information, provide greater access to learning for learners (including learners with visual impairments) and generally motivate all learners, develop problem solving capabilities and aid deeper understanding. Selinger (2008) asserts that for learners who are visually impaired, the use of ICTs can provide access to learning in new ways which for many were previously inaccessible.

Information and communication technology (ICT) is an important tool which enhances academic performance of all students especially students with visual impairment. It is a necessary condition for the development of the digital proficiency required of today's citizens, and, on a more basic level, must consist of the use of multimedia technologies to recuperate, evaluate, store, produce, present and exchange information (Mutula, 2002). The expansion of new technologies has made the accessibility of computers to today's students possible. The popularisation of computers has translated to the presence of these resources in multiple contexts in students' lives at school and at home (Cuban, 1993).

ICT facilitate the learning of school subjects and basic skills needed for a meaningful living thereby contributing to the development of students with visual impairment immediate environment and the society at large. ICT has brought about a revolution in every walk of today's life. Particularly, it has become an integral part of education and its impact on teaching and learning is widely accepted (Warschauer, 2004).

Access to ICT for visually impaired students may require more resources than are provided for other differently-abled students (D'Aubin, 2007). It has impacted greatly in education for the visually-challenged in a number of ways. ICTs are electronic technologies used for accessing processing, gathering, manipulating and presenting or communicating information. The introduction of ICT in education accelerates, enriches and deepens basic skills in reading, writing and it can motivate and engage students with visual impairment to learn as they become more independent and responsible for their learning (Nkomo, 2009).

Cook and Polgar (2014) posit that the use of Information and Communication Technologies (ICT) allows for the removal of many of the remaining barriers faced by students with visual impairment. With ICT increasingly integrated into every aspect of the modern world, these ubiquitous technologies have become a positive force of transformation and a crucial element of any personal development/empowerment and institutional framework for development. ICT is already providing access to key public services, with widespread implications for social progress and economic growth aimed at eradicating poverty and promoting inclusive societies and sustainable development. Accessible ICT has the potential to provide persons with visual impairment unprecedented levels of access to education, skills training and employment, as well as the opportunity to participate in the economic, cultural and social life of their communities.

Moreover, ICT helps to encourage students to become active participants in social, cultural, and economic development. ICT can be

multimedia for instructional delivery, additionally, it can be delivered in textual, audio, visual, and audio-visual forms (Soman& Sudhier, 2015).

Data of the World Health Organization seem to confirm, that visually impaired students are a relevant percentage of the overall population of the students with disabilities (Evenhuis, Sjoukes, Koot, & Kooijman, 2009). Such students, in principle, could highly benefit from using ICT for educational purposes but they actually, despite the availability of a growing number of technology-enhanced and sophisticated assistive devices, face a number of usability problems (Burzagli et al., 2004).

Findings from numerous studies have shown a positive relationship between the use of information and communication technology and students' academic performance. For example, in an Illinois blue collar rural community, mathematics achievement levels improved (computation and problem-solving skills) as well as student interest among elementary and secondary students (Warschauer, & Matuchniak, 2010). Using a computer assisted instruction (CAI) programme called Fundamental Mathematics, led to higher mathematics achievement for students in two elementary and one middle school in a large urban North Carolina school district (Slavin, Lake, Davis, & Madden, 2011). In another study (Judson & Sawada, 2000) involving eighth grade students, mathematics achievement increased through the integration of math and science using inquiry-based data-generation technology (graphing calculators and probes). But this raises the issues of whether this study on use of ICT will yield the same level of importance to students with visual impairment in Ghana.

Though a lot of ICT are in the system, it has become difficult for students with visual impairment to utilise some of these devices in their training and education. This denies the student with visual impairment the opportunity to utilise the current trend of educational technologies which are necessity for 21st century training and education. This study seeks to investigate the utilisation of ICT in the training and education of students with visual impairment in tertiary institutions in Ghana.

Statement of the Problem

Access to information is key for academic performance of students. With advent of ICT, students have acquired additional source for getting information along with the libraries in the university. According to Khetarpal (2014), ICT breakthroughs have brought new opportunities to restructure the learning and knowledge transfer environments along with information dissemination. E-courses and web-based teaching as well as e-learning resources in all education vocational and higher educational institutions provide an opportunity to the people with disabilities to gain knowledge and enter into the pool of skilled labour. ICT solutions such as word prediction or text highlighting have been shown to help visual impairment with their reading and writing.

Information and communication technology (ICT) expresses the convergence of telecommunications, information, broadcasting and communications. It is crucially important for sustainable development in developing countries. Mobile phones, satellites or Internet are a unique kind of infrastructure that expands access to key public services, thereby promoting digital inclusion. We all are aware of the importance and convenience that

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technology can have in our lives, but for persons with disabilities, access to technology can mean living more independent lives, and being able to access the same information, goods and services that others take for granted. Such merits become a mirage to the visually impaired. There are very few available facilities leading to almost no opportunities for them and this again leads to their being uncounted. Inaccessibility and exclusion accentuate their disabling conditions.

According to Wang (2009), there is widespread belief that ICTs use can and will empower teachers and learners with visual impairment, transforming teaching and learning processes from being highly teacherdominated to student-centered. This transformation will result in increased learning gains for students, creating and allowing for opportunities for learners to develop their creativity, problem-solving abilities, informational reasoning skills, communication skills, and other higher-order thinking skills. However, there are currently very limited, unequivocally compelling data to support this belief.

In the last decade, there has been rapid development in information and communication technologies. The inclusion of World Wide Web into our daily lives has brought new and important implication also for education.

ICT is one of the strongest allies to the visually impaired persons in overcoming the negative effects of visual impairment (Edwards & Lewis, 1998). The technology is related to successful education and positive change in attitudes and has potential in reducing the influence of certain negative consequences brought by visual impairment. Closely connected with education, ICT makes it possible for the visually impaired persons to become

more successful, function as equal members of the society and develop their personal self-respect but in spite of all technological advancement, accessing information remains an almost unreachable aim for visually impaired persons, thus limiting their opportunities for training and education, employment, leisure and independence (Abner & Lahm, 2002). Constant barriers prevent independent, reliable and timely access to information.

There is a considerable body of research on visually impaired people that concentrates on the importance of ICT to students with visual impairment but this study starts by looking mainly into the question of how the visually impaired needs to make good use of ICT facilities (ICT). With this study I hope to contribute to an integrated view on utilisation from which we can fully increase independence living in the training and education of the visually impaired. This is also aimed at reducing the dependence rate of students with visual impairment on resource personnel or on their colleges.

According to Freire, Linhalis, Bianchi, Fortes and Pimentel (2010), the use of ICTs and e-learning has brought a high number of changes to supplementary educational resources. For instance, the use of ICTs, like integrated White Boards (IWB) for the teaching of visually impaired learners has been reported by a number of research studies (Gillen, Staarman, Littleton, Mercer, & Twiner, 2007).

It is quite obvious that ICTs can make the teaching of students with visual impairment so much more comprehensive as it addresses many of their specific needs (Florian & Hegarty, 2004). By doing so these learners who are visually impaired will have many more probabilities to improve and enhance their learning opportunities. Wilson–Strydom, Thompson, and Hodkinson–

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Williams (2005), report that many educators who are teaching visually impaired learners are not trained in using ICTs appropriately. They do not have the necessary skills to impact into these students.

Nkosis' (2007) study on integrating technology into the learning and teaching practice revealed that the integration of ICTs into the curriculum demand empowerment of educators. However, she also found that educators lack computer technology skills and consequently there is a great need for intensive training of educators on computer technology and the various softwares which are available for educators in various learning areas and subjects. Will these findings be applicable to schools for visually impaired learners in Ghana?

The use of ICT to support learners with disabilities by all teachers is not something that can be achieved without considering a range of implications, notably training of teachers and availability of ICTs. In many studies it has been demonstrated that ICT is not only reducing barriers of access, but at the same time creating barriers (Balanskat, Blamire, & Kefala, 2006). People with visual impairment face special barriers in using the Internet, aside from those related to material access and computer related trainings. Van-Puffelen (2009), mentions technical accessibility and the skills needed in using computers are the extra barriers that students with a visual impairment face. Bayer and Pappas (2006), found that especially navigation and screen reading posed problems for blind internet users. This has been as a result of inadequate accessibility to some of these screen reader software such as Job Access With Speech (JAWS) which is expensive.

ICT skills are a fundamental requirement for students with visual impairment in this digital age. In schools, universities and in the work place, the question of how to utilise ICT tools for learning purposes has become more and more important for anybody engaging in education and training as new technologies are spreading rapidly (Trilling & Fadel, 2009). Even if a learner is not doing what directly relates to computing, ICT skills are required to do most assignments and projects. In fact, virtually all tertiary institutions courses require basic computer knowledge.

Over the years, there has been considerable research in the area of ICT availability (Nelson, 2013). But despite their proliferation on the market, availability of ICT in the training and education of students with visual impairment has become questionable. Most schools and educational systems have started providing extensive computer networks for their students and these are increasingly becoming main components of teaching and learning environment, but so far little is known about the effectiveness and use of these technologies among students with visual impairment (Fraillon, 2014). There is uncertainty to ICT use among students with visual impairment. The problem of availability brought the situation where the student with visual impairment finds it difficult to use some of these ICT devices. Within this body of research in special education there is no doubt that utilisation of ICTs for training and education is a key issue; this relates to usability of technology and the importance of computer literacy in the wider social context of participation and access to education, employment and information.

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Purpose of the Study

  The main purpose of the study is to examine the utilisation of ICT in the training and education of students with visual impairment in tertiary institutions in Ghana. Specifically, the study sought to:

1. Identify the availability of ICT tools to students with visual impairment in their training and education in tertiary institutions in Ghana.

2. Examine how accessible ICT tools are to students with visual impairment in their training and education in tertiary institutions in Ghana

3. Identify ICT skills needed by students with visual impairment in their training and education in tertiary institutions in Ghana.

4. Investigate the benefits that would be derived from the use of ICT to students with visual impairment in their training and education in tertiary institutions in Ghana

5. Identify the barriers students with visual impairment encounter with the use of ICT in their training and education in tertiary institutions in Ghana.

6. Suggest ways by which ICT utilisation could be improved for students with visual impairment in their training and education in tertiary institutions in Ghana.

Research Questions

  To guide the conduct of this study, six research questions were used. The research questions are;

1. What are the ICT tools available to students with visual impairment in their training and education in tertiary institutions in Ghana?

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2. Which ICT tools are accessible to students with visual impairment in their training and education in tertiary institutions in Ghana?

3. What ICT skills will be needed by students with visual impairment in their training and education in tertiary institutions in Ghana?

4. What benefits will be derived from the use of ICT to students with visual impairment in their training and education in tertiary institutions in Ghana

5. What barriers do students with visual impairment encounter with the use of ICT in their training and education?

6. What suggestions could be made towards the improvement with the use of ICT to students with visual impairment in their training and education in tertiary institutions in Ghana?

Significance of the Study

The desire of modern societies is to integrate marginalised groups into the mainstream of the society. This integration process cuts across all spheres of life ranging from education, sports and games, job and career opportunities and participation in politics and governance. Equitable integration of the visually impaired will require the use of some ICT devices such as computers and the internet. The knowledge of these peculiar devices and their unique work will help society to accommodate such individuals. The outcome of this study will therefore help to uncover ICT tools that are not available but useful for such an integration.

Through the outcome of this study, students who are visually impaired will be aided to increase their access to the general curriculum and improvement of academic performance. The outcome will help us to know if the available ICT's are accessible to students with visual impairment. It is

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important to thoughtfully consider what devices, tools and technologies will be accessible to meet the student's individual and unique learning needs.

To the policy makers, the result of this research can assist them in knowing the types of ICT facilities suitable and needed by the students with visual impairment in a particular institution. ICT in education for people with visual impairment will not be seen as an end in itself – it will be seen as a means, or a tool for increasing effective access to and meaningful participation in educational opportunities. This access and participation should have the ultimate goal of increasing life chances and opportunities for students with visual impairment. According to the Persons with Disability Act, 2006 Act 715, the Minister of Education shall by Legislative Instrument designate schools or institutions in each region which shall provide the necessary facilities and equipment that will enable persons with disability to fully benefit from the school or institution (National Council On Persons With Disability, 2010). In order for this policy to be fully implemented, the policy makers or enforcers must have an idea of various ICT devices that will meet the needs of students with visual impairment.

Stakeholders such as parents, teachers, school administrators, special educators and guardians of individuals with visual impairment may also benefit from this work. Since parents are the primary care givers of students with visual impairment, they may want to help the child make the best use ICT to maximize their independence. Parents may need to know about these everchanging options in technology and various ICT skills their visually impaired wards will need. To achieve success in schools, and later in the world of work, people who are visually impaired need access to a toolbox

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filled with a variety of tools, so that they can select the appropriate tool for any given task and parents can assist especially financially in acquiring these devices. Therefore, from the result of this work making that choice in acquiring a device suitable for academic work will be easier.

Delimitation

This work is intended to cover utilisation of ICT in the training and education of students with visual impairment (partially sighted and the blind) in tertiary institutions in Ghana. The study will mainly use students with visual impairment and resource personnel. Although there are a lot of tertiary institutions in Ghana with students with visual impairment, the University of Cape Coast (UCC), University of Education, Winneba and University of Ghana (Legon) have well-organized resource centres for the visually impaired and also the number of students to make the work more reliable and authentic. The findings of this research can be generalised and can be used as a basis for introduction to further research.

Limitations

Though Questionnaires were used for collection of data, a qualitative method of observation could have been added to the former to really know how students who are visually impaired utilise ICTs. This could have aided the researcher to get first hand report on available ICT tools.

The researcher had a hectic time collecting data from students with visual impairment across the three public universities. Students gave excuses like going for lectures, writing quizzes and assignment. This caused a lot of delay since they all had to take part because the researcher adopted the census

sampling technique. Again, some of the students with visual impairment were not willing to participate in the study or did not consent to be part of the study.

Assumptions of the Study

The study will be based on the following assumptions:

1. That respondents are conversant with Information Communication Technology.

2. That the respondents; students who are visually impaired understand what ICT is. They are therefore expected to understand the application and importance of ICT in training and education.

Definition of Terms

Utilisation- This refers to the available and appropriate use of various ICT devices.

Visual impairment- It means an individual's inability to fully use his or her eyes or vision for daily educational routines unless adaptations are made in his or her learning experience and learning environment.

Training and education- This refers to systematic process of learning something (ICT) to impart a special skill or behaviour to a person who is a visually impaired.

ICT- It has to do with devices or technologies people use to access information, gather information, process information and use for communication services.

Organisation of the Study

This study is reported in five chapters, the first chapter includes the background to the study, statement of the problem, purpose, research questions, significance, delimitation, limitation of the study and organisation

of the study. Related literature is reviewed in chapter two. The third chapter discusses the research methods adopted for the study and this describes the research design, population, sample and sampling procedure, instrument and data collection. In the fourth chapter, data are analysed and discussed. The last chapter, which is the fifth, is made up of a summary of the research process and the major findings, conclusions and recommendations.

CHAPTER TWO

LITERATURE REVIEW

Introduction

This chapter reviews related literature of earlier studies conducted in relation to the research topic. The review involved empirical studies and theoretical framework of the problem under study.

Visual Impairments

Definition

The World Health Organization (WHO, 2000) defines impairments as problems in the body function or structure. Persons with visual impairments therefore have problems with their vision. However, there are many aspects of "seeing" that one needs to be aware of; for example, visual sharpness for distance and near objects from the eyes, field of vision, colour vision and adaptability to light.

According to Wendy (2003), in order to understand the definition of a visual impairment and legal blindness, it is important to know how eyesight is measured. Central vision is measured using an eye chart. The results are recorded as a pair of numbers called visual acuity. Normal sight is recorded as 20/20. The first number is the distance from the eye chart and second number is the distance from which a normal eye sees a letter on the chart clearly.

Someone with a visual acuity of 20/20 can see certain sized letters at a distance of 20 feet whereas someone with a visual acuity of 20/60 only sees

letters at 20 feet that a normal eye identifies at 60 feet. The higher the second number of your visual acuity, the worse your vision will be (Wendy, 2003).

Legal definitions of a visual impairment

According to Javitt, Zhou, and Willke (2007), the legal definition is based on visual acuity and field vision. A person whose visual acuity is 20 / 200 or less after the best possible correction with glasses or contact lenses is considered legally blind. This means that a person whose vision is restricted to an area of 20 degrees or less is considered legally blind. Legal blindness does not necessarily mean that a learner or a child has no visual acuity at all; the child may be able to sense light and darkness and may have some visual descriptions. A child who scores between 20/70 and 20/200 on tests of visual acuity, with correction, is legally partially sighted or has low vision (Wendy, 2003). Jernigan (2005) states that, this is not really a satisfactory definition. It is rather, a way of recognizing in medical and measurable terms something that must be defined not medically or physically but in functionality.

Educational Definitions of Visual Impairments

The educational classification of visual impairments are described as moderate, severe and profound and are not based on tests (Wendy, 2003), but rather on the special educational adaptations that are necessary to help the affected children to learn. As such the Individuals with Disabilities Education Act (IDEA, 1998) emphasises the relationship between vision and learning in the education scenario:

i.   With a moderate or low vision impairment, an individual uses eyes as a primary means of learning. It can be improved with the help of visual

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aids, either in the regular classroom or a reading laboratory which is equipped with ICTs;

ii. With a severe visual or functionally blind impairment a learner receives learning content primarily through hearing and is helped somewhat with visual aids. The child can still use vision as a channel of learning. This classification is equivalent to the definition of a child with low vision; and

iii. With a totally blind or profound visual impairment an individual receives no useful information through the eyes. For this learner, touch and hearing are the predominant learning channels. This classification is at the level of legal blindness.

In other words, IDEA (1998) confirms that an impairment in vision, even with correction, adversely affects a child's educational performance. Each eye condition has an impact on vision, therefore, the impact that a visual impairment has on learning is unique to every learner. The vast majority of learners with visual impairment have some useful sight, although the degree of sight can vary greatly. For many learners with visual impairment, reading and writing presents barriers to learning. These barriers inevitably result in difficulties in accessing and engaging the curriculum (IDEA, 1998). According to Argyropoulos, Sideridis and Katsoulis (2008, p. 221), "a visually handicapped learner is one whose visual impairment interferes with his best possible learning and achievement, unless adaptations are made in the methods of presenting learning experiences, the nature of the materials used, and/or in the learning environment". However, before adaptations are made, we should know the causes of visual impairments.

Causes of Visual Impairment

WHO (2010), affirms that there are many causes of visual impairments. The following conditions can affect children from birth to age 5 and cause visual impairments. These conditions have changed over time as medical treatments evolved and new conditions arise that result from medical conditions or complex premature births (American Optometric Association, 2009). The most common causes of visual impairments are listed below:

i. retinopathy of prematurity (ROP): a retinal deterioration common in premature infants;

ii. glaucoma and cataracts: due to structural impairments;

iii. refractive errors: Myopia (near-sightedness) and hyperopia (farsightedness);

iv. cortical visual impairments-suspected damage to parts of brain that interpret visual information; and

v. Visual impairment may also be caused by trauma or inherited eye disorders (American Optometric Association, 2009, p. 8).

Types of Visual Impairments

1. Partial sight

The term partially sighted is used to describe learners with a visual impairment, but can still read through their eyes (Mason, 1997). Partial sightedness extends from those with relatively minor visual difficulties to those who may be on the margin between print and Braille and who are sometimes described as having a low vision. While medical causes of visual impairments are many, the functional implication for partially sighted learners

is summarized under the following broad headings as proposed by Mason (1997)

i.   **Poor Acuity**

Poor acuity refers to sharpness of the whole image seen by an individual. Both distance and near vision are affected by poor sharpness. Some learners may be able to see quite small print on a page, but are unable to see the blackboard, while for others the opposite may be true. The child with poor acuity will not clearly see what is written in a book which is near to him and will not see at all what is written on the chalkboard which might be a little bit further away.

ii.   **Central vision loss**

Central vision loss indicates a loss in the area of the visual field that is used for detecting fine details. Learners may be able to move around freely if the rest of the visual field is unaffected. These learners often experience difficulties with tasks involving reading, writing and close observation.

iii.   **Peripheral vision loss**

Peripheral vision loss means that a learner experiences a secondary vision loss whereby they have a problem with moving around and locating objects. It can also present learners with difficulty in finding the space to record their answers on a question paper or workbook.

iv.   **Interrupted vision**

Interrupted vision means that a learner experiences a broken-up vision. This means there are irregular patches of poor vision that affect a learner's sight. In such an instance learners may have a longer time inspecting objects consciously through weak eyes in order to see them effectively. Complicated

visual tasks may become impossible for these learners if they are able to pick up information only in disjointed fragments.

v. Low contrast sensitivity

Some visual conditions cause particular difficulties where an object to be viewed does not stand out clearly from its background. For such learners the lighting and colour scheme of the class environment will be especially problematic. They may find the clarity and contrast of print on the page more important than its size.

vi. Adaptability to light

Many learners with visual impairments will find obvious variations in light difficult to manage. Many find bright light painful (photophobia), while others may find it difficult to adjust visually when moving from a bright to a dimly lit area or activity.

vii. Colour loss

Mason (1997) asserts that colour loss on its own does not constitute a visual impairment, but it often accompanies and compounds other visual difficulties. The extent of colour vision loss varies between individuals, but the main educational implications remain the same; difficulty in distinguishing detail in pictures, maps and diagrams. This means that activities that are heavily dependent on colour-coding may present significant problems to learners with a severe colour loss. Mason (1997) declares that the majority of learners with visual impairments are partially sighted. However, since there are so many types of visual impairments their needs vary considerably. Many are able to work with normal print, but this apparent ability to cope often creates a significant difficulty for educators as it may lead to their very real

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needs being underestimated or overlooked since educators may think their eyesight is normal. For learners with partial visual impairments ICTs could be a beneficial tool to support their process of training and education.

2. **Blindness**

Learners who are educationally blind have insufficient vision to access printed materials, relying instead on their senses, like hearing and touch. This means that such learners cannot see what is printed on written worksheets or on the chalkboard. They therefore rely on Braille. However, being educationally blind does not necessarily mean that a learner has no useful vision. Many Braille-reading learners retain some, although very little, vision, which may serve them well both in and out of the classroom, for close observation of practical work, for example, or for independent mobility (McLinden & McCall, 2016).

Characteristics of Learners with Visual Impairments

The level to which a visual impairment can affect a learner's development depends on the type of visual loss, severity, age of commencement, intellectual ability, and environmental experiences. The lack of vision or reduced vision may result in delays or limitations in motor (mobility) skills, cognitive (thinking), and social development. Jamieson (2004) affirms that children who are congenitally blind exhibit the following characteristics:

i. Motor skills: without visual input, a pre-schooler may not be motivated to walk towards interesting objects in the environment, because he does not see the object. Therefore, his motor skills develop at a slower rate than those of sighted children. However, as

soon as the preschooler with a visual impairment finds it exciting to hear sounds, he or she will begin to reach and move toward the objects in the environment that make the sound. Visual impairments often lead to delays and deficits in motor development.

ii. Cognitively: The child who has a visual impairment finds it difficult to be familiar with objects in the environment outside his grasp, including those that are too large or too small or are moving. This means that blind learners have limited concrete experiences. While the use of other senses enables the child to obtain information about the environment, a cognitive limitation does exist in the range and variety of experiences. Impaired or absent vision makes it difficult to see the connections between experiences. They may have difficulty with abstract language such as expressing their feelings and emotions. Lack of vision often results in the child who is blind having an individual limited vocabulary.

iii. Socially: A child with a visual impairment is limited in interaction with the environment. The child cannot see the facial expressions of parents, teachers, and peers; the child cannot model social behaviours through imitation; and sometimes he or she is unaware of the presence of others unless a sound is made. While touch provides direct information, it is often socially unacceptable. The older child is limited in the ability to orient to environmental cues and travel freely, implying that a grown-up child will have difficulties in acquainting himself with the environment around himself. This means that children with a visual impairment interact

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less and are often delayed in social skills. Many persons who have lost their sight report that the biggest difficulty socially is dealing with the negative attitudes and behaviour of those around them.

Prevalence of Visual Impairment in Ghana

Over 190,000 persons in Ghana are blind, according to the 2015 Ghana Blindness and Visual Impairment Study (GBVIS) conducted under the auspices of the Ghana Health Service. The prevalence rate of blindness among those aged 50 years and above was 4.0% and increased with age to 19.12% in those aged 80 years and above. Males were more affected than females. Four out of five blind Ghanaians are blind from causes which could have been avoided such as cataract. The study indicated that the major cause of low vision was refractive errors, adding, however, that only 5% of those affected by refractive error and who needed to wear spectacles in Ghana, were using their eye glasses. The study found that 0.74 percent of Ghanaians have visual acuity of less than 3/60 in the better eye with the best possible correction (with pinhole). Additionally, 1.07 percent had severe visual impairment. The prevalence of blindness is higher in the rural areas of Ghana (0.79%) than in the urban areas (0.67%). Cataract (54.8%) was the most common cause of blindness, followed by glaucoma (19.4%). However, the main cause of visual impairment was refractive error (44.4%), followed by cataract (42.2%).

History of Educational Development of Students with Visual Impairment

Blindness and education were first talked of in the ancient Egypt (Yates, 2014). History shows that period of time as the start for visually impaired education. "Institut National des Jeunes Aveugles" was established as the first modern institution for the visually impaired in 1784, in Paris by

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Valentin Haüy. A boy named Louis Braille got admitted at this institution in 1819. He started to think about the gap between the sighted and the visually impaired students regarding reading and writing. Later on, he got in touch with a soldier, who told him about a reading system used on the battlefield by the soldiers. This idea crossed his mind, and he developed the revolutionary system of reading and writing for visually impaired students called the Braille system. Yorkshire School for the Visually Impaired in England, established in 1835, was the first institution rendering proper education for the visually impaired: Formal efforts in the United States to educate children with visual impairment began in Boston in 1829, with the establishment of the residential school now called the Perkins School for the Visually Impaired. In 1834, Louis Braille perfected his literary raised dots code of reading, but it was not until 1900 that the first public school class for children who were visually impaired organized in Chicago (Kirk, Gallagher, Coleman, & Anastasiow, 2012).

During the past few decades, a rapid growth in public school services for children with visual impairment has been stimulated by the Education for All Handicapped Children Act (PL 94-142) (IDEA, 2004 in Kirk et al., 2012). Currently, there are teacher preparation programmes and orientation and mobility (O&M) programmes based in universities that prepare professionals to work with children with visual impairment (Goodrich, 1999).

Before the implementation of the Individuals with Disabilities Education Act (IDEA), children with multiple handicaps that included visual disabilities were often refused education in schools for the visually impaired and were placed in settings that focused on their other disabilities while often

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ignoring the visual problems. As Whitburn (2014) pointed out, it is no longer possible for educators of students with visual impairments to ignore students with multiple impairments (Kirk et al., 2012).

Theoretical Review

Theory of Cognitive Flexibility

The research was based on the theory of Cognitive Flexibility (Spiro, Feltovich, Jacobson, & Coulson, 1992), emphasized by Kirkpatrick's four levels of evaluation (Kirkpatrick, 1959). Kirkpatrick emphasizes reactions, learning, transfer and results. Level one is reactions and just as the word implies, learning at this level measures how participants in a training programme react to it. It attempts to answer questions regarding the participants' perceptions, for example, did they like it? Was the material relevant to their work? In addition, the participants' reactions have important consequences for learning (level two), although a positive reaction does not guarantee learning, a negative reaction almost certainly reduces its possibility (Winfrey, 1999).

At level two, teaching moves beyond learner satisfaction and attempts to assess the extent to which students have advanced in skills, knowledge, and attitude to determine the amount of learning that has occurred. Level three is transfer; this level looks at the transfer that has occurred in learners' behaviour due to the teaching program. Teaching at this level attempts to answer the question - are the newly acquired skills, knowledge, or attitude ready to be used in the everyday environment of the learner? Cognitive Flexibility means the ability to spontaneously restructure one's knowledge in many ways, in

adaptive response to radically changing situational demands (Spiro, Feltovich, Jacobson, & Coulson, 1992).

The Theory largely concerns the transfer of knowledge and skills beyond their initial learning situation. Skills transfer can be described as students' desire to use the knowledge and skills mastered in the training program on the job (Noe & Schmitt, 1986 in Yamnill & McLean, 2001). Behavioural change would likely occur for students who learn the material presented in training and desire to apply that new knowledge or skills to his or her education. Two different types of transfer have been proposed, near transfer and far transfer. Near transfer is applying the learnt information or skills in a new environment that is very like the original one. Teachers need to design ICT instruction that teaches the steps of a task that are always applied in the same order. The advantage of this is that the skills and knowledge are easier to train and transfer of learning is usually a success.

Far transfer is being able to use learned knowledge or skills in very different environments (Alessi & Trollip, 2001). With far transfer teachers need to design ICT instruction where learners are trained to adapt guidelines to changing situations or environments. Thus once the skills and knowledge are acquired, the learner is able to make judgments and adapt to different situations.

This is most ideal for the dynamic ICT evolution in the world today. To support the degree of transfer of knowledge desired, it is important to understand that it is every learners wish to apply the trained skills acquired in doing their work. But this applies only when the learner acknowledges the relevancy of the skills to his/her nature of work expected of him in the field.

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Level four is results, frequently thought of as the bottom line; this level looks at the success of the program. It also tends to look at the skills achieved and the speed to which the skills will be used.

According to Yamnill and McLean (2001), one cause of failure to transfer is that sometimes the training rarely provides for transfer of learning. That is, cognitive learning may well occur, but program participants may not have an opportunity to practice the training in an educational context or may not be taught how to apply their knowledge on the field. So the training itself can have a direct influence on transfer of trained skills.

Information Communication Technology in the Training and Education of Students with Visual Impairment Historical Development of ICT in Education

Merriam, Caffarella, and Baumgartner (2012), opine that, Information and Communication Technology (ICT) is now a commonplace concept in all aspects of life. During the past twenty years, the use of ICT has fundamentally changed the practices and procedures of nearly all forms of life. Education is no exception. Education is a very socially oriented practice and quality. Education has traditionally been affiliated with strong teachers having high degrees of personal contact with their students. The use of ICT in education contributes itself to more student-centred learning settings. But, with the world changing rapidly into digital media and information, the role of ICT in education is becoming more and more efficient, and this importance will continue to acquire and develop in the 21st century.

Olakulehin (2007), holds that ICT has become, within a very short time, one of the basic building blocks of modern society. Many countries now

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consider understanding ICT, and mastering the basic skills and concepts of ICT as part of the core of education, alongside reading, writing, and mathematical literacy. However, there seems to be a misconception that ICT generally refers to 'computers and computing related activities'. This is fortunately not the case in complete sense, although computers and their application play an efficient role in modern information management, other technologies and/or systems also comprise the phenomenon that is commonly defined as ICTs. Pelgrum and Law (2003) state that around the end of the 1980s, the term 'computers' was replaced by 'IT', commonly known as Information Technology, signifying a shift of focus from computing technology, to the ability to store, retrieve and manipulate information. This was followed by the introduction of the term 'ICT' near 1992, when e-mail started to become available to the general public (Pelgrum, & Law, 2003). According to a United Nations report (1999), ICT cover internet service provision, telecommunications equipment and services, information technology equipment and services, media and broadcasting, libraries and documentation centres, commercial information providers, network-based information services, and other related information and communication activities. Various kinds of ICT products have relevance to education, such as teleconferencing, email, audio conferencing, television lessons, radio broadcasts, interactive radio counselling, interactive voice response system, audiocassettes and CD-ROMs etc. all being used in education for different purposes (Bhattacharya & Sharma, 2007).

Ghana introduced ICT into the school curriculum in September 2007 following the recommendations of the ICT4AD document and the Anamuah-

Mensah National Education Review Committee Report (2002). Both documents highlight the importance of integrating ICT into the curriculum at all levels. As a result, the government and other institutions have invested huge sums of money in procurements of computers and establishment of computer labs in most tertiary institutions.

For both visually impaired learners and their educators, ICTs represent access to new worlds. They provide information about new areas of learning, which is text, audio and graphic based (Kosara & Mackinlay, 2013). They also stimulate new ways of thinking and analysing of problems. With ICTs, visually impaired learners and their educators are free to "play" with the information and find facts and ideas in different ways (Ertmer & OttenbreitLeftwich, 2010).

Mama and Hennessy (2013) further acknowledge that ICTs add a new, exciting dimension to data gathering and use. It is almost as if personal computer software adds some personality routine facts. For visually impaired learners, this added test can be the key to more productive and focused study sessions.

Information Communication Technology

For the purposes of this study, ICTs (Information and Communication Technologies) represent a diverse set of technological tools and resources used to communicate, and to create, disseminate, store and manage information (Huda, Tabassum, & Ahmed, 2009). ICT has become a very important part of the educational delivery and training processes for students with visual impairment. ICT to a great extent facilitates the acquisition and absorption of knowledge, and hence can provide

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extraordinary opportunities to developing countries for enhancing their educational systems particularly for the underprivileged constituency, and thereby for raising the level of quality of life of their people. The new communications technologies promise to reduce the sense of isolation, and open access to knowledge in ways unthinkable (Mishra, 2010).

Information Technology

Information Technology (IT) is a term used to describe the items of equipment (hardware) and computer programmes (software) that allow people to access, retrieve, store, organise, manipulate, and represent information by electronic means. Personal computers, scanners and digital cameras fit into the hardware category; database programmes and multimedia programmes fit into the software category (Ertmer, Ottenbreit-Leftwich, Sadik, Sendurur, & Sendurur, 2012).

Communication Technology

Communication Technology is a term used to describe telecommunication equipment through which information can be sought, sent and accessed, for example, phones, faxes, modems and computers (Brown, & Duguid, 2017).

Educational Technology

Educational Technology, also known as e-learning, instructional technology and learning technology refers to the use of technology to support the learning process. Although the term can refer to all kinds of analogue technologies, for example, photographs, film, video, audio recordings etc., it is usually used to talk specifically about digital computer technology (Danesi, 2014). Although technology is widely used in the administration and management of education (e.g. student records, marketing, procurement,

finance etc.) and in research, educational technology among students with visual impairment is only concerned with technology as it impacts upon the learning process, for example in delivering learning materials, facilitating communication and providing assessment and feedback (Kennewell & Beauchamp, 2007). In this way, technology benefits both traditional (i.e. faceto face) as well as open and distance learning models. It can also make it easier to combine different educational models to provide a blended learning experience tailored to individual needs (Wu, Tennyson & Hsia, 2010). This means that through the use of technology, an educator and a learner with visual impairment can still communicate live as well as at a distance.

Educational ICT Policies for the Visually Impaired the UN Convention on the Rights of Persons with Disabilities

The UN Convention on the Rights of Persons with Disabilities addresses the risks of exclusion of persons with disabilities from participating equally in society by defining ICT accessibility as integral to general accessibility rights and on a par with accessibility to the physical environment and transportation. It came into force in May 2008 and enshrines the principle that persons with disabilities must be able to enjoy human rights and fundamental freedoms on an equal basis with others. It is the first international human rights treaty requiring that information and communications technologies and systems be accessible as a necessary condition for persons with disabilities to fully enjoy these fundamental rights without discrimination. Its dispositions provide a human rights foundation for existing policies and programmes developed by countries, such as universal service and access policies for telephony,

video programming and/or web accessibility, and set a clear roadmap for State Parties lacking such policies. Article 9 of the Convention sets out general obligations for States Parties to ensure that persons with disabilities have access to information and communication technologies and systems. Articles 21, 29 and 30 expand on this and refer to media, communications and ICTs serving as platforms for furthering the rights of persons with disabilities to freedom of expression and opinion, access to information, participation in political and public life and participation in cultural life, recreation, leisure and sport. These Articles collectively call for all content, communication, information, hardware, software and interfaces to be accessible. They further call upon States Parties to encourage the private sector to deliver accessible products and services.

Accessibility is identified in Article 3(f) of the Convention as one of its eight general principles, and accessibility, including access to ICTs, is established there in as a condition that will enable persons with disabilities to exercise their fundamental freedoms and human rights. Article 2 defines "communication" in an inclusive manner to include all possible means of communication "languages, display of text, Braille, tactile communication, large print, accessible multimedia as well as written, audio, plain-language, human-reader and augmentative and alternative modes, means and formats of communication, including accessible information and communications technologies "that can eliminate barriers for persons with disabilities to enjoy their fundamental freedoms and human rights.

The Ghana ICT for Accelerated Development (ICT4AD) Policy

Nations worldwide have recognized the developmental opportunities and the challenges of the emerging information age characterized by information and communication technologies (ICTs). These technologies are driving national development efforts worldwide and a number of countries in both the developed and developing world are exploring ways of facilitating their development process through the development, deployment and the exploitation of ICTs within their economies and societies.

The Ghana ICT for Accelerated Development (ICT4AD) Policy represents the Vision for Ghana in the information age. It is based on the Policy Framework Document: "An Integrated ICTled Socio-economic Development Policy and Plan Development Framework for Ghana" released in March 2003. The development of this policy framework document was based on a nation-wide consultative process involving all key stakeholders in the public sector, private sector and civil society.

The Ghana ICT for Accelerated Development (ICT4AD) Policy Statement fully takes into account the aspirations and the provisions of key socio-economic development framework documents including: the Vision 2020 –The First Steps; the Ghana Poverty Reduction Strategy (GPRS) (20022004) and the Co-ordinated Programme for Economic and Social Development of Ghana (2003-2012).

Information and communication technologies (ICT), when accessible and available, can serve as critical enablers that allow persons with disabilities to realise full and effective opportunities to participate, on the basis of equality, in all aspects of society and development. ICTs can help persons with

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disabilities have a greater access to knowledge and independent living. However, there are a few principles that should be taken into consideration while introducing ICTs. Whether one is considering the respective needs of rich and poor, rural and urban, those with access to the internet and those without (the digital divide), ICT has the power to bring people together but, where persons with disabilities lack access to ICTs, they can also leave people behind. Wi-Fi access is essential, as is access to a stable electrical supply. Technology advances quickly and ICT can quickly become obsolete (and examples provided given in the present module may also quickly become dated).

There are general basic principles that should be applied in respect of ICT and disability; first, ICTs need to be accessible to all persons and not just to persons with disabilities. All persons ought to be able to access ICTs that help facilitate communication in different cultural, educational, and professional situations. Another principle is that particular forms or approaches to ICT should reflect the goal of fostering greater participation and inclusion. Where possible, technologies ought to be designed to be as inclusive as possible of everybody, as opposed to further development of certain technologies that would only be used specifically by persons with disabilities.

A further important principle relates to the level of independence and control persons with disabilities have in their use of ICTs. Indeed all people, including those with disabilities, have personal preferences for particular technologies and ought to be able to choose the ICT that best serves them.

Availability of ICT Tools to Students with Visual Impairment

For teachers and their students, the availability of modern computers, peripherals, networking and resources within an increasingly diverse range of technologies is an essential part of learning and teaching in the 21st century. ICT constitutes an input in the student learning process that should help produce better learning output. The availability of ICT resources can enhance learning by making education less dependent on differing teacher quality and by making education available at home throughout the day (Bingimlas, 2009). Biggs (2011) argues that the use of ICT can positively transmit knowledge to students. Furthermore, the availability and use of ICT can help students exploit enormous possibilities for acquiring information for schooling purposes and can increase learning through communication (Youssef & Dahmani, 2008).

Livingstone (2012), opined that, availability of computers and related technologies without being made adequate in regards to students needs may make no difference in the training and education processes. Lau and Sim (2008) further explained that inadequacy of ICT facilities translates into lack of skills in the use of ICT equipment and software which results in a lack of confidence in utilising ICT tools among the students. This is consistent with Tedla (2012) who concluded that lack of enough ICT tools to be key inhibitor to the use of ICT in classroom.

Also, according to Şendag and Odabasi (2009), computers raise the potential to equip students with higher-order skills such as inquiry, reasoning, problem solving and decision-making abilities, critical and creative thinking and learning how to learn. Research also showed that using computers has a

positive effect on students achievement compared to traditional methods (Papastergiou, 2009). According to the Swedish National Agency for School Improvement (2008), ICT provides a positive impact on learning and student performance when it becomes an integrated element in the classroom and teaching. Hsu (2011) argues that the availability of ICT involves students and reinforces conceptual understanding but the main problem with ICT has been its lack of availability to support students learning. ICT use also encourages development from a teacher-focused or teacher-led model to a more studentfocused model in which students work together, make their own decisions and take an active role in learning (Swedish National Association for School Improvement, 2008).

Fink (2013) asserts that increased availability of ICT is especially useful for students who suffer from visual impairment since ICT use allows teachers to prepare suitable tasks for individual needs and each individual more effectively. However, authors like Geist (2011) believe that allowing certain students to use computers distract them from paying attention on the task at hand.

The lesson here is that computers are but a subset of the information communication technology facilities necessitated in schools and that even then, they have to be furnished with quality accessories, installed with appropriate software and linked to necessary networks to allow access to rich resources beyond the school rather than serve as a resource for minor typesetting and other word processing activities Blowers, Iribarne, Colbert and

Kott (2016). Whilst the above studies attempted generally to explain the utilisation of ICT, availability of ICT also affects training and education of students with visual impairment.

A study carried out by Vidhya and Kumari (2015) to analyse the impact of ICT in education sector of Pakistan and based on data accumulated from 429 respondents from 5 colleges and universities. The study report shows that the availability and usage of ICT improves the knowledge and learning skills of students. This indicates that existence of ICT is improving the educational efficiency as well as obliging for making policies regarding education sector. It recommends that the availability and usage of ICT is very essential to improve the educational efficiency of students with visual impairment and also helps the students' development through projects and assignments. The report concludes that ICT brings a positive impact on education sector of Pakistan. In Pakistan, the computer is one of the technological resources many homes are equipped with. In the family home, the availability of the computer can respond to different purposes, in function with the type of users. Particularly, for students who are visually impaired the computer represents a tool for work and plays an important role in entertainment. Via the internet, the computer constitutes a means of looking for and obtaining information, and is a means of communicating and participating in forums on a diverse number of topics.

Accessibility of ICT Resources and Students Learning

Central to the argument of availability are the issues of whether or not the Resource personnel and students with visual impairment have ample and convenient access to computers and their accessories let alone the software

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that is necessitated in the context of their day-to-day research, collaboration, teaching and student evaluation (O'Brien, 2008). Furthermore, students and teachers should have confidence in these facilities, which are in turn reliant on the facilities' reliability or degree to which the teachers and students are sure that they will have access to them at all expected times and utilise them predictably to the betterment of their academic work (Granger, Leech, 2014).

Effective integration of ICT in schools would call for a whole institution to be networked to ensure access to multimedia and learning- rich resources via the school's Intranet and the Internet wherever students and teachers are, in or out of school. The computer labs (resource centres) and classroom computers need to be sufficient in number to allow ready access by students and staff in most subjects across the school. A wide range of peripheral and remote working devices, including video-conferencing, is provided and integrated into the curriculum. Large and small group presentation facilities are readily available (Moore, & Kearsley, 2011). Despite the above desired situation, most Institutions in Africa face barriers to effective integration of ICT in the teaching and learning process; limited infrastructure in terms of satisfactory physical conditions of laboratories and the subsequent accessibility of the resources (ICT) to the learners (Nestel & Browne, 2010).

Many commercial and academic developers of educational multimedia have focused primarily on information access and presentation (Nestel & Browne, 2010). However, it is easy to see that multimedia has tremendous potential to enhance the vividness with which information can be presented and ease with which it can be accessed, the main barriers to learning are not

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generally that appropriate information is difficult to access or badly presented. The problem has more to do with that information (Buckingham, 2013).

Accessibility and use of ICT allows students to investigate more thoroughly the real world (Grégoire, Bracewell & Laferriére, 1996; Youssef & Dahmani, 2008). They can more readily access information sources outside the classroom and can use tools to analyse and interpret such information. Information may be accessed through online systems or through data logging systems (Youssef & Dahmani, 2008). The technologies allow them to receive feedback, refine their understanding, build new knowledge and transfer from school to non-school settings (Lankshear & Knobel, 2011). In the past this has been difficult to provide in schools due to logistical constraints and the amount of material to be covered all of which can now be addressed with ICT. What can be learned is broadened and deepened (Biggs, 2011).

Barriers, associated with ICT integration that fall within the physical realm are beyond the direct control of the teacher (Buckingham, 2013). These barriers centres around accessibility and infrastructure and include decisions about purchasing, locations of wiring drops, and decisions regarding the placement of computers in centralized labs verses placement of computer pods in classrooms. Placing computers in centralized labs may provide students with equitable and efficient exposure to technology but severely limit the technology accessibility for classroom instruction (Buckingham, 2013). Labs deny teachers the flexibility of deciding when technology should be incorporated into instruction and may send the message to students that computers are not central to learning or the activities in their classrooms. In addition, physical limitations of the classroom including size and location of

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desks, often limit choices of room arrangement and do not provide the space that is necessary to add pods of computers to be used as technology centres.

The researcher agrees that awareness, skills only may not be sufficient enough but rather continuous accessibility to ICT resources would do much better. Continuous access to computers helps teachers feel more secure in their ICT use during lessons and gives them the courage to experiment more and thus helps them integrate ICT into lessons effectively. Many studies also indicate that the impact on learning will increase over time as teachers and students become more experienced in continued practice on using computers (Swedish National Association for School Improvement, 2008).

Mai (2016) argues that information that is accessed but never put to use during that process, may be difficult to retrieve and use when need arises in the real world. Equal attention must be paid to ensuring that the technology is actually being used by the target learners and in ways that truly serve their needs (Salomon, 1994). Whereas the above studies looked at the accessibility of ICT resources in institutions of learning, key information in regards to access points like library, laboratory, and halls of residence were not explored and the frequency of access by the students and staff was never looked at.

ICT Skills Needed By Students with Visual Impairment

According to Hall, Nix and Baker (2012), ICT skills can be described as the confident and critical use of ICT for work, leisure, learning and communication. By contrast, Claro, Preiss, San Martín, Jara, Hinostroza, Valenzuela, Cortes and Nussbaum (2012) maintain that ICT skills encompass the capacity to solve problems of information, communication and knowledge in the digital environment. Furthermore, Binkley, Erstad, Herman, Raizen,

Ripley, Miller-Ricci, and Rumble (2012) embraced the view that ICT skills can be described as the set of skills and understandings required by people to enable meaningful use of ICT appropriate to their needs.

Skills associated with ICTs are increasingly taken for granted at all stages of a student's training and education existence (Livingstone, 2012). Almost any tertiary institution expects students to have appropriate computer skills. In fact, most tertiary institutions assume that new students are computer literate when they arrive in contrast to past expectations that all new students would need some basic computer training (Hacker & Dreifus, 2010).

ICT skills are a fundamental requirement for students and workers in the digital age. In schools, universities and in the work place, the question of how to utilise ICTs for learning purposes has become more and more important for anybody engaging in education and training as new technologies are spreading rapidly (Trilling & Fadel, 2009). Even if a learner is not doing what directly relates to computing, ICT skills are required to do most assignments and projects. In fact, virtually all tertiary institutions courses require basic computer knowledge. Similarly, more and more jobs are demanding that workers become increasingly familiar with using a wide range of computer applications.

According to International Association of Technology, Education and Development (2013), ICT skills can be subdivided and measured in six dimensions: file management, technical issues, legal issues, security, internet use, and risk awareness of one's online traceability.

Each measure consists of 4 to 6 items, referring to particular activities that are deemed important. The item pool was generated on the bases of

findings of the Information Companion project, in with more than 25 ICT lecturers and researchers were directly involved. The activities were very specific such as 'moving several files to a different map or location', 'synchronizing folders between several computers', 'setting up a firewall', '(re)formatting a hard disk', 'adding information to a wiki', 'sharing a digital document with several people over the internet', etc.

The six dimensions can be defined as follows.

1. File management: Activities related to (re)naming, moving, finding and making backups of files.

2. Security: Skills include setting up a firewall and passwords, and installing spam filters and antivirus programs.

3. Technical Issues: Comprises activities such as burning CDs, creating PDF files, formatting hard disks, understanding HTML and Cascade Style Sheets.

4. Legal Issues: Related to the understanding of public property rights of information on the internet, the legal protection of digital information, and terms such as Codecs and Creative Commons.

5. Internet: Includes activities such as: sharing electronic documents over the internet, using social network sites, updating information on a Wiki, a blog, etc., using cloud computing and synchronizing files between several networked computers and mobile devices.

6. (Risk) Awareness: the degree to which students are knowledgeable of identity traces they leave on the internet when using social network sites or other applications.

Also, Youssef, Dahmani and Omrani (2012) are of the view that ICT skills should be divided into four categories, namely operational, formal, information and strategic ICT skills, which are the most needed skills. Below are the stated skills;

i.   Operational ICT skills entail the very basic skills to operate a computer.

ii.   Formal ICT skills include the operational skills and the use of some basic Internet applications.

iii.   Information ICT skills encompass the first two categories, namely operational and formal ICT skills, as well as the utilisation of ICT as a learning tool.

iv.   The final category includes strategic ICT skills, which are those skills that enable the intensive use of ICT to collaborate with other users.

Krubu and Krub (2011) opined that, the need exists for a policy that will outline minimum standards of ICT skills for students and teachers but that, skills must be grounded in use of ICT for learning and this can only be achieved when ICT tools are adequately available. Also, there is a need for change in the type of training offered to students. Clearly a basic level of ICT skill must be achieved but this should be followed by an integrated approach to ICT and learning. The aim should be for embedding ICT firmly into the teaching and learning process so that it is no longer considered a separate and discrete element (Jones & Sallis, 2013).

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Barriers to the Use of ICTs by Students Who Are Visually Impaired

The act of integrating ICT into training and education is a complex process and one that may encounter a number of challenges. These challenges are known as "barriers". A barrier is defined as "any condition that makes it difficult to make progress or to achieve an objective" (WordNet, 1997, as cited in Schoepp, 2005, p. 2). The objective being analysed in this paper is utilisation of ICT in the training and education of students who are visually impaired. Different categories have been used by researchers and educators to classify barriers to use of ICT in in education and training of students who are visually impaired.

Several studies have divided the barriers into two categories: extrinsic and intrinsic barriers. However, what they meant by extrinsic and intrinsic differed. In one study, Bingimlas (2009) referred to extrinsic barriers as firstorder and cited access, time, support, resources and training and intrinsic barriers as second-order and cited attitudes, beliefs, practices and resistance; whereas, Merireng (2013) saw extrinsic barriers as pertaining to organisations rather than individuals and intrinsic barriers as pertaining to teachers, administrators, and individuals.

Another classification found in the literature is teacher-level barriers versus school-level barriers. Al-Senaidi, Lin, and Poirot (2009) grouped the barriers according to whether they relate to the individual (teacher-level barriers), such as lack of time, lack of confidence, and resistance to change, or to the institution (school-level barriers), such as lack of effective training in solving technical problems and lack of access to resources. Similarly, Balanskat, Blamire, and Kefala (2006), divided them into micro level barriers,

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including those related to teachers' attitudes and approach to ICT, and meso level barriers, including those related to the institutional context. The latter added a third category called macro level (system-level barriers), including those related to the wider educational framework.

Another perspective presents the obstacles as pertaining to two kinds of conditions: material and nonmaterial (Pelgrum, 2001). The material conditions may be the insufficient number of computers or copies of software. The non-material obstacles include teachers' insufficient ICT knowledge and skills, the difficulty of integrating ICT in instruction, and insufficient teacher time.

Some of these studies look at the barriers at teacher, institution, or system level. However, since the purpose of this study is to determine the utilisation of ICT in the training and education of students who are visually impaired in their tertiary institutions, this analysis focuses on the teacher-level and school-level barriers only as discussed in the following sections.

Teacher-Level Barriers

Lack of Teacher Confidence

Several researchers indicate that one barrier that prevents teachers from using ICT in their teaching is lack of confidence. Dawes (2001) sees this as a contextual factor which can act as a barrier. According to British Educational Communications and Technology Agency (2004), much of the research proposes that this is a major barrier to the uptake of ICT by teachers in the classroom. In Becta's survey of practitioners (Becta, 2004), the issue of lack of confidence was the area that attracted most responses from those that took part.

Some studies have investigated the reasons for teachers' lack of confidence with the use of ICT. For example, Beggs (2011) asserted that teachers' "fear of failure" caused a lack of confidence. On the other hand, Balanskat, Blamire, and Kefala (2006), found that limitations in teachers' ICT knowledge makes them feel anxious about using ICT in the classroom and thus not confident to use it in their teaching. Similarly, Becta (2004) concluded their study with the statement: "many teachers who do not consider themselves to be well skilled in using ICT feel anxious about using it in front of a class of students who perhaps know more than they do" (p. 7). In Becta's survey (2004), many of the teacher respondents who identified their lack of confidence as a barrier reported being particularly afraid of entering the classroom with limited knowledge in the area of ICT with their students knowing that this was the case. It was argued that lack of confidence and experience with technology influence teachers' motivation to use ICT in the classroom (Balanskat et al., 2006).

On the other hand, teachers who confidently use technologies in their classrooms understand the usefulness of ICT. Ertmer et al., (2010) found that teachers who have confidence in using ICT identify that technologies are helpful in their teaching and personal work and they need to extend their use further in the future.

Lack of Teacher Competence

Another barrier, which is directly related to teacher confidence, is teachers' competence in integrating ICT into the training and education of students who are visually impaired (Becta, 2004). In an Australian research, Newhouse (2002) found that many teachers lacked the knowledge and skills to

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use computers and were not enthusiastic about the changes and integration of supplementary learning associated with bringing computers into their teaching practices.

Current research has shown that the level of this barrier differs from country to country. In the developing countries, research reported that teachers' lack of technological competence is a main barrier to their acceptance and adoption of ICT (Pelgrum, 2001; Al-Oteawi, 2002). In Syria, for example, teachers' lack of technological competence has been cited as the main barrier (Albirini, 2006). Bingimlas, (2009) produced a report on the use of ICT in European schools. The data used for the report came from the Head Teachers and Classroom Teachers Survey carried out in 27 European countries. The findings show that teachers who do not use computers in classrooms claim that "lack of skills" are a constraining factor preventing teachers from using ICT for teaching. Another worldwide survey conducted by Pelgrum (2001), of nationally representative samples of schools from 26 countries, found that teachers' lack of knowledge and skills is a serious obstacle to using ICT in primary and secondary schools. The results of a study conducted by Balanskat et al. (2006) have shown that "in Denmark ... many teachers still chose not to use ICT and media in teaching situations because of their lack of ICT skills rather than for pedagogical/didactics reasons" while "in the Netherlands ... teachers' ICT knowledge and skills is [sic] not regarded any more as the main barrier to ICT use" (p. 50). Hence, lack of teacher competence may be one of the strong barriers to the integration of technologies into education. It may also be one of the factors involved in resistance to change.

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Resistance to Change & Negative Attitudes

Much research into the barriers to the integration of ICT into education found that teachers' attitudes and an inherent resistance to change were a significant barrier (Watson, 1999; Earle, 2002; Becta, 2004). At a broader level, Becta (2004) argued that resistance to change is an important barrier to teachers' use of new technologies in the training and education of students who are visually impaired.

Fink (2013), argued that integrating the new technologies into the training and education of students who are visually impaired settings requires change and different teachers will handle this change differently. According to him, considering different teachers' attitudes to change is important because teachers' beliefs influence what they do in classrooms. Becta (2004) claims that one key area of teachers' attitudes towards the use of technologies is their understanding of how these technologies will benefit their teaching and their students' learning. Schoepp's study (2005) found that, although teachers felt that there was more than enough technology available, they did not believe that they were being supported, guided, or rewarded in the integration of technology into their teaching. According to Empirica (2006), teachers who are not using new technology such as computers and screen readers in the classroom are still of the opinion that the use of ICT has no benefits or unclear benefits.

Obviously, not all communities have this barrier. In Europe, for example, Korte and Hüsing (2007) state that only very few teachers can be regarded as fundamentally opposing the use of ICT in the classroom. Only a

fifth of European teachers believe that using computers in class does not have significant learning benefits for pupils.

School-Level Barriers

Lack of Time

Several recent studies indicate that there is inadequate time to teach students who are visually impaired how to use the various ICTs. A significant number of researchers identified time limitations and the difficulty in scheduling enough computer time for classes as a barrier to use of ICT in their training and education of students who are visually impaired (AlAlwani, 2005; Becta, 2004; Schoepp, 2005; Sicilia, 2005). According to Sicilia (2005), the most common challenge reported by resource personnels was the lack of time they had to plan technology lessons, explore the different Internet sites, or look at various aspects of educational software.

Becta's study (2004) found that the problem of lack of time exists for teachers in many aspects of their work as it affects their ability to complete tasks, with some of the participant teachers specifically stating which aspects of ICT require more time. These include the time needed to locate Internet advice, prepare lessons, explore and practise using the technology, deal with technical problems, and receive adequate training.

Recent studies show that lack of time is an important factor affecting the application of new technologies in science education (Al-Alwani, 2005). According to Al-Alwani (2005), lack of time is a barrier affecting the application of ICT in Saudi Arabia because of busy schedules.

Lack of Effective Training

The barrier most frequently referred to in the literature is lack of effective training (Toprakci, 2006). One finding of Ertmer, and OttenbreitLeftwich (2010) study was that there were not enough training opportunities for students who are visually impaired in the use of ICTs in their training and education. Similarly, Beggs (2011) found that one of the top three barriers to the use of ICT by students who are visually impaired was the lack of training.

According to Becta (2004), the issue of training is certainly complex because it is important to consider several components to ensure the effectiveness of the training. These were time for training, pedagogical training, skills training, and an ICT use in initial teacher training. Correspondingly, recent research by Gomes (2005 concluded that lack of training in digital literacy, lack of pedagogic and didactic training in how to use ICT in the classroom, and lack of training concerning the use of technologies in specific areas were obstacles to using new technologies in the training and education of students who are visually impaired.

Lack of Accessibility

Several research studies indicate that lack of access to resources, including home access, is another complex barrier to the training and education of students who are visually impaired. The various research studies indicated several reasons for the lack of access to technologies occurred. In Sicilia's study (2005), students complained about how difficult it was to always have access to computers. According to Becta (2004), the inaccessibility of ICT resources is not always merely due to the

nonavailability of the hardware and software or other ICT materials within the school. It may be the result of one of a number of factors such as poor organisation of resources, poor quality hardware, inappropriate software, or lack of personal access for teachers (Becta, 2004).

The barriers related to the accessibility of new technologies for students who are visually impaired are widespread and differ from country to country. Empirica's (2006) European study found that lack of access is the largest barrier and that different barriers to using ICT for example a lack of computers and a lack of adequate material. Similarly, Korte and Husing (2007) found that in European schools there are some infrastructure barriers such as broadband access not yet being available. They concluded that one third of European schools still do not have broadband Internet access. Pelgrum (2001), explored practitioners' views from 26 countries on what were the main obstacles to the implementation of ICT in schools. He concluded that four of the top ten barriers were related to the accessibility of ICT. These barriers were insufficient numbers of computers, insufficient peripherals, insufficient numbers of copies of software, and insufficient simultaneous Internet access. Toprakci (2006) found that low numbers of computers, oldness or slowness of ICT systems, and scarcity of educational software in the school were barriers to the training and education of students who are visually impaired.

Basically, there are several barriers associated with the lack of access to ICT. In his research, Gomes (2005) found a lack of appropriate infrastructure and a lack of appropriate material resources to be barriers. However, overcoming such hardware barriers does not, in itself, ensure ICT will be used successfully. According to Balanskat et al. (2006), the

accessibility of ICT resources does not guarantee its successful implementation in training and education of students who are visually impaired, and this is not merely because of the lack of ICT infrastructure but also because of other barriers such as lack of high quality hardware, suitable educational software, and access to ICT resources.

Lack of Technical Support

Without both good technical support in the whole-school resources, students who are visually impaired cannot be expected to overcome the barriers preventing them from using ICT (Lewis, 2003). Pelgrum (2001) found that in the view of students who are visually impaired, one of the top barriers to ICT use in education was lack of technical assistance.

In Sicilia's study (2005), technical problems were found to be a major barrier for students who are visually impaired. These technical barriers included waiting for websites to open, failing to connect to the Internet, printers not printing, malfunctioning computers, and teachers having to work on old computers. "Technical barriers impeded the smooth delivery of the lesson or the natural flow of the classroom activity" (Sicilia, 2005, p. 43).

Korte and Husing (2007) argued that ICT support or maintenance contracts in schools help teachers to use ICT in teaching without losing time through having to fix software and hardware problems. The Becta (2004) report stated that "if there is a lack of technical support available in a school, then it is likely that technical maintenance will not be carried out regularly, resulting in a higher risk of technical breakdowns" (p. 16). Many of the respondents to Becta's survey (2004) indicated that technical faults might

discourage them from using ICT in their teaching because of the fear of equipment breaking down during a lesson.

In general, several studies have identified a range of the following or similar factors as widespread barriers: lack of computers, lack of quality software, lack of time, technical problems, teachers' attitudes towards computers, poor funding, lack of teacher confidence, resistance to change, poor administrative support, lack of computer skills, poor fit with the curriculum, lack of incentives, scheduling difficulties, poor training opportunities, and lack of skills in how to integrate ICT in education.

Merits of ICT Use to Students Who Are Visually Impaired ICT as a Technical Resource

Ertmer and Ottenbreit-Leftwich (2010) hold that the field of education has been affected by ICTs, which have undoubtedly affected teaching, learning, and research. According to Al-Ansari (2006), a great deal of research has proven the benefits to the quality of education. ICT has the potential to innovate, accelerate, enrich, and deepen skills, to motivate and engage students, to help relate school experience to work practices, create economic viability for tomorrow's workers, as well as strengthening teaching and helping schools change (Davis & Tearle, 1999 cited by Yusuf, 2005). As Noor-Ul-Amin (2013) states, much has been said and reported about the impact of technology, especially computers, in education. Initially, computers were used to teach computer programming but the development of the microprocessor in the early 1970s saw the introduction of accessible microcomputers into schools at a rapid rate. Computers and applications of technology was becoming more pervasive in society, which led to questions

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about the need for computing skills in everyday life. Hepp, Hinostroza, Laval and Rehbein (2004) claim in their paper "Technology in Schools: Education, ICT and the Knowledge Society" that ICT has been utilised in education ever since their inception, but they have not always been astronomically present. Although at that time computers have not been fully integrated into the learning of traditional subject matter, the commonly accepted rhetoric that education systems would need to prepare citizens for lifelong learning in an information society boosted interest in ICT (Pelgrum & Law, 2003). The 1990s was the decade of information communications computer and access, particularly with the popularity and accessibility of internet-based services such as electronic mail and the World Wide Web (WWW). At the same time, the CD-ROM considered standard for distributing packaged software (replacing the floppy disk). As a result, educators became more resourceful on the use of the technology to improve student learning as a rationale for investment. Any discussion about the use of computer systems in schools is built upon an understanding of the link between schools, learning and information communication technology. When the potential use of computers in schools was first mooted, the predominant conception was that students would be 'taught' by computers (Mevarech & Light, 1992). In a sense, it was regarded that the computer would 'take over' the teacher's job in much the same way as a robot computer may take over a welder's job. Collis (1989) terms this as "a rather grim image" where "a small child sits alone with a computer".

ICT as a teaching and learning tool:

The use of information and communication technologies in the educative process can be classified into two broad categories: 1. ICT as a technical resource and, 2. ICT as a teaching and learning tool. ICT for education focuses the development of information and communications technology specifically for teaching/learning purposes, while the ICT in education indicates the adoption of general components of information and communication technology as a teaching and learning tool. The field of education has been affected by ICTs, which have undoubtedly affected teaching, learning, and research (Yusuf, 2005). ICT has the potential to accelerate, enrich, and deepen skills, to motivate and engage students, to help relate school experience to work practices, create economic viability for tomorrow's workers, as well as strengthening teaching and helping schools change (Davis & Tearle, 1999; Lemke & Coughlin, 1998; cited by Yusuf, 2005).

Conventional teaching has accentuated content. For many years the course has been written almost as textbooks. Teachers have taught through lectures and presentations interspersed with tutorials and learning activities designed to solidify and practice the content. Contemporary settings now prefer curricula that promote competency and performance. Curricula are starting to focus capabilities and to be concerned more with how the information will be utilized than with what the information is. Contemporary ICTs are able to provide strong support for all these requirements and there are now many outstanding examples of world class settings for competency and performance-based curricula that make sound use of the affordances of

these technologies (Oliver, 2000). The Inclusion of information and communication technologies can help revitalize teachers and students. This can support to improve and develop the quality of education by providing curricular support in difficult subject areas. To achieve these objectives, teachers need to be involved in collaborative projects and development of arbitration change strategies, which would include teaching partnerships with ICT as a tool. Zhao and Cziko (2001) remark that three conditions are necessary for teachers to introduce ICT into their classrooms:

a. Teachers should believe in the effectiveness of technology.

b. Teachers should believe that the use of technology will not cause any disturbances.

c. Teachers should believe that they have control over technology.

However, research studies find that most teachers do not make use of the potential of ICT to contribute to the quality of learning environments, although they value this potential quite significantly (Darling-Hammond, 2010). Harris (2012) conducted case studies in three primary and three secondary schools, which focused on innovative pedagogical practices implicating ICT. Harris (2012) suggests that the benefits of ICT will be achieved when confident teachers are willing to explore new opportunities for changing their classroom practices by using ICT. As a consequence, the use of ICT will not only enhance learning environments but also prepare next generation for future lives and careers as Ertmer et al.(2012) states that the changed pool of teachers will bring changed responsibilities and skill sets for future teaching involving high levels of ICT and the need for more facilitative than didactic teaching roles.

According to Noor-Ul-Amin (2013), the flexibilisation time-space accounted for by the integration of ICT into teaching and learning processes contribute to increasing the interaction and reception of information. Such possibilities show changes in the communication models and the teaching and learning methods used by teachers, giving way to new scenarios which favour both individual and collaborative learning.

The use of ICT in educational fields, by itself, acts as a catalyst for change in this domain. ICT by its very nature are tools that encourage and provide independent learning. Students using ICT for learning purposes become immersed in the process of learning and as more and more students use computers as information sources and cognitive tools (Greenhow, Robelia, & Hughes, 2009). In the past, the conventional technique of teaching has revolved around teachers planning and leading students through a series of instructional sequences to achieve the desired learning outcome.

Typically, these forms of teaching have rearranged around the planned transmission of a body of knowledge followed by some forms of interaction with the content as a means to consolidate the knowledge acquisition. Contemporary learning theory is based on the notion that learning is an active process of constructing knowledge rather than acquiring knowledge and that instruction is the process by which this knowledge construction is supported rather than a process of knowledge transmission (Duffy & Cunningham, 1996). In this domain, learning is viewed as the construction of meaning rather than as the memorization of facts (Greenhow, Robelia, & Hughes, 2009). Learning approaches using contemporary ICT provide many opportunities for constructivist learning through their provision and support for resource-based,

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student-centered settings and by enabling learning to be related to context and to practice (Noor-Ul-Amin, 2013). Moreover, use of ICT in learning settings can serve to support various aspects of knowledge construction and as more and more students employ ICT in their learning practices, the more pronounced the impact of this will become teachers generate efficient and engaging learning experiences for their students, strategically using ICT to enhance learning. Students enjoy learning, and the independent inquiry which can foster the innovative and proper use of ICT.

ICT as an aid in instruction

Some educationists consider ICT to be the only way to go if not a substitute for conventional teaching and learning resources (Lang, Cornelissen, Klahn, Van Logtestijn, Broekman, Schweikert, & Aerts, 2009). ICT's interactive testing and review mechanism, together with "a -let-go-back and look-at-that-again-loop" was believed to offer the best of all worlds of learning (Van den Beemt & Diepstraten, 2016). Studies have shown that ICT can contribute to an innovative student-centered learning environment where teachers act as coaches while remaining in firm control of the learning environment (Smeets & Mooij, 2001). Apple (2014), found that ICT programs are said to promise power for students to control over their own learning, that networking replaces hierarchies and promises to give voice to learners. According to Clark, Yates, Early, Moulton, Silber, and Foshay, (2010), there was evidence that ICT provided motivation and variety, generated enthusiasm, interest, and involvement, maintained attention and enjoyment, enhances thinking and problem-solving skills. These features have been described as a

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way to move from elite to mass education through digital media where more students get access to education for both campus and distance.

The study indicated that ICT is primarily used to support existing teaching structures and traditional ways of tuition. It seemed to Punie (2007) that most European universities are still at a stage where the use of ICT consists of treating the computer as a sophisticated typewriter and as a means of facilitating communication via traditional pedagogy and didactics in the actual teaching situation and only a minority take advantage of the potential of ICT to redesign curricula and the content of programs. The OECD has also investigated student performance at the secondary School, providing evidence of the impact of ICT on concrete school achievements.

Based on the OECD's PISA 2003 assessment of educational performance by 15-year old students, it can be stated that regular computer users perform better in key school subjects compared to those with limited experience with computers or to those that lack confidence in their capability to perform basic computer functions. In this perspective, it can be said that ICT generally has a positive impact on teaching and learning but the expectations that ICT could in some ways revolutionize processes at school have not been realized. Teachers, trainers, and other learning facilitators have to be trained up, examples and time to "adopt" ICT in their daily practice. Empowering teachers and trainers are, therefore, fundamental (Punie, 2007). Information and Communication Technology (ICT) includes computers, the internet, and electronic delivery systems such as radios, televisions, and projectors among others, and is widely used in today's educational setting. School is an important environment in which students participate in wide

range of computer activities, while the home serves as a complementary site for regular engagement in a narrower set of computer activities. Increasingly, ICT is being applied successfully in teaching, learning, and assessment.

ICT as a Support to Collect Information

In this century, ICT has become a powerful informative addition for educational change and reformation. A number of previous studies have shown that an appropriate use of ICT can raise educational quality and connect learning to real-life situations (Lowther, Smaldino, Russell, & Mims, 2008; Weert & Tatnall, 2005). As Weert and Tatnall (2005) have claimed, learning is an ongoing lifelong activity where learners change their expectations by seeking knowledge, which departs from traditional approaches. As time goes by, they will have to expect and be willing to find out new sources of knowledge. Skills in using ICT will be an unavoidable prerequisite for these learners. These days ICT inclines to expand access to education. Through ICT, learning can come anytime and anywhere. Online course materials, for example, can be accessible within short time or no inconvenience. Teleconferencing classrooms support both learner and teacher to interact simultaneously with ease and convenience. By using ICT, learning and teaching no longer depend exclusively on printed materials. Multiple resources are bounteous on the internet, and knowledge can be acquired through video clips, audio sounds and visual presentation and so on. Sánchez and Alemán (2011) point out that, current research has indicated that ICT assists in transforming a teaching environment into a learner-centered one. Since learners are actively involved in the learning processes in ICT

classrooms, they are authorized by the teacher to make decisions, plans, and so forth (Fu, 2013).

ICT, therefore, provides both learners and teachers with more educational affordances and possibilities. Students are now more frequently engaged in the meaningful use of computers (Sánchez & Alemán, 2011). They build new knowledge through accessing, selecting, organizing, and interpreting information communication and technology. Based on learning through ICT, students are more capable of using information and data from various sources, and critically assessing the quality of the learning materials. ICT develops students' new understanding in their areas of learning (Chai, Koh & Tsai 2010). ICT provides more creative solutions to different types of learning inquiries. For example, in reading class, e-books are commonly used in reading aloud activities. Learners can access all types of texts from beginning to advanced levels with ease through computers, laptops, internet personal digital assistants (PDAs), or iPads. Therefore, ICT involves purpose designed applications that offer innovative ways to meet a variety of learning needs.

ICT as a Support of Learning Development through Communication

Koc (2005), holds that using ICT enables students to communicate, share, and work collaboratively anywhere, anytime. For instance, a teleconferencing classroom is enable to invite students around the world to gather together simultaneously for a topic discussion. They may have the possibility to analyses problems and explore ideas as well as to develop concepts. They can further evaluate ICT learning solutions. Students not only acquire knowledge together but also share diverse learning experiences from

one another in order to express themselves and reflect on their learning activities. McMahon's study (2009) figured out that there were statistically significant correlations between studying with ICT and the acquisition of critical thinking skills. A longer exposure in the ICT environment can foster students' higher critical thinking skills. Thus, schools are strongly advised to include technology across all of the learning areas and among all learning levels. Where this is done, students are capable to apply technology to the attainment of higher levels of cognition within specific learning contexts. There are three important characteristics needed to develop good quality teaching and learning with ICT: autonomy, capability, and creativity (Lowther et al, 2008).

Autonomy means that students take control of their learning activities through use of ICT. In this way, they will become more capable of working by themselves and with others. Teachers may also authorize students to complete certain tasks with peers or in groups. Through collaborative learning with ICT, the students have more opportunity to gain new knowledge onto their background knowledge and become more confident to take risks and learn from their mistakes. Moreover, Fu (2013) argued that ICT helps to foster autonomy by allowing educators to create their own material, thus providing more control over course content than is possible in a traditional classroom environment. With regard to capability, once students are more confident in learning processes, they can develop their capability to apply and transfer knowledge while using new technology with effectiveness.

To cite an example, in a regular class room, students visually impaired may be asked to practice their study using online learning resources. They are

required not only to listen to the learning material from the internet, but also to learn the usefulness of ICT like sighted student. They then can make a recording of their own studies and maintain class activities. Before completing this task, they have to know which browser to use in order to search a suitable online audio or readable text book. They will have to browse several online resources and select the one that best meets their learning needs. In addition, finding talking software to access their learning material is another prerequisite for these learners. Therefore, the whole learning process enriches students' learning skills and broadens their knowledge beyond what they already know. Considering ICT, students' creativity can be optimized. They may bring out new multimedia tools and create materials in the styles readily available to them.

ICT Supporting Teachers

Fu (2013), concluded that teachers can act as catalysts for the use of ICT. If the encouragement, equipment, and necessary technological support are available for the teachers, developing an ICT class will be comfortable with them. The main responsibilities of these teachers will be changing their course format, creating and explaining the new class activities, and setting the computer lab through their technology learning specialists or assistants. The use of ICT also changes the teacher learner relationship. Based on the findings of Reid's study, teachers claimed that the relationship between teacher and learner is sometimes reversed with regards to information technology. This relationship boosts student's' confidence when they are able to cooperate teachers with technical issues in the classroom. Therefore, ICT reconstructs

the traditional teacher-centred approach and requires teachers to be more creative in customizing and adapting their own material.

Tezci (2011), holds that technology should be used for more than just support of traditional teaching methods According to him, teachers should learn not only how to use technology to enhance traditional teaching or increase productivity, but also should learn from a student-centred perspective how ICT can be integrated into classroom activities in order to promote student learning. This means that teachers need to use ICT in more creative and productive ways in order to create more engaging and rewarding learning activities and more effective lessons (Birch & Irvine 2009; Honan 2008). Hence, Sánchez and Alemán (2011) suggested that teachers need to keep an open mind about ICT inclusion in the classroom. It is imperative that teachers learn new teaching techniques to adapt to the new instruments when teaching with technology.

Ertmer and Otternbreit-Leftwich (2010), reviewed the related literature on the necessary elements to enable pre-service and in-service teachers to apply ICT as a fruitful pedagogical tool. They suggested that schools provide teachers with solid evidence supporting the positive impact of technologybased and student-centred instruction on student learning and achievement on standardized tests. For an example, schools can offer opportunities for preservice teachers to observe a variety of examples and models, which they can apply with real learners. Schools need to support pre-service teachers understand difficulties they may face when they begin to use ICT in their classrooms, and present effective techniques for addressing them. School authorities should ensure that teachers understand that the ultimate

objective of technology integration is to advance the teaching and learning process, not replace it.

Darling-Hammond and Baratz-Snowden (2007) recommended that, developing a pedagogical model deserves a strong link between theory and application with a view to helping teachers overcome the obstacles faced in technology integration. Thus, Staples, Pugach and Himes (2005) said that, good planning for technology integration requires a special understanding of specific hardware and software related to the curriculum. Staff development and teacher training are also unavoidable to supporting the curriculum with technology integration.

According to Sang, Valcke, Braak, Tondeur and Zhu (2011), several internal factors also have influence over technology inclusion outcomes. Internal factors related to teachers include: understanding of ICT use, attitudes toward technology integration; perceptions, including intention or encouragement to use ICT; self-confidence and knowledge; technology skills; readiness to use ICT; and technology self-efficacy (Sang et al 2011; Tezci 2011a). Chen (2008) explained two common issues associated with internal factors. Firstly, teachers may apply policies based on limited or improper theoretical interpretations and comprehension of ICT use. Secondly, teachers may be under pressure to address all content and be unwilling or hesitant to let students spend more time exploring content on their own with technology due to their other conflicting beliefs. These issues indicate that teachers' beliefs may not continue in their practices. A school culture emphasizing competition and a high-stakes assessment system can discourage teachers from including

technology into their classrooms. Therefore, Chen (2008) says that teachers' beliefs influence ICT use in the classroom.

Internet usage in home and workplace has grown exponentially (Obiadazie, 2014). ICT can potentially decrease the barriers that are causing the problems of the low rate of education in any country. It can be used as a tool to overcome the issues of cost, less number of teachers, and poor quality of education as well as to overcome time and distance barriers (Obiadazie, 2014).

ICT Supporting Learners

ICT offers an entirely new learning environment for students, thus requiring a different skill set to be successful. Critical thinking, research, and evaluation skills are creating in importance as students have increasing volumes of information from a variety of sources to sort through (New Media Consortium, 2007). ICT is playing role in changing techniques of teaching and learning by adding elements of vitality to learning environments including virtual environments for the purpose. ICT is a powerful tool even full of potentially for offering educational opportunities. It is difficult and maybe impossible to imagine future learning environments that are not affirmed, in one way or another, by Information and Communication Technologies (ICT). When looking at the current widespread diffusion and use of ICT in modern societies, especially by the young the so-called digital generation then it can be stated that ICT will affect the complete learning process today and in the future. Collins (2017) focused mostly on the authenticity which should be addressed in the design and development of learning environments. Learning environments need to reflect the potential uses of knowledge that pupils are

expected to master, in order to prevent the acquired knowledge from becoming inert (Adu & Olatundun, 2013). In addition, teachers should encourage pupils to engage in active knowledge construction. This calls for open-ended learning environments instead of learning environments which focus on a mere transmission of facts (Jonassen, Peck, & Wilson, 1999; Light, Calkins, & Cox, 2009; Rennie & Morrison, 2013). ICT may contribute to creating effective learning environments in numerous ways.

Suggestions to Improve ICT Utilisation for Students with Visual Impairment Personal Development for Teachers

According to Almalki and Williams (2012), irrespective of teachers' earnest inclination, profound interest in knowing the potential of ICT, their practical use of ICT is comparatively low, and it generally focuses on a limited range of applications. Ainscow, Dyson, and Weiner (2013), found that teachers' perceived impediments in using ICT reveals three main factors i.e. their lack of resources, their lack of knowledge and skilfulness and instructive complexities to incorporate technology in instruction. However, the competency and compatibility of teachers' self-assurance in their expertise, is a key to understand their eagerness to integrate technology in their instruction. Sime and Priestley (2005) explored three conditions that can help motivate teachers in using ICT to carry out their pedagogical responsibilities: (1) Teachers should have faith that the use of technology would enhance the effectiveness of their goals, which is unachievable through ordinary means, (2) They should also believe that the use of technology would not hamper the other high-level goals they want to accomplish, and (3) There should be the full command on available resources and have enough potential for effectively

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utilizing ICT. Cox (2013) states that, a positive perception of students and teachers towards the value of ICT will encourage them to use ICT. Therefore, understanding the teachers' perception toward ICT will help the decision maker (government or school principal) to make plans on how the teachers will adopt ICT in their teaching activities.

Professional development for teachers was considered as a critical factor in the successful integration of ICT in schools (Neyland (2011). Teachers should have 'technology-supported-pedagogy knowledge' which is required when they plan to integrate ICT in classrooms (Hew and Cheung 2010). Boud (2012) states Training teachers enable teaching in 'student-centred way' and develop 'individual learning program' for their students. He also encouraged the students to work independently on their own computer. Furthermore, Oyaid (2009), states that the barriers that hamper the teacher from using ICT can be eliminated through two ways, namely, individual level enablers and whole school level enablers. At individual level, the teachers have full access to personal PCs or laptops with good quality hardware and software, access to good educational resources, and appropriate training. At whole school level, adequate technical support, effective timetabling, support from senior staff or principal and adequate equipment, such as whiteboards in classroom are key factors to assist teachers.

Training for Students

Availability of ICT resources will not be useful if the students have no skill to use it in their learning process. Therefore, the school should provide basic training for the students. The training has to aim at increasing the

motivation to learn in students. Indeed, as training for teachers is given, suitable ICT training for students is also required Buabeng-Andoh (2012).

Institution/School Support

Support from institution/school is required to perform 'supportive environment' which include encouragement to use ICT, training, and in providing technical support staff (Bingimlas, 2009). All ICT components, hardware and software, should be well maintained, with technical support available when teachers have difficulties to operate it. Hiring special staff, that has the responsibility to support ICT implementation in the primary schools, may be a good solution (Agyei & Voogt, 2011).

According to Bingimlas (2009), a well-planned timetable may provide the teachers more time to prepare teaching material which use ICT. By reducing teachers' workload, they will have more time for developing learning program with their colleagues, trying new methods to teach in ICT environment, and thinking about better pedagogical practices. Schools should also facilitate work groups, which enable the teachers to work together in producing learning materials. This effort will save teachers time, while increasing their productivity.

As a leader, the schools principals' commitment to improve the usage of ICT will support the successful integration of ICT in the school. This support can be in the form of improvement of curriculum and establishing technology committees, encouraging teachers to improve their technological skills, providing appropriate resources and continuous monitoring. The technology committee's main task is the development of plans and strategies to ensure that ICT integration will work well Bingimlas (2009). Furthermore,

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from questionnaires to teachers on online learning tool integration in schools, Neyland (2011) concluded that 'local leadership, including the level of school support and commitment to innovation, was seen to be more important than broader systemic level strategies'.

The effort by schools in integrating ICT in science laboratories will assist students in getting intriguing visualizations of nature proceedings. This effort will be inspirational to students in familiarizing with ICT alongside developing their learning capabilities (Fauville, Lantz-Andersson, and Säljö, 2014).

Community and Government Support

Pouezevara, Mekhael, and Darcy (2014), posit that when schools have adequate finances, ICT access sustainability will be a guarantee. Government financing is a top prerequisite for the provision of appropriate software and hardware to the schools. Support from finances raised by the association of parents allows for the continuity and access achievement in the access of the ICT.

Involving commercial ventures is also a significant step. In India, there was software provision by Pearson Education that combined the ELearning tools, administration tools, management of homework tools, and management of teacher's resources. There has been a successful running of pilot projects in 125 schools. The tools possibly will assist the schools with the implementation of ICT along with saving their worthy time (Almalki & Williams, 2012).

Chapter Summary

Tertiary institutions can no longer ignore the utilisation of ICTs in the training and education of students with visual impairment. The use of ICTs have become an integral part of our education in Ghana. How effectively these educational tools will be used to enhance the learning process of students who are visually impaired depends almost entirely on the available ICT tools, how the available ICT tools are accessed and the skills that will be needed to use the various ICT tools. The mentioned available ICTs are important issues that have to be evaluated and incorporated in a National strategic ICT plan. Stakeholders have to know the needs of visually impaired learners and their Resource Persons before implementing ICTs. The Ghanaian government has to design and deliver quality ICTs through accessibility and create opportunities for visually impaired learners in their training and education. ICTs use should maximize technology to enhance the teaching and learning process of visually impaired learners. We need to know the information society's potential on how to support students with visual impairment and in particular tackle the removal of technical and other barriers to the student with visual impairment utilisation of ICT tools in the knowledge based economy and society.

CHAPTER THREE

RESEARCH METHODS

Introduction

This chapter discusses the research methods used to generate data for analysis and to answer the research questions. Specifically, the Research Design, the Study Area, Population, Sample and Sampling Technique, Sample Size, Data Collection instrument, Procedure for Data Collection, Data Processing and analysis.

Research Design

Research design is a researcher's overall plan for obtaining answers to the research questions or for testing the research hypothesis (Amedahe & Asamoah-Gyimah, 2016). Burns and Grove (2003, p. 27) define a research design as "a blueprint for conducting a study with maximum control over factors that may interfere with the validity of the findings". Parahoo (1997, p. 28) describes a research design as "a plan that describes how, when and where data are to be collected and analysed". In other words, the research design articulates what data is required, what methods are going to be used to collect and analyse the data, and how all of this is going to answer the research question.

MacMillan and Schumacher (2001), define it as a plan for selecting subjects, research sites, and data collection procedures to answer the research question(s). They further indicate that the goal of a sound research design is to provide results that are judged to be credible. For Durrheim (2004), research

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design is a strategic framework for action that serves as a bridge between research questions and the execution, or implementation of the research strategy.

Based on the research philosophy, the study was guided by descriptive cross sectional survey design. The study was quantitative and for that matter collection of data and analyses of data was done. The study was conducted at a given point in time and was not a continuous study. In this regard, the study participants were approached once during the data collection (Creswell & Poth, 2017).

The descriptive cross-sectional survey design was appropriate for this study because the objectives of the study were basically to; identify ICT tools that are available to students with visual impairment in their training and education in tertiary institutions in Ghana; examine ICT tools accessible to students with visual impairment in their training and education in tertiary institutions in Ghana; find out which ICT skills will be needed by students with visual impairment in their training and education in tertiary institutions in Ghana; examine the benefits of ICT to students with visual impairment in their training and education in tertiary institutions in Ghana; discuss the challenges students with visual impairment encounter in their training and education in tertiary institutions in Ghana and elicit suggestions to improve ICT use.

According to Burns and Grove (2003, p. 201), a descriptive research "is designed to provide a picture of a situation as it naturally happens". It may be used to justify current practice and make judgment and also to develop theories. Amedahe and Asamoah-Gyimah (2016) described descriptive

research as a type of research which specifies the nature of a given phenomenon.

The purpose of descriptive research is to observe, describe, and document aspects of a thing as it naturally occurs. The reason for employing cross sectional survey in this study was because, cross-sectional surveys are studies aimed at determining the frequency (or level) of a particular attribute, such as a specific exposure as in ICT utilisation. In this type of study, subjects were contacted at a fixed point in time and relevant information were obtained from them. On the basis of this information, they were then classified as having or not having the attribute of interest.

A descriptive survey is a non-experimental design which measures the characteristics of a sample at one point in time (Muijs, 2010). Surveys are traditional ways of conducting research. They are particularly useful for descriptive designs that seek to describe reality. Descriptive surveys tend to be cross-sectional. Cross sectional surveys are surveys that are carried out at a just one point in time. They provide a snapshot of what is happening in that group at that particular time.

Survey research involves acquiring information about one or more groups of people, perhaps about their opinions, characteristics, attitudes, or previous experiences, by asking questions and tabulating the answers. The ultimate goal is to learn about a large population by surveying a sample of it (Leedy & Ormrod, 2005). In other instances, a survey is viewed as the research method used to structure the collection and analysis of standardised information from a defined population using a representative sample of that

population. In addition, the term survey refers to a study that has used a representative sample (Creswell, 2009).

The survey research design was adopted for the study because it gave the researcher the opportunity to generate data from resource persons and students through their objective opinions obtained through administration of questionnaire.

The use of this type of design helped generalise information as well as develop specific predictions from general principles regarding the utilisation of ICT in the training and education of students with visual impairment in tertiary institutions in Ghana.

Data collection techniques in descriptive survey present several advantages as they provide a multifaceted approach for data collection. Some of the advantages may include:

First, surveys have internal and external validity. A survey which is based on some form of random sampling technique will produce a sample which is representative of the particular population under study and will produce findings which may be generalised to the wider population.

Second, surveys are efficient because they can use a random sampling technique to recruit participants and relatively small sample sizes can be used to generate findings which can be used to draw conclusions about the whole population. They are thus a very cost-effective way of finding out what people do, think and want.

Again, surveys can cover geographically spread samples. Surveys can be undertaken using a wide range of techniques including postal

questionnaires and telephone interviews. This means that participants who are widely dispersed can be accessed and included in the sample.

Also, surveys have ethical advantages. Since most surveys do not expose individuals to possibly invasive techniques or withhold treatment, they may be considered more ethical, since the individuals included in a study will merely be exposed to events that occur in the real world and would have taken place anyway.

To add to the above, surveys are flexible. Surveys can easily be combined with other methods to produce richer data. So for instance, you might want to consider also using diaries, focus groups, or in-depth interviews.

Study Areas

The study was mainly conducted in three public universities namely: University of Ghana, University of Education, Winneba and the University of Cape Coast. The reason for selecting these tertiary institutions was because of the availability of resource centres.

 University of Ghana

The University of Ghana is the oldest and largest of the thirteen Ghanaian universities and tertiary institutions. It is one of the best universities in Africa and by far the most prestigious in West Africa. It was founded in 1948 as the University College of the Gold Coast, and was originally an affiliate college of the University of London, which supervised its academic programmes and awarded degrees. It gained full university status in 1961. The University is mainly based at Legon, about 20 kilometres north - east of the centre of Accra the capital city of Ghana.

University of Ghana is an inclusive tertiary institution. The Office of Students with Special Needs (OSSN) is the department that assists students with disabilities including the visually impaired in their training and education. OSSN provides various assistive devices to aid students with visual impairment.

University of Cape Coast

The University of Cape Coast is one of the rare sea front universities in the world. It was established in October, 1962 as a University College and placed in a special relationship with the University of Ghana, Legon. On October 1, 1971, the College attained the status of a full and independent University, with the authority to confer its own degrees, diplomas and certificates by an Act of Parliament. The University of Cape Coast Act, 1971 (Act 390) and subsequently the University of Cape Coast Law, 1992 (PNDC Law 2781).

The University was established out of a dire need for highly qualified and skilled manpower in education to provide leadership and enlightenment. Its original mandate was therefore to train graduate professional teachers for Ghana's second cycle institutions and the Ministry of Education, in order to meet the manpower needs of the country's accelerated education programme at the time. Today, with the expansion of some of its faculties and the diversification of programmes, the University has the capacity to meet the manpower needs of other ministries and industries in the country, besides that of the Ministry of Education.

The university, which is five kilometres west of Cape Coast, is on a hill overlooking the Atlantic Ocean. It operates on two campuses: the Southern

Campus (Old Site) and the Northern Campus (New Site). University of Cape Coast is an inclusive tertiary institution. The Resource Centre for Alternative Media and Assistive Technology (RCAMAT) is the department that assist students with disabilities including the visually impaired in their training and education. RCAMAT provides various assistive devices to aid students with visual impairment.

University of Education, Winneba

The University of Education at Winneba (UEW) is a university in Winneba, Ghana. Its main aim is to train teachers for the education system of Ghana. The University of Education, Winneba, is charged with the responsibility of producing professional educators to spearhead a new national vision of education aimed at redirecting Ghana's efforts along the path of rapid economic and social development. The University of Education, Winneba is expected to play a leading role in the country's drive to produce scholars whose knowledge would be fully responsive to the realities and exigencies of contemporary Ghana and the West African sub-region.

The university has three campuses in Winneba where its administrative office is located, the University also has three extra campuses in addition to over 20 study centers: - The College of Technology Education - Kumasi Campus, The College of Agriculture Education - Mampong Campus and The College of Languages Education -Ajumako Campus.

University of Education, Winneba is an inclusive tertiary institution. The Department of Special Education is the department that assist students with disabilities including the visually impaired in their training and

education. The Department of Special Education provides various assistive devices to aid students with visual impairment.

Population

Population is the entire set of individuals of interest to a researcher (Gravetter & Forzano, 2009). Population means all the people or subjects about whom the study is meant to generalise (Kothari, 2004). The population for this study included students with visual impairment and resource persons across Ghanaian Public Universities (University of Ghana, University of Cape, and University of Education, Winneba). In all, there were 134 students with visual impairment and 25 resource persons across the three Universities at the time of the study. At the University of Cape Coast, there were 25 students with visual impairment, out of which seven were females, 18 were males. There were eight resource persons at the University of Cape Coast. University of Education, Winneba also had 84 students with visual impairment of which 17 were females and 67 were males. There were nine resource persons at the University of Education, Winneba. At the University of Ghana there were 25 students with visual impairment and eight resource persons. Out of the 25 students with visual impairment, six were males and 19 were females.

Sample and Sampling Procedure

Sampling is the process of selecting smaller portions of the larger population to be studied in order to draw conclusions from the sample to the population from which the sample was drawn (Orodho, 2012). Considering the small nature of the study population, the census method was employed where all the 134 students with visual impairment and 25 resource persons across the three universities were selected to respond to the study. The

purposive sampling technique was employed for the study. This was because of the special characteristics possessed by the students. Out of the 159 targeted population, 136 were valid and used for the analysis.

Data Collection Instruments

This section discusses the data collection methods and tools used for the study with sound and justifiable reasons for the choice. A further brief description of the instrument, thus the relevant items on the instrument is also included in this section. Data collection is an important aspect of any type of research study. Inaccurate data collection can significantly impact on the results of a study and ultimately lead to misleading results and conclusions (Yin, 2011).

The study relied on primary data. Primary was collected through the use of questionnaire. Questionnaires are easy to administer, friendly to complete and fast to score and therefore take relatively very little time of researchers and respondents. Additionally, questionnaires are valuable methods of collecting a wide range of information from a large number of individuals or respondents. In this case, the population size of students with visual impairment across the selected universities was large enough to use a questionnaire to obtain statistically useful information. More importantly, all the students and resource persons could read and complete questionnaire.

Singh (2007), maintains that a questionnaire is almost always self-administered, allowing respondents to fill them out themselves. All the researcher has to do is to arrange for their delivery and collection. In affirmation, Bhattacherjee (2012) indicates that questionnaires are instruments completed by respondents themselves; they are relatively easy to use,

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inexpensive and are often the most plausible option for measuring unobservable constructs such as attitudes, values and preferences, intentions and personalities. They have a highly structured format, often used where the aim is to generate quantitative data from a large sample to test research questions and/or hypotheses. To corroborate this view, Fowler (2013), mentions that questionnaires are efficient tools for surveying large samples of respondents in a shorter period of time than interviews or other research methods, with less expense.

Questionnaires were developed by the researcher (adapted) from the review of related literature and were converted into Braille form for the students with visual impairment to make reading and completion easy for the respondents to self-complete the items on the questionnaire. Some of the questionnaires were printed in large characters to aid students who are partially blind and those who preferred to use a Close Circuit Television in their response. Some of the questionnaires were also printed for the resource persons.

According to Sanders (1997), the key to getting the right data depends on the questions that are asked. Every well-structured questionnaire contained either close, open-ended or both types of questions. Questionnaires were open-ended and close-ended. Regarding the close – ended questions, respondents were provided with a set of options (multiple choices) to a question to choose among them (See Appendices C and D).

In order to ensure that the questionnaires were designed in relation to the objectives of the study, they were structured into seven parts where each part focused on one objective. The questions were constructed in a concise

manner in order to avoid ambiguity. In addition, an explanation of the research aims was provided to the respondents to give them some information about the study. The intention was to show the relevance and usefulness the study may have.

The first section "A" focused on the background characteristics of the respondents including the age-range, gender, level and programme of study for students with visual impairment and age-range, gender and years of service for resource persons. The second section "B" focused on the availability and adequacy of ICT tools for both students and resource persons. In this section, there were 10 variables which were measured on a three point scale (not available, available but inadequate and available and adequate). The third section "C" focused on the accessibility of ICT tools for both students and resource persons. The section included accessibility to various locations where ICTs are used (not accessible, fairly accessible and accessible) and accessibility to various ICT hardware and software (easy, difficult and very difficult). In this section, there were 19 variables which were measured on a three point scale. The fourth section "D" focused on the ICT skills students with visual impairment and resource persons possessed and skills they will like to possess. On skills that students with visual impairment and resource persons possessed, they were measured on a three point scale (poor, fairly good and good) while students with visual impairment and resource persons were made to choose from a list of stated skills. The fifth section "E" focused on the barriers that students with visual impairment encounter with the use of ICT tools. In this section, there were 10 variables which were measured on a four point Likert scale (strongly agree, agree, disagree and strongly disagree).

The sixth section "F" centred on the benefits students with visual impairment and resource persons will derive from the use of ICT tools in their training and education in tertiary institutions in Ghana. This section covered 13 variables which were measured on a three point Likert scale (agree, disagree and don't know). The last or seventh section "G" focused on the suggestions made by both students and resource persons on the improvement of the use of ICT in the training and education of students with visual impairment in tertiary institutions in Ghana. (See Appendices C and D. for data collection instrument)

Validity and Reliability

 Validity

Golafshani (2003), opines that an instrument is valid if it measures what it was intended to measure. In addition, the instrument should cover all the research issues pertaining to both content and detail. To corroborate this view, Nardi (2006), indicates that validity is about accuracy and whether the items are correctly indicating what they are supposed to indicate. Nardi (2006), discusses several ways of determining if the measures one uses are valid. In this study, the value of the research findings was ensured by addressing the issues of both reliability and validity in the following manner:

The research instruments were pilot-tested with the aim of increasing validity. The instrument was pilot-tested at the Wesley College of Education. Sample was similar to the intended study population. The comments from the pilot-test were used to refine the final instruments.

All the respondents who participated in the study were assured of confidentiality. The respondents were not to provide any information on their identity so that they could freely respond to the questions without any fear of being identified. This also made it possible for them not to hold back some information. As well as contribute to the true picture of the situation as seen and experienced by the respondents.

Reliability

Reliability refers to consistency of measurement (Creswell, 2009), that is, the extent to which results are similar over different forms of the same instrument or occasions of data collection (McMillan & Schumacher, 2001). This means that if another person carrying out the research follows the same procedure of measurement and then gets the same result, over a certain period, the instrument is reliable.

According to Bell (2010), reliability is the extent to which a test or procedure produces similar results under constant conditions on all occasions. Delport (2005) suggests four possible ways of increasing the reliability of instruments, namely:

1. Clear conceptualisation of constructs by developing an unambiguous, clear theoretical definition for each construct and by making sure that each measure indicates only one specific concept;

2. Increasing the level of measurement indicators to a higher or more precise level of measurement;

3. Using multiple indicators of a variable, such as two or more indicators to measure each aspect of a variable; and

4. Using pre-tests, pilot studies and replications.

Data Collection Procedure

Data was collected personally by the researcher. Collecting the data personally could help to standardise all the instruments, including the researcher as the human instrument. It also provides more insights about the respondents. This is intended to yield field notes that are informative and that would otherwise have been missed if the data collection had been done by someone else. Data for the study was collected between March and April, 2018. Thus a two month period was used in collecting data across the three universities.

Pilot-Testing

Pilot-testing was done at Wesley College of Education with 21 students with visual impairment. The instrument was subjected to a reliability test to see whether it measures what it is supposed to measure. Sections B-G had reliability coefficient more than 0.70 (see Appendix E). A reliability coefficient (alpha) of 0.70 or higher was considered for the instrument to be reliable (Bolarinwa, 2015). In the view of Gorman and Clayton (2005), a pilottest means taking the draft research plan and applying it in a neutral location that will not be used in the actual fieldwork, or collection of preliminary data in the actual location(s) from which data are to be collected. Either way, a pilot-test allows one to test several variables and to remove any initial problems before preparing the broad plan that would direct the entire research project. The idea is not to get data per se, but to learn about the research process, and the instrument.

According to Gorman and Clayton (2005), a pilot-test could also be used to test the language and the content of the questions, as well as the

length and approach of the interviews and focus groups. Moreover, a pilottest could test observation techniques such as the non-verbal responses of those being interviewed. Revisions were made accordingly from the pilot study so that the actual study is of better quality.

Ethical Consideration

Observation of research ethics helps to protect the rights of the research participants and promote the integrity of the research (Israel & Hay, 2006). The following measures were taken as a way of observing ethics in research.

The researcher applied for a research permit from Institutional Review Board from University of Cape Coast. It is important that research participants get informed before they are approached for data collection. To comply with this, the respondents were informed before data collection through the use of consent letters. Consent letters contained important information about the research, and the importance of their participation in the study. The aim was to seek their informed consent and ensure voluntary participation. Research participant had an opportunity to withdraw from the study if they felt like doing so. Anonymity and confidentiality were observed in the research study. In this study, the names of participants were kept anonymous and the data collected from the respondents were used for academic purpose.

Data Processing and Analysis

Patton (2002), notes that analysis of any kind of data refers to its systematic examination to determine its parts, the relationship among the parts, and their relationship to the whole. According to Blanch and Durrheim

(2001), the main objective of data analysis is to transform data into a meaningful form in order to answer the original research question(s).

Descriptive statistics were used to analyse the data. Means, frequencies and standard deviations were used. To establish availability, accessibility, skills, learning, benefit, barriers and suggestions of ICT in the education and training of students with visual impairment in tertiary institutions in Ghana, descriptive statistics were used.

Research question one was analysed using means and standard deviations. To achieve this, the students and resource persons were made to rate the whether the ICT tools are Not Available, Available but Inadequate and Available and Adequate. Using means to interpret the results, the scales were scored as (Not Available=1, Available but Inadequate=2, and Available and Adequate=3). The criterion value of 2.00 was set for the scale. To obtain the criterion value (CV=2.00), the scores were added together and divided by the number scale (3+2+1= 6/3=2.00). Therefore to interpret the means, any tool that scored a mean of **0.0 to 1.49** was regarded as Not Available. Those tools that scored mean from **1.50 to 2.49** was viewed available but Inadequate, and tools that scored a mean of **2.50 to 3.0** was interpreted as Available and Adequate.

Research question two was analysed using means and standard deviations. To realize this, the students and resource persons were made to rate the whether the ICT tools and location in the following way Not Accessible, Fairly Accessible and Accessible. Using means, the scales were scored as (Accessible =3, Fairly Accessible =2 and Not Accessible =1). The criterion value of 2.00 was established for the scale. To obtain the criterion value

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(CV=2.00), the scores were added together and divided by the number scale (3+2+1= 6/3=2.00). To understand the means, any of the Location that scored a mean of **0.0 to 1.49** was regarded as Not Accessible. Those ICT tools and location that scored mean from **1.50 to 2.49** was referred as Fairly Accessible and tools that scored a mean of **2.50 to 3.0** was interpreted as Accessible. Specifically on the tools, the same criterion value of 2.00 was established for the scale. Where the scales were scored as (Easy =3, Difficult =2 and Very Difficult =1).

Research question three was analysed using means, standard deviations and percentages. The first part of the question measured ICT skills students with visual impairment and resource persons possessed. It was analysed using means and standard deviations. To achieve this, the students and their resource persons were required to indicate ICT skills they possess and select from a list of ICT skills they would need and make use of. It was measured by using Good, Fairly Good and Poor. Using means, the scales was scored as (Good =3, Fairly Good =2 and Poor =1). The criterion value of 2.00 was established for the scale. To obtain the criterion value (CV=2.00), the scores were added together and divided by the number scale (3+2+1= 6/3=2.00). To understand the means, skills that are needed by students that scored a mean of **0.0 to 1.49** was regarded as Poor. Those skills that are needed by students that scored mean from **1.50 to 2.49** was referred as Fairly Good and skills that scored a mean of **2.50 to 3.0** was interpreted as Good. The second part of the question which was about ICT skills students and their resource persons will like to possess was analysed using percentages.

Research question four was analysed using means and standard deviations. To accomplish this, the students with visual impairment and their resource persons were made to examine barriers students with visual impairment encounter with the use of ICT in their training and education in tertiary institutions in Ghana. To compute results for this research question, the resource persons and students with visual impairment were made to rate the barriers as whether they Strongly Agree, Agree, Disagree or Strongly Disagree. Using means, the scales was scored as (Strongly Agree =4, Agree =3, Disagree=2 and Strongly Disagree =1). The criterion value of 2.50 was established for the scale. To obtain the criterion value (CV=2.50), the scores were added together and divided by the number scale (4+3+2+1= 10/4=2.50). To interpret the scores from the table, any of the pre-coded barriers that scored a mean of **0.00 to 1.49** was regarded as Strongly Disagree. Those barriers that scored mean from **1.50 to 2.49** was interpreted as Disagree. Those items that had a mean of 2.50 to 3.49 was construed as Agree and finally that items that scored a mean of **3.50 to 4.0** was interpreted as Strongly Agree. Table 9 gives a vivid description on the results.

Research question five was analysed using means and standard deviations. To establish the benefits that could be derived from the use of ICT to students with visual impairment in their training and education in tertiary institutions in Ghana. The students with visual impairment and resource persons rated the benefits as whether they Agree, Disagree or Don't know to the pre-coded statements. Using means, the scales was scored as (Agree =3, Disagree=2 and Don't know =1). The criterion value of 2.0 was set for the scale. To obtain the criterion value (CV=2.0), the scores were added together

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and divided by the number scale (3+2+1= 6/3=2.0). To interpret the scores from Table 6, any of the pre-coded benefits that scored a mean of **0.00 to 1.49** was regarded as Don't Know. Those benefits that scored a mean from **1.50 to 2.49** was interpreted as Disagreement. Those items that had a mean of **2.50 to 4.0** was construed as Agreement.

Research question six was analysed using percentages. The students with visual impairment and resource persons made various suggestions. Suggestions were themed and analysed using percentages.

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CHAPTER FOUR

RESULTS AND DISCUSSION

Introduction

This chapter presents results of the analysis and interpretation of the findings of this research. The first part of this chapter presents the demographic characteristics of the students and resource persons. These were analysed using frequencies and percentages. In the second part, the results of the analysis are presented based on the research questions framed for the study.

Demographic Characteristics of the Students

This section relates to the background information of the students who responded to the questionnaires. Demographic variables of the students included their age range, gender, programmes. The data was analysed using frequencies and percentages.

Table 1 presents the demographic characteristics of the students with visual impairment selected for the study.

Table 1-*Demographic Characteristics of the Students*

Variables	Subscale	Freq.	Percent %
	less than 20	2	1.7
	21-25	51	44.0
Age Range	26-30	43	37.1
	31-35	14	12.1
	41 and above	6	5.1
Gender	Male	98	84.5
	Female	18	15.5
	100	28	24.1
Levels	200	16	13.8
	300	33	28.4
	400	38	32.8
	Post graduate	1	0.90

Source: Field survey, (2018)   (n=116)

Table 1 shows that 51(44%) of the students were within the age range of 21-25, 2(1.7%) were less than 20 years old and 98(84.5%) of the students were males, while 18(15.5%) were females. This shows that there were more males than the females.

The table further shows that, 38(32.8) of the students were in level 400, while 1(0.9%) student was a postgraduate student. This shows that the postgraduate students were the least represented in the sample selected.

Table 2 shows the demographic characteristics of the Resource Persons selected for the study.

Table 2-*Demographic Characteristics of the Resource Persons*

Variables	Subscale	Freq.	Percent %
	21-25	1	5.0
	26-30	8	40.0
Age Range	31-35	4	20.0
	36-40	3	15.0
	41 and above	4	20.0
Gender	Male	13	65.0
	Female	7	35.0
	less than 5 years	10	50.0
Years of service	6-10years	6	30.0
	More than 11 years	4	20.0

Source: Field Data, (2018)   (RPs, n=20)

Table 2 shows that eight (40%) of the resource persons were within the age range of 26-30, 1(5.0%) of the resource persons were within the age range of 21-25 and 13(65%) of resource persons were males while seven (35%) were females. This shows that the males were more than the females.

The table further shows that 10(50%) of resource persons have less than 5 years of service while four (20%) have more than 11 years of service. This means that resource persons who have served for more than 11 years were the least represented.

Research Question One: What are the ICT tools available to students with visual impairment in their training and education in tertiary institutions in Ghana?

One of the main motivation of this study was to assess the availability of ICT tools for students with visual impairment in their training and education in tertiary institutions in Ghana.

Table 3 shows the availability of ICT tools to students with visual impairment in their training and education in tertiary institutions in Ghana.

Table 3-*Results on the Availability of ICT tools to students with visual impairment in their Training and Education in Tertiary Institutions in Ghana*

Sn	Tools	Both Students and RP Perspective Criterion Value=2.00		s
		Means	±Std.D	
1	Embosser	2.02	.39	1st
2	Scanner	1.95	.54	2nd
3	Recorder	1.90	.56	3rd
4	Laptop or desktop computer	1.89	.63	4th
5	Internet	1.87	.76	5th
6	Screen reader	1.85	.71	6th
7	Printer	1.84	.61	7th
8	Close Circuit Television	1.79	.61	8th
9	Projector	1.43	.63	9th
10	Television	1.24	.55	10th
	Mean of means/Std.D	1.77	.60	

Source: Field survey, (2018)   (Stds, n=116, RPs, n=20)

Table 3 further shows that the overall means was less than the CV (2.0). By implication, most of the ICT tools were available but inadequate to students with visual impairment in their training and education in tertiary institutions in Ghana. It was also presented in Table 3 that embosser had a mean of (M=2.02, M>CV) is available and adequate, the other tools (Scanner, Recorder, Laptop or desktop computer, Internet, Screen reader, Printer and Close Circuit Television) had means less than (M<CV) meaning they were available but inadequate. Projector and television have means of (M<1.49) indicating they were not available. The unavailability of television in tertiary institutions may suggest that televisions were not utilised as a tool for learning.

Research Question Two: Which ICT tools are accessible to students with visual impairment in their training and education in tertiary institutions in Ghana?

The main thrust of this research question was to ascertain the ICT tools and location that were accessible to students with visual impairment in their training and education in tertiary institutions in Ghana.

Table 4 shows results on ICT tools and location that were accessible to students with visual impairment in their training and education in tertiary institutions in Ghana.

Table 4-*Results on location and Accessibility of ICT tools to students with visual impairment in their Training and Education in Tertiary Institutions in Ghana*

Sn	Locations	Both Students and RPs Perspectives Criterion Value=2.00		
		Means	±Std.D	
1	Resource Centre	2.50	.654	1st
2	Hall of residence	2.17	.878	2nd
3	Lecture room	2.04	.831	3rd
4	Computer lab	1.75	.867	4th
5	Library	1.57	.762	5th
	Devices			
1	Projector	2.70	.516	1st
2	Printer	2.44	.651	2nd
3	Embosser	2.43	.610	3rd
4	Scanner	2.37	.653	4th
5	Laptop/ desktop	1.43	.651	5th
6	Recorder	1.17	.444	6th
7	Mobile phone	1.07	.256	7th
8	Radio	1.04	.205	8th
	Software			
1	Translation/Conversion	2.15	.740	1st
2	Screen reader	1.77	.784	2nd
3	Text to speech	1.63	.789	3rd
4	Video and audio players	1.62	.743	4th
5	Social media network	1.54	.729	5th
6	Microsoft Word	1.43	.703	6th

Source: Field survey, (2018)   (Stds, n=116, RPs, n=20)

Table 4 shows that most of the location were Fairly Accessible (Hall of residence, Lecture room, Computer lab, Library). The results indicate that resource centre was accessible. With the exception of resource centre, all the other locations were Fairly Accessible.

Table 4 further shows that most of the devices were difficult and Very difficult to use. The students indicated that Projector was easy to use. The results also reveals that, Printer, Embosser and Scanner were difficult to be accessed by students with visual impairment. It was again discovered from Table 4 that, student with visual impairment found it very difficult to use Laptop/ desktop, Recorder, Mobile phone and Radio.

In relation to Softwares, none of them had an indication of it being easy to be accessed by students with visual impairment. Majority of them (Translation/Conversion, Screen reader, Text to speech, Video and audio players and Social media network) were identified as difficult to be accessed with the exception of Microsoft soft word which students found it very difficult to be accessed. This was evident after most of Software scored means that were cluttered around 1.50 to 2.49.

Research Question Three: What ICT skills will be needed by students with visual impairment in their training and education in tertiary institutions in Ghana?

The aim of this research question was to out the ICT skills that were needed by students with visual impairment in their training and education in tertiary institutions in Ghana.

Table 5 shows the ICT skills that students with visual impairment and their resource persons possess.

Table 5-*Results on the ICT skills that will be needed by Students with Visual Impairment in Their Training and Education in Tertiary Institutions in Ghana*

Sn	Tools	Both Students and RP Perspectives Criterion Value=2.00		
		Means	±Std.D	
1	Communication	2.68	.586	1st
2	Present and exchange information	2.32	.767	2nd
3	Typing	2.16	.833	3rd
4	Creating file and folder	2.15	.881	4th
5	File management	1.98	.898	5th
6	Browsing the internet	1.97	.843	6th
7	Formatting	1.96	.892	7th
8	Send and receive Email	1.90	.821	8th
9	Running programmes	1.70	.818	9th
10	Printing	1.42	.713	10th

Source: Field survey, (2018)   (Stds, n=116, RPs, n=20)

Table 5 shows a lot of students with visual impairment possess communication skills in ICT. The least skill that was possessed by students with visual impairment was printing which was considered as poor. The rest of the skills (Present and exchange information, Typing, Creating file and folder, File management, Browsing the internet, Formatting, Send and receive Email, and Running programmes were considered as fairly good.

Table 6 shows the ICT skills that were needed by students with visual impairment in their training and education in tertiary institutions in Ghana.

Table 6-*Skills Needed to Facilitate Training and Education (Students Responses)*

Skills	Frequency	Percent (%)
send and receive email only	3	2.6
Present and exchange information only	1	0.9
Printing only	2	1.7
running programmes only	1	0.9
Typing only	3	2.6
Formatting and typing only	1	0.9
Send and receive email, Browsing the internet, Communication, Present and exchange information, Formatting, Creating file or folder, File management, Printing, Running programmes, and Typing	68	58.6
Creating file or folder, File management, Printing, Running programmes, and Typing only	1	0.9
Running programmes and Typing only	2	1.7
Send and receive email, Browsing the internet Running programmes and Typing only	1	0.9
Printing, Running programmes, and Typing only	4	3.4
Browsing the internet, Running programmes and Typing only	1	0.9
Send and receive email, Browsing the internet, Present and exchange information, Creating file or folder, File management, and Running programmes only	1	0.9
Formatting, Creating file or folder, and File management only	1	0.9
Formatting, Creating file or folder, File management, Printing, Running programmes, and Typing only	1	0.9
Send and receive email, Browsing the internet, Communication, Printing, and Running programmes only	1	0.9
Communication, Present and exchange information, Running programmes, and Typing only	1	0.9
Browsing the internet, and Typing only	1	0.9

Table 6: Continued

Printing and Running programmes only	3	2.6
Send and receive email, Browsing the internet, Printing, and Running programmes only	2	1.7
Browsing the internet, Formatting and Typing only	2	1.7
Send and receive email, Browsing the internet, Communication, Present and exchange information, Creating file or folder, and File management only	1	0.9
Send and receive email, Printing, and Running programmes only	2	1.7
Send and receive email, Browsing the internet, and Typing only	1	0.9
Browsing the internet, Formatting, Creating file or folder, File management, Printing, Running programmes, and Typing only	1	0.9
Communication, Present and exchange information, Printing, Running programmes, and Typing only	1	0.9
Send and receive email, Browsing the internet, Formatting, Creating file or folder, File management, Printing, and Running programmes only	1	0.9
Formatting, Printing, and Running programmes only	2	1.7
Formatting, File management, and Printing only	1	0.9
Send and receive email, Browsing the internet, Communication, Creating file or folder, File management, Printing and Typing only	1	0.9
Send and receive email, Browsing the internet, Communication, Present and exchange information, File management, Printing, and Running programmes only	1	0.9
Send and receive email, Browsing the internet, Communication, Present and exchange information, Formatting, Creating file or folder, and File management only	1	0.9

Source: Field survey, (2018)

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Table 6 shows that a lot of students with visual impairment needed the skill of sending and receiving email, browsing the internet, communication, presenting and exchange information, formatting, creating file or folder, file management, printing, running programmes, and typing which was 68(58.6%). It was then followed by printing, running programmes, and typing with 4(3.4%) respectively.

On the type of ICT skills the resource persons would need to facilitate the training and education of students with visual impairment. The results are depicted in Table 7

Table 7-*Skills needed by resource persons to facilitate the training and*
education of student with visual impairment

Skills	Frequency	Percent (%)
Running programmes and Typing only	1	5.0
Send and receive email, Browsing the internet, Communication,	13	65.0
File management, Printing, Running programmes, and Typing	1	5.0
Send and receive email, Browsing the internet,	2	10.0
Send and receive email, Browsing the internet, Communication, Present and exchange information, Creating file or folder, File management, and Typing only	1	5.0 only
Present and exchange information and Printing	1	5.0
Present and exchange information, Formatting, Creating file or folder and File management only	1	5.0
Send and receive email, Browsing the internet, Communication, Creating file or folder, File management, and Typing only	1	5.0
Source: Field survey, (2018)	(n=20)	

Table 7 shows that resource persons needed the skills of Sending and receiving email, Browsing the internet, Communication, Presenting and exchange of information, Formatting, Creating file or folder, File management, Printing, Running programmes, and Typing representing 13(65%). This means that resource persons suggested that they needed all the ICT skills that were stated to enable them teach their students in their training and education and education in tertiary institutions in Ghana.

Research Question Four: What barriers do students with visual impairment encounter with the use of ICT in their training and education?

Table 8 shows the barriers students with visual impairment encounter with the use of ICT in their training and education in tertiary institutions in Ghana.

Table 8-*Results on the Barriers Students with Visual Impairment Encounter with the Use of ICT in Their Training and Education*

Sn	Tools	Students and RPs Perspectives Criterion Value=2.50		
		Means	±Std.D	
1	Inadequate training opportunities	3.75	.550	1st
2	Unstable power supply	3.50	.895	2nd
3	High cost of laptop or desktop	2.86	.894	3rd
4	Screen readers are expensive	2.79	.641	4th
5	Inadequate screen reader software's	2.65	.826	5th
6	Low battery backup	2.61	.616	6th
7	low quality screen software	2.59	.801	7th
8	Inadequate ICT trainers	2.54	.616	8th
9	Insufficient number of computers	2.10	.858	9th
10	Inadequate time to learn ICT	1.95	.759	10th
	Mean of means/Std.D	2.70	.745	

Source: Field survey, (2018)   (RPs, n=20, Students=116)

Table 8 shows the overall computed mean and standard deviation (MM=2.70, SD=.745, M>CV) gives indication that generally there were many challenges or barriers students with visual impairment encounter with the use of ICT in their training and education. However, the challenges or barriers students encounter varied in magnitude. Table 8 indicated that, the major barrier students with visual impairment encounter in their training and education in tertiary institutions in Ghana was inadequate training opportunities which was followed by unstable supply. The least of the students with visual impairment problem was inadequate time to learn ICT.

Research Question Five: What benefits will be derived from the use of ICT to students with visual impairment in their training and education in tertiary institutions in Ghana?

Table 9 presents results on the benefits that would be derived from the use of ICT to students with visual impairment in their training and education in tertiary institutions in Ghana.

Table 9-*Results on the benefits that will be derived from the use of ICT to students with visual impairment in their training and education in tertiary institutions in Ghana*

Sn	Benefit	Both students and RPs Perspectives Criterion Value=2.50		
		Means	±Std.D	
1	Learn independently	3.70	.308	1st
2	Process and analyse information	3.60	.410	2nd
3	Acquire knowledge and skills	3.40	.360	3rd

Table 9: Continued

4	A prerequisite to workplace preparedness	3.27	.447	4th
5	Access to information	3.23	.540	5th
6	Collaborate with others	3.20	.616	6th
7	Data entry	3.18	.437	7th
8	Apply what has been learnt to real world situation	3.14	.407	8th
9	Develop interest in learning content	3.10	.412	9th
10	Improve organisational skills	3.00	.567	10th
11	Scanning and editing	2.89	.224	11th
12	Doing course work and assignment	2.80	.340	12th
13	Communication Mean of means/Std.D	2.75	.489	13th

Source: Field survey, (2018)   (RPs, n=20, Students=116)

Table 9 shows that students with visual impairment would benefit when they used ICT. With a mean greater than the CV (M>CV), majority of students with visual impairment agreed that ICT would benefit them to learn independently and processing and analyzing information. Table 9 further shows that students with visual impairment would benefit from the use of various ICT tools (process and analyse information, acquire knowledge and skills, a prerequisite to workplace preparedness, access to information, collaborate with others, data entry, apply what has been learnt to real world situation, develop interest in learning content, improve organisational skills,

Scanning and editing, doing course work and assignment, and communication).

Research Question Six: What suggestion can you make towards the improvement of the use of ICT tools in your tertiary institution?

Table 10 presents the results on the suggestions made by resource persons on the improvement of the use of ICT tools in the various tertiary institutions.

Table 10-*Suggestions made Towards the Improvement of the Use of ICT Tools in Your Tertiary Institution (resource persons).*

Resources Person suggestions	Frequency	Frequency
introduce ICT to VI earlier	2	10.0
more trained ICT personnel	1	5.0
introduce ICT as a compulsory course for the VI	5	25.0
procure more ICT tools	5	25.0
More trained ICT personnel and Introduce ICT as a compulsory course for the VI	1	5.0
In-service ICT training for resource personnel	1	5.0
None	3	15.0
More trained ICT personnel and Procure more ICT tools	1	5.0
Procure more ICT tools and Provide more time for VI students to learn ICT	1	5.0
Total	20	100.0

Source: Field survey, (2018)   (n=20)

Table 10 presents results on the suggestions can be put in place to improve the use of Use of ICT Tools in the tertiary institutions. From the results, the resources persons were of the view that the introduction of ICT as a compulsory course for the VI could help to improve the use of Use of ICT Tools in the tertiary institution (n=5, 25.0%). They were also of the view that

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procurement of more ICT tools can help to improve the use of Use of ICT Tools in the tertiary institution (n=5, 25.0%).

Further results show that introduction of ICT to students with visual impairment earlier could help to improve the use of Use of ICT Tools in the tertiary institution (n=2, 10%).

Table 11 presents the results on the suggestions made by students on the improvement of the use of ICT tools in the various tertiary institutions.

Table 11-*Suggestion made Towards the Improvement of the Use of ICT Tools in Your Tertiary Institution (students).*

Students Suggestions	Frequency	Percent (%)
More time to teach ICT	3	2.6
Need more Trained ICT instructors for the visual impaired	7	6.0
ICT as an examined and graded course for the Visually Impaired	2	1.7
More ICT tools should be procured	50	43.1
Increase ICT training opportunities	2	1.7
More audio books	1	0.9
More time to teach ICT and need more Trained ICT instructors for the visual impaired	2	1.7
Need more Trained ICT instructors for the visual impaired and ICT as an examined and graded course for the Visually Impaired	1	0.9
Increase ICT training opportunities and More audio books	4	3.4
Need more Trained ICT instructors for the visual impaired and Increase ICT training opportunities	31	26.7
ICT as an examined and graded course for the Visually Impaired and Mechanism to check ICT trainers	1	0.9

Table 11: Continued

Need more Trained ICT instructors for the visually impaired,	1	0.9 graded course
ICT as an examined and for the Visually Impaired and Increase ICT training opportunities	1	0.9
Subsidies for ICT tools for the vi,		
Increase ICT training opportunities and		
ICT tools for the vi	1	0.9 subsidies for
ICT as an examined and graded course for the Visually Impaired and Increase ICT training	1	0.9 opportunities
None	3	2.6
More time to teach ICT and Increase ICT opportunities	1	0.9 training
More time to teach ICT, need more Trained ICT instructors for the visual impaired and Increase ICT training opportunities	1	0.9

Source: Field survey, (2018)   (n=116)

Table 11 shows results on the suggestions that could be put in place to improve the use of Use of ICT Tools in the tertiary institutions from students with visual impairment. From the table, it is evident that More ICT tools should be procured to improve the use of Use of ICT Tools in the tertiary institutions (n=50, 43.1%).

Discussion

The findings reported are discussed in relation to research questions earlier formulated and outlined. The following is the discussion according to the research objectives and findings.

Discussion on availability of ICT tools in the training and education of students with visual impairment in tertiary institutions in Ghana.

The study established that ICT tools in the three tertiary institutions in Ghana are available but inadequate. Out of the ten ICT tools that were

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assessed, embosser was the only tool which was available and adequate. Seven of the ICT tools were available and inadequate (Scanner, Recorder, Laptop or desktop computer, Internet, Screen reader, Printer and Close Circuit Television) with projector and television not available. This implies that ICT tools in tertiary institutions are not available.

The result of research question one is in line with what Hsu (2011) argued. Hsu (2011) argued that the availability of ICT involves students and reinforces conceptual understanding but the main problem with ICT has been its lack of availability to support students learning. For utilisation of ICT into the training and education of students with visual impairment in tertiary institutions in Ghana to be effective, technology gadgets and their accessories should be made available for use to yield the intended benefits. Bingimlas (2009) averred that the availability of ICT resources can enhance learning by making education less dependent on differing teacher quality and by making education available at any time throughout the day. Inadequacy and unavailability of ICT tools may hinder education been available at any time throughout the day for students with visual impairment.

Biggs (2011) also argues that the use of ICT can positively transmit knowledge to students. Furthermore, the availability and use of ICT can help students exploit enormous possibilities for acquiring information for schooling purposes and can increase learning through communication (Youssef & Dahmani, 2008). The above therefore suggest that inadequacy and the unavailability of ICT resources can negatively affect the student with visual impairment in his or her training and education.

ICT use also encourages development from a teacher-focused or teacher-led model to a more student-focused model in which students work together, make their own decisions and take an active role in learning (Swedish National Association for School Improvement, 2008). But when ICT tools are inadequate and unavailable, development from teacher-focused to student-focused will not be possible.

Also according to Şendag and Odabasi (2009), computers raise the potential to equip students with higher-order skills such as inquiry, reasoning, problem solving and decision making abilities, critical and creative thinking and learning how to learn. Research also showed that using computers has a positive effect on students achievement compared to traditional methods (Papastergiou, 2009).

Livingstone (2012), opined that, availability of computers and related technologies without being made adequate in regards to students needs may make no difference in the training and education processes. Lau and Sim (2008) further explained that inadequacy of ICT facilities translates into lack of skills in the use of ICT equipment and software which results in a lack of confidence in utilising ICT tools among the students. This is consistent with Tedla (2012) who concluded that lack of enough ICT tools to be key inhibitor to the use of ICT in classroom.

In similar account, Fink (2013) asserted that increased availability of ICT is useful for students who suffer from visual impairment since ICT use allows teachers to prepare suitable tasks for individual needs and each individual more effectively. However, authors like Geist (2011) believe that

allowing certain students to use computers distracts them from focusing on the task at hand.

Discussion on accessibility of ICT tools in the training and education of students with visual impairment in tertiary institutions in Ghana.

From the results of the study, it was found that resource centre is accessible to students with visual impairment in their training and education in tertiary institutions in Ghana. Hall of residence, Lecture room, Computer lab and Library were reported as fairly accessible. In addition to the inaccessibility of various locations, students with visual impairment also reported that ICT tools such as Printer, Embosser and Scanner are difficult to be accessed. It was further indicated by students with visual impairment that it is easy to access projectors. This may be due to the fact that projectors have few keys to access it. Laptop/ desktop, Recorder, Mobile phone and Radio were reported to be very difficult to be used by the students with visual impairment. In relation to software, it was discovered that, with the exception of Microsoft word, students with visual impairment found it difficult to access Translation/Conversion software, Screen reader software, Text to speech, Video and audio players and Social media network.

UNESCO (2000) points out that the success of ICT in teaching and learning process in higher education shall base on the degree with which students and teaching staff access ICT facilities. Due to the difficulty in accessing ICT as indicated by the study, such as success in ICT will be a mirage for students with visual impairment in their training and education in tertiary institutions in Ghana.

The results of the study give ample evidence to agree with other researchers. For example, Biggs (2011) and Youssef and Dahmani (2008) were of the view that accessibility and use of ICT allows students to investigate more thoroughly the real world. They can more readily access information sources outside the classroom and can use tools to analyse and interpret such information. Information may be accessed through online systems or through data logging systems (Youssef & Dahmani, 2008).

Lankshear and Knobel (2011) also recounted that technologies allow them to receive feedback, refine their understanding, build new knowledge and transfer from school to non-school settings and as such should be made accessible to students. Buckingham (2013), suggested that placing computers in centralized labs may provide students with equitable and efficient exposure to technology but severely limit the technology accessibility for classroom instruction.

In another incidence, Mai (2016) argues that information that is accessed but never put to use during that process, may be difficult to retrieve and use when need arises in the real world. Equal attention must be paid to ensuring that the technology is actually being used by the target learners and in ways that truly serve their needs (Salomon, 1994).

From the above, the researcher agrees that availability of ICT may not be sufficient enough for the utilisation of ICT in the training and education of students with visual impairment but rather continuous accessibility to ICT resources would help improve ICT utilisation. Continuous access to computers helps teachers feel more secure in their ICT use during lessons and

gives them the courage to experiment more and thus helps them integrate ICT into lessons effectively (Davis & Krajcik, 2005).

Furthermore, according to 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 within the school. It may be the result of one of a number of factors such as poor organisation of resources, poor quality hardware, inappropriate software, or lack of personal access for teachers (Becta, 2004).

In similar results, the barriers related to the accessibility of new technologies for students who are visually impaired are widespread and differ from country to country. Empirica's (2006) European study found that lack of access is the largest barrier and that different barriers to using ICT for example a lack of computers and a lack of adequate material.

Likewise, Korte and Hüsing (2007) found that in European schools there are some infrastructure barriers such as broadband access not yet being available. They concluded that one third of European schools still do not have broadband Internet access. Pelgrum (2001) explored practitioners' views from 26 countries on what were the main obstacles to the implementation of ICT in schools. He concluded that four of the top ten barriers were related to the accessibility of ICT. These barriers were inaccessible numbers of computers, inaccessible peripherals and inaccessible numbers of copies of software.

Discussion on ICT skills needed in the training and education of students with visual impairment in tertiary institutions in Ghana.

The results of the study indicated that students with visual impairment did not have the needed ICT skills. It was found that communication skills

was good while Present and exchange information, Typing, Creating file and folder, File management, Browsing the internet, Formatting, Send and receive Email, and Running programmes were considered as fairly good. Again, it was realised that printing skills was poor. Also, both students and resource persons proposed that they will need all the ICT skills that was made available to them (Send and receive email, Browsing the internet, Communication, Present and exchange information, Formatting, Creating file or folder, File management, Printing, Running programmes, and Typing).

According to UNESCO (2002), the safe way to bring computers to institutions is teaching students the skills necessary to use the various ICT tools. These are the productive tools required later on in life. The developments of appropriate strategies to use these tools productively are through identifying and developing ICT skills. As indicated in the study, majority of students with visual impairment did not possess the needed ICT skills to utilise the various ICT tools. This may be due to the fact that; ICT tools are unavailable or due to the difficulty in accessing the various ICT tools and the locations they can be found.

Skills associated with ICTs are increasingly taken for granted at all stages of a student's training and education (Livingstone, 2012). Almost any tertiary institution expects students to have appropriate computer skills. In fact, most tertiary institutions assume that new students are computer literate when they arrive in contrast to past expectations that all new students would need some basic computer training (Hacker & Dreifus, 2010). But the results of the study proved otherwise, it was revealed that students with visual impairment did not possess the needed ICT skills to utilise various ICT tools.

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This means that tertiary institutions should restructure their curriculum to include the teaching of basic ICT skills to students with visual impairment.

When students were made to choose from a list of ICT skills they will need, majority of them chose all the skill that was provided (Send and receive email, Browsing the internet, Communication, Present and exchange information, Formatting, Creating file or folder, File management, Printing, Running programmes, and Typing). This was in line with what Youssef, Dahmani and Omrani (2012) provided. They were of the view that for students to utilise ICT, they will need operational ICT skills which include Send and receive email, Browsing the internet and Communication; Formal ICT skills which include Send and receive email, Browsing the internet Communication and Typing; Information ICT skills which encompass the first two categories, namely operational and formal ICT skills, as well as the utilisation of ICT as a learning tool and the final category includes strategic ICT skills, which are those skills that enable the intensive use of ICT to collaborate with other users. These include Present and exchange information, Formatting, Creating file or folder, File management, Printing and Running programmes.

The researcher agrees with Krubu and Krub (2011), that the need exists for a policy that will outline minimum standards of ICT skills for students and teachers but that, competency must be grounded in use of ICT for learning and this can only be achieved when ICT tools are adequately available. Also there is a need for change in the type of training offered to students. Clearly a basic level of ICT skill must be achieved but this should be followed by an integrated approach to ICT and learning. The aim should be

for embedding ICT firmly into the teaching and learning process so that it is no longer considered a separate and discrete element (Jones & Sallis, 2013).

Discussion on barriers that students with visual impairment encounter in their training and education in tertiary institutions in Ghana

The study established that generally there are many barriers students with visual impairment encounter with the use of ICT in their training and education in tertiary institutions in Ghana. The results of the study proved that the major barrier students with visual impairment encounter in their training and education in tertiary institutions in Ghana is inadequate training opportunities which was followed by unstable supply. The least of the students with visual impairment barrier is inadequate time to learn ICT.

The results lend support to some studies which indicated that there is inadequate time to teach students who are visually impaired how to use the various ICT tools. A significant number of researchers identified time limitations and the difficulty in scheduling enough computer time for classes as a barrier to use of ICT in their training and education of students who are visually impaired (Al-Alwani, 2005; Becta, 2004; Schoepp, 2005; Sicilia, 2005).

The results further confirm the study of Toprakci (2006) who emphasised that inadequate training can affect students. One finding of Ertmer, and Ottenbreit-Leftwich (2010) study was that there were not enough training opportunities for students who are visually impaired in the use of ICTs in their training and education. Similarly, Beggs (2000) found that one of the top three barriers to the use of ICT by students who are visually impaired was the lack of training.

In Sicilia's study (2005), technical problems were found to be a major barrier for students who are visually impaired. These technical barriers included waiting for websites to open, failing to connect to the Internet, printers not printing, malfunctioning computers, and teachers having to work on old computers. "Technical barriers impeded the smooth delivery of the lesson or the natural flow of the classroom activity" (Sicilia, 2005, p. 43).

Korte and Husing (2007) argued that ICT support or maintenance contracts in schools help teachers and students to use ICT in teaching without losing time through having to fix software and hardware problems. The Becta (2004) report stated that "if there is a lack of technical support available in a school, then it is likely that technical maintenance will not be carried out regularly, resulting in a higher risk of technical breakdowns" (p. 16). Many of the respondents to Becta's survey (2004) indicated that technical faults might discourage them from using ICT in their teaching because of the fear of equipment breaking down during a lesson.

The study was also in line with what Balanskat, Blamire, and Kefala (2006), on his meso level barrier posited. He was of the view that meso level barriers are related to institutional context. These barriers may include; inadequate ICT trainers, inadequate time to learn ICT, inadequate training opportunities and insufficient number of computers.

Discussion on benefits that students with visual impairment will derive from the use of ICT tools in their training and education in tertiary institutions in Ghana.

The research question five sought to find the benefits that students with visual impairment will derive from the use of ICT tools in tertiary

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institutions in Ghana. The results of this research question indicated that majority of students with visual impairment agreed that ICT will benefit them to Learn independently and Processing and analyzing information. It further revealed that students with visual impairment will benefit from the use of various ICT tools. Such benefits may include; process and analyse information, acquire knowledge and skills, a prerequisite to workplace preparedness, access to information, collaborate with others, data entry, apply what has been learnt to real world situation, develop interest in learning content, improve organisational skills, scanning and editing, doing course work and assignment and Communication.

To compare the results with the reviewed literature, Al-Ansari (2006), opined that a great deal of research have proven the benefits to the quality of education and further posited that ICTs have the potential to innovate, accelerate, enrich, and deepen skills, to motivate and engage students, to help relate school experience to work practices, create economic viability for tomorrow's workers, as well as strengthening teaching and helping schools change (Davis & Tearle, 1999 cited by Yusuf, 2005).

The results of the study shows that ICT will benefit students with visual impairment by assisting them in data entry, developing interest in learning content, doing course work and assignment and Communication. To buttress evidence to support the study, Oliver (2000), was of the view that the inclusion of information and communication technologies can help revitalize teachers and students. This can support to improve and develop the quality of education by providing curricular support in difficult subject areas. To achieve these objectives, teachers need to be involved in collaborative projects and

development of arbitration change strategies, which would include teaching partnerships with ICT as a tool.

In the past, the conventional technique of teaching has revolved around teachers planning and leading students through a series of instructional sequences to achieve the desired learning outcome. Typically, these forms of teaching have rearranged around the planned transmission of a body of knowledge followed by some forms of interaction with the content as a means to consolidate the knowledge acquisition. Contemporary learning theory is based on the notion that learning is an active process of constructing knowledge rather than acquiring knowledge and that instruction is the process by which this knowledge construction is supported rather than a process of knowledge transmission (Duffy & Cunningham, 1996). The result of the study is in line with this notion. This is because majority of the students with visual impairment believed that ICT will benefit them to learn independently. The use of ICT in educational fields, by itself, acts as a catalyst for change in this domain. ICT by its very nature are tools that encourage and provide independent learning. Students using ICT for learning purposes become immersed in the process of learning and as more and more students use computers as information sources and cognitive tools (Greenhow, Robelia, & Hughes, 2009). This in its entirety means that ICT will contribute to an innovative student-centered learning environment where teachers act as coaches while remaining in firm control of the learning environment (Smeets & Mooij, 2001).

Discussion on suggestions that can be made towards the improvement of the use of ICT tools in the training and education of students with visual impairment in tertiary institutions in Ghana.

The last research question for the study demanded responses from students and resource persons about suggestions to improve ICT utilisation. The results shows that, majority of the students and resource persons believed that ICT should be made a compulsory and graded course of study for students with visual impairment. Both students and resource persons believed that tertiary institutions should procure more ICT tools to facilitate its utilisation. They also suggested that ICT should be introduced to students with visual impairment earlier. It was also agreed by both students and resource persons that there should be ICT training opportunities for students with visual impairment.

The results confirm the assertion that Sime and Priestley (2005) stated in their second condition for students to utilise ICT. They stated that there should be the full command on available resources and have enough potential for effectively utilizing ICT. This means that there is the need for adequate ICT resources to enable students with visual impairment utilise ICTs in their training and education. Again, Buabeng-Andoh (2012) was of the view that, availability of ICT resources will not be useful if the students have no skill to use it in their learning process. Therefore, the school should provide basic training for the students. The training had to aim at increasing the motivation to learn in students. Indeed, as training for teachers is given, suitable ICT training for students is also required.

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CHAPTER FIVE

SUMMARY CONCLUSIONS AND RECOMMENDATIONS

Introduction

The chapter presents the summary, the conclusion and recommendations. Additionally, the chapter presents suggestions for further research.

Overview of the Study

The study examined the utilisation of ICT in the training and education of students with visual impairment in tertiary institutions in Ghana.

The study employed the descriptive cross-sectional survey. Questionnaire was used to collect the data for the study from both students with visual impairment and resource persons. The sample for the study was 136 of which there were 116 students with visual impairment and 20 resource persons

Summary of Key Findings

The study revealed that, ICT tools in tertiary institutions in Ghana are available but inadequate. Out of the ten ICT tools that were assessed, embosser was the only tool which was available and adequate. Seven of the ICT tools were available and inadequate (Scanner, Recorder, Laptop or desktop computer, Internet, Screen reader, Printer and Close Circuit Television) with projector and television not available.

Again, it was revealed that, accessibility to various locations for students to use ICT was not possible with the exception of resource centre.

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Hall of residence, Lecture room, Computer lab and Library were reported as fairly accessible. In addition to the inaccessibility of various locations, students with visual impairment also reported that ICT tools such as Printer, Embosser and Scanner are difficult to be accessed. It was further indicated by students with visual impairment that it is easy to access projectors. This may be due to the fact that projectors have few keys to access it. Laptop/ desktop, Recorder, Mobile phone and Radio were reported to be very difficult to be used by the students with visual impairment. In relation to software, it was discovered that, with the exception of Microsoft word, students with visual impairment found it difficult to access Translation/Conversion software, Screen reader software, Text to speech, Video and audio players and Social media network.

Also, it was brought to light that, students with visual impairment did not have the needed ICT skills. It was found that communication skills was good while Present and exchange information, Typing, Creating file and folder, File management, Browsing the internet, Formatting, Send and receive Email, and Running programmes were considered as fairly good. Again, it was realised that printing skills was poor. Also, both students and resource persons indicated that they will need all the ICT skills that was made available to them (Send and receive email, Browsing the internet, Communication, Present and exchange information, Formatting, Creating file or folder, File management, Printing, Running programmes, and Typing).

Furthermore, the study established generally that there are many barriers students with visual impairment encounter with the use of ICT in their training and education in tertiary institutions in Ghana. The results of the

study proved that the major barrier students with visual impairment encounter in their training and education in tertiary institutions in Ghana is inadequate training opportunities which was followed by unstable supply of electricity. The least of the students with visual impairment barrier is inadequate time to learn ICT.

To add to the above findings, it was established that majority of students with visual impairment agreed that ICT will benefit them to Learn independently, Process and analyse information. It further revealed that students with visual impairment will benefit from the use of various ICT tools. Such benefits may include; process and analyse information, acquire knowledge and skills, a prerequisite to workplace preparedness, access to information, collaborate with others, data entry, apply what has been learnt to real world situation, develop interest in learning content, improve organisational skills, scanning and editing, doing course work and assignment and Communication.

Last but not the least, it was suggested that ICT should be made a compulsory and graded course of study for students with visual impairment. Both students and resource persons believed that tertiary institutions should procure more ICT tools to facilitate its utilisation. They also suggested that ICT should be introduced to students with visual impairment earlier. It was also agreed by both students and resource persons that there should be ICT training opportunities for students with visual impairment.

Conclusions

Information and communication technology (ICT) is crucially important for sustainable development in a developing country like Ghana.

Mobile phones, satellites or internet are a unique kind of infrastructure that expands access to key public services, promoting digital inclusion. We all are aware of the importance and convenience that technology can have in our lives, but for persons with visual impairment, access to technology can mean living more independent lives, and being able to access the same information, goods and services that others take for granted. If information and communication technologies (ICT) are utilised, it could play an important role as tools for the general restructuring of learning instruction processes, facilitating the development of students' skills of collaborating and working productively with knowledge. But inadequacy of ICT availability mingled with inaccessibility of ICT tools and lack of skills to utilise various ICT tools by students with visual impairment will mean that they will not be able to compete with their peers in the near future which may lead to another form of marginalisation. This will be a future ruled and controlled by ICT.

Recommendations

On the strength of the findings and conclusions arising from the study, the following recommendations may be considered:

The advent of ICT in educational system has revolutionalised the education sector and students with visual impairment should not be left out as found in this study. It is therefore recommended that the Ministry of Education should adopt appropriate ICT tools that will enhance training and education of students with visual impairment. Tertiary institutions should procure more ICT tools to meet the growing demand by students. This means there is need for the tertiary institutions to invest more in computers and related technology as means of not only solving accessibility problem but

improving on the presence of the facilities especially ICT tools in the lecture rooms and computer lab. More infrastructures: printers, computers, projectors should be put in place for more practice and utilization.

Tertiary institutions should maintain internet connection and connect more computers to the internet since the influence of internet cannot be overlooked in modern day training and education. Tertiary Institutions should then liberalize accessibility of internet and e-mail in the various institutions in form of establishment of ICT resource centres where all software can be accessed, students with visual impairment packages and all versions of technology. All in all, tertiary institutions shall take time and afford a 1:1 ratio of Student with visual impairment ICT access to facilitate the utilisation of ICT.

Tertiary Institutions should also train students with visual impairment on proper usage of ICT tools to aid them in their training and education. Training in ICT skills should not be limited to one particular aspect such as screen reader; tertiary institutions should go ahead to integrate the other programs and packages as recommended by UNESCO (2000) curriculum for schools. Clearly a basic level of ICT skill must be achieved but this should be followed by an integrated approach to ICT and learning. The aim should be for embedding ICT firmly into the training and education process so that it is no longer considered a separate and discrete element but as mounted course that should be differentiated for students with visual impairment and should be graded. Such changes may offer the potential to improve on training and education in using modern technology.

There should be the need for tertiary institutions to produce resource persons who are more ICT oriented. This will help reduce the burden of inadequate ICT instructors for students with visual impairment. A move from the traditional method of training resource persons to a more modern way of training them.

Suggestions for Further Research

Based on the findings and the recommendations of this research, I suggest a study should be conducted after two years to examine stakeholders' role in improving the utilisation of ICT in the training and education of students with visual impairment in tertiary institutions in Ghana.

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APPENDICES

APPENDIX A

UNIVERSITY OF CAPE COAST

FACULTY OF EDUCATIONAL FOUNDATION

COLLEGE OF EDUCATIONAL STUDIES

DEPARTMENT OF EDUCATION AND PSYCHOLOGY

QUESTIONNAIRE FOR STUDENTS

This questionnaire is intended to find out the utilisation of ICT in the training and education of students with visual impairment in tertiary institutions in Ghana. Your response to this questionnaire will be used for academic purposes only. You are therefore not to write your name anywhere on the question paper. If you have any question or concern you can reach me on mobile: 0542811751 or Email: kwakuderkye@gmail.com.

SECTION A: BACKGROUND INFORMATION

Instruction: Please choose/ tick (✓) the one applicable to you

1. Age-Range:

   [ ] Less than 20

   [ ] 21-25

   [ ] 26-30

   [ ] 31-35

   [ ] 36-40 [ ] 41

   and above

2. Gender:

   [ ] Male

   [ ] Female

160

3. Level:

[ ] 100

[ ] 200

[ ] 300

[ ] 400

[ ] Post graduate

4. Programme of Study…

SECTION B: AVAILABILITY AND ADEQUACY OF ICT TOOLS

Instruction: Please, tick (✓) the responses applicable to you

5. Indicate the availability and adequacy of the following ICT tools

ICT TOOLS	NOT AVAILABLE	AVAILABLE BUT INADEQUATE	AVAILABLE AND ADEQUATE
Laptop or desktop			
Internet/Email			
Television			
Projector			
Recorder			
Printer			
Scanner			
Embosser			
Screen reader			
Close Circuit Television (CCTV)			

161

SECTION C: ACCESSIBILITY OF ICT

Please, tick (✓) the responses applicable to you

6. To what extent are the following ICT tools accessible in the following

    locations?

LOCATION	NOT ACCESSIBLE	FAIRLY ACCESSIBLE	ACCESSIBLE
Library			
Computer lab			
Resource Centre			
Lecture room			
Hall of Residence			

7. How easy is it to access the following ICT devices?

DEVICES	EASY	DIFFICULT	VERY DIFFICULT
Laptop/ desktop			
Mobile phone			
Radio			
Recorder			
Scanner			
Printer			
Embosser			
Projector			

8. How easy is it to access the following ICT software?

SOFTWARE	EASY	DIFFICULT	VERY DIFFICULT
Microsoft Word			
Screen reader			
Text to speech			
Translation/Conversion			
Video and audio players			
Social media network			

SECTION D: ICT SKILLS

Please, tick (✓) the responses applicable to you

9. How do you equate your skills in the use of the following ICT tools?

SKILLS	POOR	FAIRLY GOOD	GOOD
Send and receive email			
Browsing the internet			
Communication			
Present and exchange information			
Formatting			
Creating file or folder			
File management			
Printing			
Running programmes			
Typing			

10. Which of the following ICT skills will you need to facilitate your training and education? Tick (✓) all the needed ones

[ ] Send and receive email

[ ] Browsing the internet

[ ] Communication

[ ] Present and exchange information

[ ] Formatting

[ ] Creating file or folder

[ ] File management

[ ] Printing

[ ] Running programmes

[ ] Typing

SECTION E: BARRIERS

Please, choose/ tick (✓) the responses applicable to you

11. To what extent are you in agreement with the following barriers to the use of ICT tools?

BARRIERS	STRONGLY AGREE	AGREE	DISAGREE	STRONGLY DISAGREE
High Cost of laptop or desktop				
Unstable power supply				
Low battery backup				
Screen readers are				

expensive				
Low quality screen reader softwares				
Inadequate ICT trainers				
Inadequate time to learn ICT				
Inadequate training opportunities				
Insufficient number of computers				
Inadequate screen reader softwares				

SECTION F: BENEFITS OF THE USE OF ICT TOOLS

Please, tick (✔) the responses applicable to you

    12. To what extent are you in agreement with the following benefits of the

        use of ICT tools?

USE	AGREE	DISAGREE	DON'T KNOW
Learn independently			
Doing course work and assignment			
Acquire knowledge and skills			
Apply what has been learnt to real world			

situations			
Improve organizational skills			
Develop interest in learning content			
Access information			
Communication			
Collaborate with others			
A prerequisite to work place preparedness			
Data entry			
Scanning and editing			
Process and analyse information			

SECTION G: SUGGESTIONS TO IMPROVE ICT UTILISATION

13. What suggestion can you make towards the improvement of the use of

   ICT tools in your tertiary institutions

   …………………………………………………………………………

   …………………………………………………………………………

   …………………………………………………………………………

   …………………………………………………………………………

   …………………………………………………………………………

   …………………………………………………………………………

APPENDIX B

UNIVERSITY OF CAPE COAST

FACULTY OF EDUCATIONAL FOUNDATION

COLLEGE OF EDUCATIONAL STUDIES

DEPARTMENT OF EDUCATION AND PSYCHOLOGY

QUESTIONNAIRE FOR RESOURCE PERSONS

This questionnaire is intended to find out the utilisation of ICT in the training and education of students with visual impairment in tertiary institutions in Ghana. Your response to this questionnaire will be used for academic purposes only. You are therefore not to write your name anywhere on the question paper.

SECTION A: BACKGROUND INFORMATION

Instruction: Please, tick (✓) what is applicable to you

1. Age-Range:

   [ ] Less than 20

   [ ] 21-25

   [ ] 26-30

   [ ] 31-35

   [ ] 36-40 [ ] 41

   and above

2. Gender:

   Male [ ]

   Female [ ]

3. How long have you been a resource personnel

   Less than 5 years [ ]

167

Between 6-10 years [ ]

More than 11 years [ ]

SECTION B: AVAILABILITY AND ADEQUACY OF ICT TOOLS

Instruction: Please, tick (✓) what is applicable to you

4. Indicate the availability and adequacy of the following ICT tools for the student with visual impairment in your institution.

ICT TOOLS	NOT AVAILABLE	AVAILABLE BUT INADEQUATE	AVAILABLE AND ADEQUATE
Laptop/desktop			
Internet/Email			
Television			
Projector			
Recorder			
Printer			
Scanner			
Embosser			
Screen reader			
Close Circuit Television (CCTV)			

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SECTION C: ACCESSIBILITY OF ICT

Instruction: Please, tick (✓) what is applicable to you

5. To what extent are ICT tools accessible in the following locations for the students with visual impairment in your institution?

LOCATION	NOT ACCESSIBLE	FAIRLY ACCESSIBLE	ACCESSIBLE
Library			
Computer lab			
Resource centre			
Lecture room			
Hall of residence			

6. How easy is it for students with visual impairment to access the following ICT devices in your institution?

DEVICES	EASY	DIFFICULT	VERY DIFFICULT
Laptop/ desktop computer			
Mobile phone			
Radio			
Recorder			
Scanner			
Printer			
Embosser			
Projector			

7. How easy is it for students with visual impairment to access the following ICT softwares in your institution?

SOFTWARE	EASY	DIFFICULT	VERY DIFFICULT
Microsoft Word			
Screen reader			
Text to speech			
Translation/ conversion			
Video and audio players			
Social network media			

SECTION D: ICT SKILLS

Instruction: Please, tick (✓) what is applicable to you

8. How do you equate your skills to the use of the following ICT tools in your institution?

SKILLS	POOR	FAIRLY GOOD	GOOD
Send and receive email			
Browsing the internet			
Communication			
Present and exchange information			
Formatting			
Creating file or folder			
File management			
Printing			
Running programmes			
Typing			

9. How do you equate your skills in the use of the following ICT tools?

SKILLS	POOR	FAIRLY GOOD	GOOD
Send and receive email			
Browsing the internet			
Communication			
Present and exchange information			
Formatting			
Creating file or folder			
File management			
Printing			
Running programmes			

10. Which of the following ICT skills will students with visual impairment need in your tertiary institution? Tick (✓) the applicable ones.

[ ] Send and receive email

[ ] Browsing the internet

[ ] Communication

[ ] Present and exchange information

[ ] Formatting

[ ] Creating file or folder

[ ] File management

[ ] Printing

[ ] Running programmes

[ ] Typing

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SECTION E: BARRIERS

Instruction: Please tick (✓) what is applicable to you

11. To what extent are you in agreement with the following barriers of the use of ICT tools?

BARRIERS	STRONGLY AGREE	AGREE	DISAGREE	STRONGLY DISAGREE
High Cost of laptop or desktop				
Unstable power supply				
Low battery backup				
Screen readers are expensive				
Low quality screen reader softwares				
Inadequate ICT trainers				
Inadequate time to learn ICT				
Inadequate training opportunities				
Insufficient number of computers				
Inadequate screen reader softwares				

SECTION F: BENEFITS OF THE USE OF ICT TOOLS

Instruction: Please tick (✓) what is applicable to you

12. To what extent are you in agreement with the following benefits to the use of ICT tools for students with visual impairment in your institution?

USE	AGREE	DISAGREE	DON'T KNOW
learn independently			
Doing course work and assignment			
Acquire knowledge and skills			
Apply what has been learnt to real world situations			
Improve organizational skills			
Develop interest in learning content			
Access information			
Communication			
Collaborate with others			
A prerequisite to work place preparedness			
Data entry			
Scanning and editing			
Process and analyse information			

SECTION G: SUGGESTIONS TO IMPROVE ICT UTILISATION

13. What suggestion can you make towards the improvement of the use of

    ICT tools in your tertiary institutions

    …………………………………………………………………………

    ………..………………………………………………………………….

    …………………………………………………………………………

    …………………………………………………………………………

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APPENDIX C

Reliability test for v sections (B-G) of the research instrument

SECTION B: AVAILABILITY AND ADEQUACY OF ICT TOOLS

Reliability Statistics	
Cronbach's Alpha	N of Items
.857	10

SECTION C: ACCESSIBILITY OF ICT

Locations

Cronbach's Alpha	N of Items
.746	5

Hardware and Software

Reliability Statistics	
Cronbach's Alpha	N of Items
.761	14

SECTION D: ICT SKILLS

Reliability Statistics	
Cronbach's Alpha	N of Items
.716	10

SECTION E: BARRIERS

Reliability Statistics	
Cronbach's Alpha	N of Items
.793	10

SECTION F: BENEFITS OF THE USE OF ICT TOOLS

APPENDIX D

INTRODUCTORY LETTER

Cronbach's Alpha	N of Items
.761	13

UNIVERSITY OF CAPE COAST
COLLEGE OF EDUCATION STUDIES
FACULTY OF EDUCATIONAL FOUNDATIONS

DEPARTMENT OF EDUCATION AND PSYCHOLOGY

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Our Ref:

Your Ref:

UNIVERSITY POST OFFICE
CAPE COAST, GHANA

APPENDIX D

LETTER OF INTRODUCTORY

12th March, 2018

TO WHOM IT MAY CONCERN

Dear Sir/ Madam,

LETTER OF INTRODUCTION: MR. CHARLES

We introduce to you the above mentioned name an M.Phil. Special Student at the Department of Education and Psychology, UCC.

He is undertaking a theses work entitled "Utilisation of Information Communication Technology in the Training and Education of Students with visual Impairment in Tertiary Institutions in Ghana ".

It is purely for academic purposes.

All information retrieved would be treated confidentially.

Kindly accord him with the necessary assistance he may need.

Thank you for your support.

(Georgina Nyantakyiwaa Thompson).
Principal Administrative Assistant
For: Head

APPENDIX E

ETHICAL CLEARANCE

UNIVERSITY OF CAPE COAST
COLLEGE OF EDUCATION STUDIES
ETHICAL REVIEW BOARD

UNIVERSITY POST OFFICE
CAPE COAST, GHANA

Our Ref: CES-ERB/ucc.edu/V2/18-19

Your Ref: ....

Date: Jan 21 2018

Dear Sir/Madam,

ETHICAL REQUIREMENTS CLEARANCE FOR RESEARCH STUDY

Chairman, CES-ERB
Prof. J. A. Omotosho
jomotosho@ucc.edu.gh
0243784739

Vice-Chairman, CES-ERB
Prof. K. Edjah
kedjah@ucc.edu.gh
0244742357

Secretary, CES-ERB
Prof. Linda Dzama Forde
lforde@ucc.edu.gh
0244786680

The bearer Ishmael Dadzie Reg. No. ED/SDP/16/0008 is an M.Phil. / Ph.D. student in the Department of Education and Psychology in the College of Education Studies, University of Cape Coast, Cape Coast, Ghana. He / She wishes to undertake a research study on the topic:

Utilisation of information communication technology in the training and education of students with visual impairment in tertiary institutions in Ghana.

The Ethical Review Board (ERB) of the College of Education Studies (CES) has assessed his/her proposal and confirm that the proposal satisfies the College's ethical requirements for the conduct of the study.

In view of the above, the researcher has been cleared and given approval to commence his/her study. The ERB would be grateful if you would give him/her the necessary assistance to facilitate the conduct of the said research.

Thank you.
Yours faithfully,

Prof. Linda Dzama Forde
(Secretary, CES-ERB)

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