# UTILISATION OF DIGITAL TECHNOLOGIES IN TEACHING STUDENTS WITH BLINDNESS AT A SELECTED UNIVERSITY IN DAR ES SALAAM CITY, TANZANIA

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## DECLARATION

I, **Hadija Suleiman**, hereby certify that this dissertation is wholly original and has no previous submissions or publications at any educational institution in consideration for a comparable award. Contributions from other people's works were acknowledged appropriately. Therefore, I should be held accountable for any errors resulting from my efforts.

**Signature**…… **Date** …….

## APPROVAL

This dissertation was prepared and completed in accordance with Kyambogo University's research guidelines and is hereby submitted to the graduate board with our approval as supervisors;

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**(Supervisor)**

## DEDICATION

I dedicate this thesis to my family: my mother, Shani; my father, Suleiman; my husband, Kamal; my daughters, Haulat, Shani, and Lailat; and my loving brother and sisters for their prayers, support, and courageous hearts, which made me sturdy during my studies.

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## TABLE OF CONTENTS

## LIST OF FIGURES

## LIST OF TABLES

## LIST OF ACRONYMS

| | |
|---|---|
| CCTV: | Closed Circuit Television |
| CRPD: | Convention on the Right of Persons with Disabilities |
| DBT: | Duxbury Braille Translator |
| DTs: | Digital Technologies |
| ETP: | Education Training Policy |
| ICT: | Information Communication Technology |
| JAWS: | Job Access with Speech |
| MoE: | Ministry of Education |
| MoEST: | Ministry of Education Science and Technology |
| NGOs: | Non-Governmental Organizations |
| NVDA: | Non Visual Desktop Access |
| OCR: | Optic Character Recognition |
| SwB; | Students with Blindness |
| TAM: | Technological Acceptance Model |
| TCU: | Tanzania Commission for Universities |
| UDL: | Universal Design for Learning |
| UDSM: | University of Dar es Salaam |
| UN: | United Nations |
| UNESCO: | United Nations Science and Cultural Organization |
| UNICEF: | United Nation International Children Emergence Fund |
| URT: | United Republic of Tanzania |
| WHO: | World Health Organization |

## ABSTRACT

This study explored utilization of digital technologies in teaching Students with blindness at selected university in Dar es Salaam City, Tanzania. The study aimed to achieve three objectives, namely, to analyze the availability and adequacy of digital technologies for teaching students with blindness at selected university, to examine how the available digital technologies are used in teaching students with blindness at selected university and to investigate the perceptions of lecturers, technical staff and students on utilization of digital technologies in selected university. The study utilized the Technology Acceptance Model to explore utilization of digital technologies at selected university. The study adopted a qualitative approach; a case study design was used to obtain the relevant data. Criterion purposive sampling was employed. Two methods of data collection were used to collect data which are Interview and Observation. In an interview, a semi-structured interview guide was prepared to explore utilization of digital technologies and 12 participants were interviewed. While under observation, the observation checklist was prepared to investigate the availability and adequacy digital technologies and supportive infrastructures that enable utilization of digital technologies and the data were recorded. The data obtained were analyzed thematically following the research purpose, objectives and research questions. The study found that digital technologies at selected university were available but not enough to cater for the academic needs of each blind student in the university. Some of digital technologies were appropriate while some are not. Additionally, the study shows that utilization of digital technologies is limited due to lack of knowledge among users, unsupportive infrastructures, and a low number of digital technologies. Finally, the study reveals that there are lectures, technical staffs and students who perceive utilization of digital technologies positively where they believe its use saves time, enhances participation, and promotes equitable quality education to students with and without disabilities and those who perceive it negatively where they believe that using technology can lead to frustration and time wastage. The study concluded that the university has inadequate DTs to enhance the teaching and learning of students with blindness; hindrances emerged, leading to the underutilization of available digital technologies in teaching students with blindness, together with the negative perceptions among lecturers, technical staff and students with blindness. Lastly, the study recommended that the Ministry of Education Science and Technology, in collaboration with other stakeholders like Non-Government Organizations and associations works with people with disabilities, to ensure the availability and adequate number of digital technologies for blind university students. The regular awareness training and capacity building of technical staff to ensure full utilization of digital technologies in teaching students with blindness. Also, the study recommends an improvement of teacher education to provide knowledge on how to handle inclusive classes with the aid of technology and to improve the supportive infrastructure.

# CHAPTER ONE

# INTRODUCTION

## 1.0 Introduction

This study intended to examine the utilisation of digital technologies in teaching Students with blindness in selected university in Dar es Salaam City, Tanzania. This chapter presents the background of the study, statement of the problem, research objectives, purpose of the study, research questions, justification of the study, scope and definition of operational terms. The chapter also shows the theoretical framework and how well it matches the objectives of this study.

## 1.1 Background to the Study

It is globally estimated that more than 1 billion people live with different forms of disabilities. Of these, 253 million people (3.2%) of the world's population have different forms of visual impairments (World Health Organization [WHO], 2021). These people have continuously been living in challenging conditions contributed by inaccessibility to information. Moreover, the twenty-first century has witnessed a revolution in technology, which has brought transformation in all aspects of life, including easy accessibility to education for the blind people. With technology literacies, the blind people can gain education and be empowered as productive members of their communities (Koganuramath & Choukimath, 2009).

Technology is appreciated in creating digital materials, which in this case are very important to make the teaching of students with blindness more accessible (Ferrara et al., 2013). Technology comes from a Greek word with two words in it, which is 'techno', meaning

skills, rule, tool, willingness, and knowledge, while ‘logos’ means science, learning mental state, and word (Stošić, 2015). In a simple way, Clark-Wilson et al. (2020) and Wahab et al. (2012) used the term technology to refer to hardware devices such as computers, smartphones, mobile devices, handheld assistive devices like calculators and software programs that help those hardware devices to function in solving problems through task completion. On the other hand, “digital” refers to a networked environment created by mobile and other information and communications technology and defined by electrical implications, social media, the internet, and the World Wide Web (Haidy, 2013). Therefore, the two words combined “digital technology” means all hardware and software programs that perform different tasks as the user commands. For the sake of this study, Digital technology will be used to refer to different hardware tools such as digitalized computers, calculators, victor readers, digital recorders, CCTVs, smartphones, and Optic character recognitions, to mention but a few, and software programs such as DBT, JAWS, NVDA, OCRs, and TapTapSee which function as the interface for students with blindness to perform their academic tasks in learning as facilitated by their lecturers in the teaching process.

Scholars have reported that digital technologies play a big role in compensating for the lost functioning of vision by adjusting educational opportunities for students with blindness in university settings (Pcheo et al., 2017). This brings the idea that effective means of accommodating persons with blindness include providing suitable digital technologies (Eligi, 2017). Many countries have struggled to accommodate people with disabilities in different life aspects, including education. Researchers have reported this to be the result of many factors, including a lack of awareness about a particular disability, including blindness (Almeida et al., 2020). Inaccessible learning information due to inappropriate resources used has been mentioned to be the cause of exclusion in the education system, especially for

learners with disabilities where students with blindness are part (Temesgen, 2018). This means that the resources used do not suit the teaching needs of students with blindness.

However, over time, technological revolution and numerous global awareness campaigns advocating fairness of possibilities for persons with disabilities have gained steadfast support through utilisation of technology, especially digital technologies, as they allow opportunities for safe and effective teaching and learning environments (Viner et al., 2020). For instance, For over 50 years, developed countries such as the United Kingdom, Sweden and Grenade have put into practice utilisation of digital technologies in education to improve teaching and learning (Passey et al., 2016).

The above-described endeavour stems from an understanding of different international and local legal frameworks, including the Convention on the Rights of Persons with Disabilities (CRPD), which in Article 4 (g) obliges States to ensure the availability and use of new technology for persons with disability. Similarly, Article 24(2) obliges States to ensure the provision of services needed for educational accessibility including the provision of reasonable accommodation within the general education system (UN, 2006). This means that teaching and learning resources, which include digital technologies, should be made available and suitable for the learning of students with blindness. The legal frameworks cited in this paragraph act as a catalyst for States to be concerned about how education systems should be made accessible to all, especially those with visual impairment, who are increasingly enrolling in different universities worldwide.

In Sweden, the National Body for Education has been concerned with utilisation of digital tools in schools, including universities, with the target of improving the teaching of all categories of learners, including those with visual impairments, particularly students with

blindness (Amhag et al., 2019). They add that desktops, laptops, smartphones, smart boards, and tablets are used in the education system, including in Swedish universities nationwide.

In Grenada, digitalization in education for learners with special needs, especially those with blindness, has been supported by the Ministry of Education (MoE) since 2004 (Hersh, 2020). The Ministry provides digital teaching materials such as computers, specialized keyboards, magnifiers, audio players, recorders and software such as screen readers and text-to-audio converters (UNESCO, 2011). As a result, the MoE registered the first blind individuals who qualified to sit for the Caribbean Secondary Exam and did well enough to be employed. This information reveals that when digital technologies are available and utilized well, they can enhance performance among students with blindness.

In Saud Arabia, applying digital technologies for educational accessibility has been a normal practice since 1958 (Alshahrani, 2020). According to Weber (2016), as cited in (Alshahrani, 2020), utilisation of digital technologies in Saudi Arabian universities gained impetus in 1999 when the internet first began to be applied. Different technologies, such as computer hardware and software like screen readers and voice recognition software, were used to increase participation, engagement and ease of communication among students with disabilities, including those with Blindness. This information clearly portrays that digital tools can potentially bridge the knowledge gap of students with blindness by helping them obtain the quality of education available to students without disabilities (Alshahrani, 2020).

In South Africa, digital technology is the solution to educational challenges in universities. According to Ng'ambi et al. (2016) twenty years back, universities used very low technology in education. Later on, strategies to raise utilisation of technologies were put into phases. The first phase is on computer practices, computer-aided skills, and awareness rising on technology. The second one is the preparation of infrastructure and policy development. The

third one is on institutions incorporating ICTs into their strategic plans, and the fourth one is on Social media and mobile learning domination. Instead of focusing on whether students will use technology, research is now focused on how to take advantage of what they are already doing to change the way teaching is done (Mawere & van Stam, 2020).

Being a signatory to different international policy frameworks, Tanzania ratified the CRPD and its Optional Protocol in 2009, thereby committing to adopt Article 4 on general obligations. In 1 (h), the state is obligated to provide digital technologies based on Assistive technologies and other related facilities necessary to ensure accessibility of quality and equal education to all learners, including those with blindness (UN, 2006). This effort has been and is contributing much to the awareness of equal accessibility to education for all groups of citizens in the country. For instance, the National Bureau of Statistics estimated that in (2018), there were 4,094,662 persons with disabilities, equal to 9.04% of the total population. Out of which, more persons with visual impairment equated to 2.48% (UDSM, 2022). The year 2021/2022 witnessed the increased enrollment of students with blindness in different universities in Tanzania. A total of 285 Students with visual impairments, 6 with visual challenges due to albinism and 35 with deaf blindness were admitted to different universities in Tanzania (TCU, 2022). This data above captures the students with blindness enrolled, although there is no clear data on the number of Students with blindness admitted to universities.

The number of enrolled students above has raised the government's attention to ensure a better learning environment for all, regardless of the visual limitations due to blindness. For instance, in 2021/2022, the government supplied all universities with digital tools such as laptops, digital tape recorders, tablets, embossers and software programs such as the JAWS under the COVID-19 programme. This was aimed at creating an inclusive and equitable

learning environment for students with blindness who are admitted to universities in Tanzania. To put these in reality, the government implemented the Education Training Policy (ETP), 2014, which phased out the Technical Education and Training Policy of 1995, the Higher Education Policy of 1999 and the ICT Policy for Basic Education of 2007. All these policies have contributed greatly to reforming the education system and improving education service delivery in the country (Mmari, Kovac &Kalman, 2022). Much is done under the National ICT Policy 2016, which promotes the accessibility of ICT in the education system and utilisation of digital tools for better service provision in education (URT, 2016). With this, it requires that the provision of education and training in all levels of education, including higher learning education, considers the use of ICT in the front line, and the provision of digital tools for students with blindness becomes a requirement to fulfil this commitment (URT, 2016).

Universities in Dar es salaam city hindered with underutilization of DTs in teaching Students with blindness. Several studies on the availability and utilisation of ICT tools and ATs by students with disabilities and visual impairments in higher learning institutions in Tanzania exist (Dalton & Sarah, 2020; Kisanga & Kisanga, 2020). However, there is no clear information on whether they are digital enough to create a learning environment for students with blindness. In the same perspectives, researchers have continuously been reporting that students with visual impairments, including those with blindness, lag behind their counterparts students in performance and that some of them are denied to study the courses of their choice due to their blindness (Zamrodah, 2016). This brings a lot of questions as to whether the available Digital Technologies (DTs) suit the learning needs, how they are utilized, and how they are perceived by the users to enhance the teaching of students with blindness in universities. The foregoing concerns and others earlier raised in this background

formed the bedrock for examining the utilisation of DTs in teaching students with blindness at a selected university in Dar es Salaam City, Tanzania.

## 1.2 Statement of the Problem

Digital technologies are invented in education to expand access to educational opportunities for marginalized groups, including PwDs, particularly students with blindness enrolled in different levels of education (UNESCO, 2022; Facer & Selwyn, 2021). The government of the United Republic of Tanzania, through the Ministry of Education, Science and Technology (MoEST), collaborates with university management, NGOs and other stakeholders to provide digital technologies to ensure the implementation of Education and Training Policy (ETP) requirements on the utilisation of technology for academic excellence of all students regardless of their differences (URT, 2017). Information from researchers shows availability, access and use of different assistive technologies (ATs) in universities (Ngonyani and Mnyanyi, 2021; Kisanga et al., 2018; Kihoza et al., 2016). However, there is no study that has been conducted on the availability and adequacy of DTs, its utilisation and perceptions of the students, technical staff and lecturers on the use of Digital technologies in Tanzanian Universities. Therefore, there is little information on whether the available DTs are adequate and meet the needs of students with blindness , how these DTs are used as a yardstick to minimize obstacles in their teaching and how DTs are perceived to be important in teaching and learning of students with blindness . Therefore, this study was aimed at bridging that gap.

## 1.3 Purpose of the Study

The purpose of this study was to examine the utilisation of DTs in teaching students with blindness at a selected university in Dar es Salaam City, Tanzania.

## 1.4 Research Objectives

The following objectives guided this study;

1. To analyze the availability and adequacy of DTs in teaching university students with blindness at the selected university in Dar es Salaam City, Tanzania.
2. To examine how the available DTs are utilized in teaching students with blindness at the selected university in Dar es Salaam City, Tanzania
3. To find out the perceptions of lecturers, technical staff and students on the utilisation of DTs in teaching university students with blindness at the selected university s in Dar es Salaam City, Tanzania.

## 1.5 Research Questions

This study was guided by the following questions:

1. What is the availability and adequacy of DTs for teaching students with blindness at the selected university?
2. How are the available DTs utilized in teaching students with blindness at the selected university?
3. What are the perceptions of lecturers, technical staff and students on the utilisation of DTs in teaching students with blindness at the selected university?

## 1.6 Justification of the Study

The government of Tanzania, through MoEST, has made efforts to increase enrollment of students with visual impairments, including those with blindness, in Universities. To guarantee equal quality education to this particular group of students with blindness, alternative ways of service delivery have been advanced including utilisation of technology.

Therefore, using DTs in teaching is highly encouraged and is an obligation for higher learning institutions. So far, there are limited studies that display information on the use and utilisation of DTs in teaching students with blindness in Universities in Tanzania.

## 1.7 Scope of the Study

This section describes three subtopics. These are the content scope, geographical scope and time scope.

### 1.7.1 Content scope

This study examined the utilisation of DTs in the teaching of students with blindness at university. The study analyzed the adequacy of the available DTs for students with blindness, how they are utilized to teach them and how the lecturers, students with blindness and technical staff perceive their use in teaching students with blindness .

### 1.7.2 Geographical scope

The study was carried out from one of the universities in Dar es Salaam city, Tanzania. The choice was made based on its experience of more than 40 years in accommodating students with blindness students with blindness and their related facilities (like inclusive infrastructures), where students with blindness students are accessing teaching and learning through the utilisation of DTs.

### 1.7.3 Time scope

This study was conducted from 2012 where Tanzania shifted from Analogue to Digital broadcasting as the implementation of International Telecommunication Union (ITU) agreement worldwide to date.

## 1.8 The Significance of the Study

The information obtained from this study is expected to be important in the following ways:

1. The study may help policymakers in designing and modifying policies that guide the provision and utilization of DTs in universities. The new policies might improve the availability and effective utilization of DTs in teaching students with blindness in universities.
2. The finding of this study may encourage the University staff to enforce policies and guidelines on provision and utilization of DTs specifically on improving academic performance of students with blindness through teaching inclusive classes with the aid of those technologies.
3. The findings of this study may bring awareness to the society and add knowledge about DTs where by other researchers might find useful when conducting further studies.

## 1.9. Definition of Operational Terms.

**Blindness;** refers to loss of sight or vision that cannot be corrected by surgery, medical treatment or reflective correction such as glasses or contact lenses.

**Teaching;** is a scientific process of imparting knowledge and skills to learners. It involves interaction between teachers and students when transferring the knowledge and skills. When teaching takes place, the expected outcome is learning.

**Utilisation;** is an approach of using something effectively, it has to do with make something in practical and in profitable way.

### 1.10 Theoretical Framework

This study was guided by the Technology Acceptance Model (TAM), which was developed by Fred Davis in 1986 based on the ideas from the Theory of Reasoned Acton of Ajzen and Fischbein of 1977 (Sprenger & Schwaninger, 2021). TAM is the most broadly comprehensive researched model which examines why people (users) opt to use or refuse to use certain types of technologies in their work (Davis, 1996;Davis, 2013; Tarhini et al., 2015). Being a widely recognized model, TAM received several validations. This study used the last version by Fred Davis and Viswanath Venkatesh in 1996 which was meant to appreciate the linkage between the influence of external stimuli and the actual usage of the system (Davis & Venkatesh, 1996).

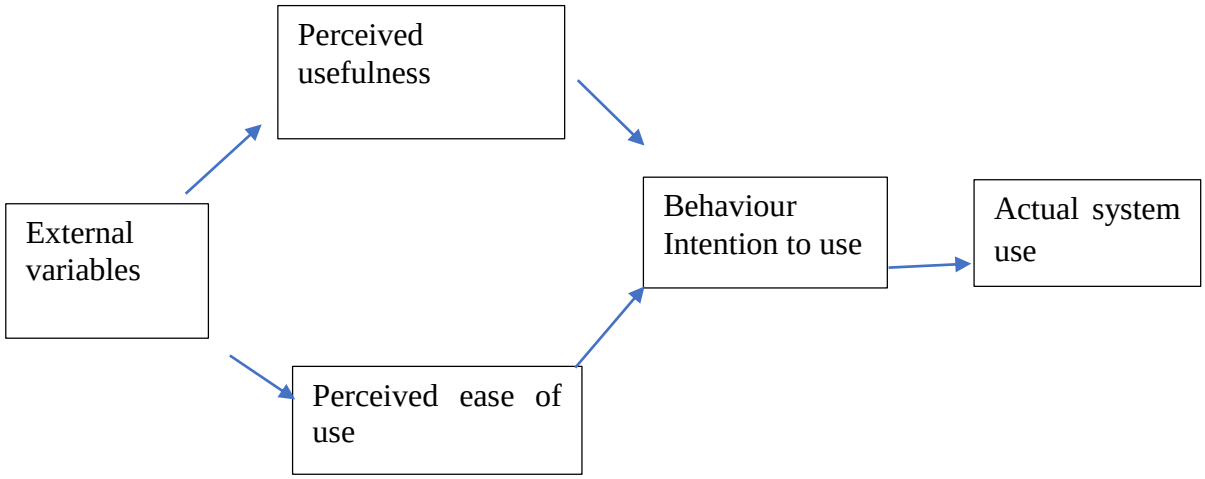


***Figure 1: TAM model and its component***

The model is engrained on five constructs: The external variables (EV), which refer to the outside stimuli that influence the intention to use and eventually lead to the system usage by activating the perceived ease of use and the perceived usefulness. These may include features of the system such as user accessibility, how fast the system is in accessing data and downloading materials, internet connectivity, training, user engagement in design,

accessibility to the equipment and support in implantation (Davis & Venkatesh, 1996; Deslonde & Becerra, 2018)

*The perceived usefulness (PU)* refers to the condition where users believe using certain technology will improve their task accomplishment (Tarhini et al., 2015). PU is recognized as an important aspect that directly influences the intention to use the system. Some scholars believe that PU partially influences intention to use because users may use the system even if they do not have a positive attitude (Tri Anni et al., 2018). PU is the most potential aspect that shapes the intention to use because users are highly motivated to accept and use the system because it enhances task performance (Davis, 1989).

*The perceived ease of use (PEOU)* refers to the extent to which people (users) believe that they can use the system without hitches or struggles (Davis, 1989; Davis & Venkatesh, 1996). The PEOU is believed to have a direct impact on the behaviour intention to use the system because as users perceive that it is possible to use it, they will eventually be motivated to adopt and use it (Deslonde & Becerra, 2018). However, PEOU was recognized as significant but not a greater determinant of the intention to use more than the PU (Liu, 2005; Tarhini et al., 2015).

*The Behavior intention to use (BI*) is a precursor of the actual system use. It is determined by one's perception of using a particular technology (Tarhini et al., 2015). This aspect is important because it indicates an individual's readiness or aversion to use the system, which is determined by positive and negative attitudes (Davis & Venkatesh, 1996; Tarhini et al., 2015). According to Deslonde & Becerra (2018), high positivity in the system will lead to high use and vice versa.

*The actual system use (AU)* is a definite performance of the behaviour, i.e., the actual use of the system as predicted by the intention to use (Fathema et al., 2015). According to Liu (2005), the actual system usage depends on the independent variables PEOU and PU. This means that the use of any system will only be influenced by how the users believe it is productive and how easily they can adapt to it (Deslonde & Becerra, 2018).

**Relevance of the theory to this study**

Digital Technologies has gained much attention by educators and students in higher learning institutions as helping tools to achieve various goals (Sprenger & Schwaninger, 2021). However, their availability and adequacy, how they are utilized in teaching, and how they are perceived by students and lecturers might reflect that the acceptance of DTs is still blurred. To examine these, the researcher put into utilisation of all the five constructs of TAM as follows;

The EV examined how well the system is powerful enough to make users; in this case, lecturers and students with blindness have to develop the readiness to use the system, which in this study is utilisation of DTs. It specifically guided in analyzing the system features, such as the available DTs and if they are enough to suit the needs of students with blindness which is the focus of objective one. This has a direct impact on the PU, PEOU and later on the BI in a way that, if DTs are not available enough or well suited to cater for the needs of students with blindness, they will be perceived to neither be helpful nor ease to use affecting negatively the users' intention to use and thus undermined system use.

In this study, PEOU is considered a determinant of PU and is expected to combine with the EV as a guiding lane to analyze the available DTs, their suitability to cater for the teaching of students with blindness and other facilitating factors such as resource rooms, internet

connectivity, power availability as well as technical support teams. Under PEOU, the consideration is that if the available DTs are adequate and meet the learning needs of students with blindness in the teaching environment is enabling, then the lecturers, technicians and students with blindness would have a positive perception and would easily use the DTs without struggles. This eventually influences their perception of the usefulness of the system, meaning that their PU will be positive. This will be different if the DTs are inadequate and the infrastructure is not quality to influence utilisation of DTs, lectures and students with blindness feel that the DTs are hard to use and therefore their PU will turn negative.

The PU was used to examine the perceptions of lecturers, technical staff, and students with blindness regarding utilisation of DTs, which aligns with the third objective. Issues such as whether they help us perform better in subjects and are worth using to teach and learn may arise. The vice versa is also true regarding the negative perceptions of lectures and students with blindness regarding using DTs, where they may find it not useful.

The BI was considered a catalyst for AU. This means that lecturers' and students with blindness actual use of different DTs, which aligns with objective two, was examined with the guide of AU as influenced by BI. If lecturers and students intend to use different DTs as influenced by PU and PEOU, they will use them in different ways and correctness. On the other side, when lecturers and students with blindness have not developed intent to use the available DTs as negatively affected by PEOU and PU, then they will not use the available DTs as expected.

**Weakness of the theory**

TAM model is criticized by number of scholar based on the weakness revealed. According to Ajibade, (2019) TAM model is not really show relationship between technology and how a

person can adoption technology. It further looks on how user's behavior can affect the BI or AU of technology. Napitupulu, (2017) added that, perceived usefulness was previously identified as a significant predictor in the TAM model, this was not always the case, especially when it came to online games that used technology for enjoyment rather than problem-solving. Therefore users can simply utilize entertainment technology to buy time and relax hence user's perceived usefulness is not affected. Despite the weakness revealed by some scholars, this study employs this theory simply because it show the factors that enhance a person to accept or not accept using technology and that is ideal of the study.

# CHAPTER TWO

# LITERATURE REVIEW

## 2.0 Introduction

This chapter focuses on reviewing the literature based on the purpose of this study. Different sources are discussed, including books, scholarly journals, articles, theses, working papers, government reports and proceedings. The literature review is discussed and organized following the objectives, which are to analyze the available DTs (including related infrastructure) and their adequacy in teaching students with blindness in Universities, to examine how the available DTs are used/utilized in teaching students with blindness and explore the perceptions of lecturers, technical staff and students on utilisation of DTs in teaching students with blindness in universities. The chapter's last paragraph presents a summary and the scrutinized gap from the discussed literature.

## 2.1 The Available DTs including related Infrastructure and their Adequacy in Teaching Students with Blindness

Utilisation of technology for PwDs is stressed in many areas, including education. Students with blindness are highly encouraged to use digital technology for better learning. To make this possible, accessibility to DTs is paramount and is legally framed in different laws, including the CRPD Article 4 (g) and (h), where States are urged to ensure new technologies (digital technologies) are accessible to facilitate accessibility to suitable information for the learning of PwDs including those with visual impairments, particularly students with blindness who are enrolled in universities (United Nations, 2006).

Amhag et al (2019) conducted a study in Sweden on utilisation of digital technologies by educators in universities. They pointed out that DTs such as desktop computers, laptops, tablets, smartphones and smart boards were among the digital tools educators were using to provide assistance for students with visual impairments, including students with blindness. On the other hand, they report that Media such as Skype, Google, and Zoom are also among the digital channels that may be used to teach those with visual challenges due to blindness. They further insist that software programs and the internet are paramount to using the DTs for better teaching.

Arslantas and Gul (2022) evaluated digital literacy among students with visual impairments, including those with blindness, in universities in Turkey. They pinpoint that portable computers, smartphones and Universal Serial Bus are the most preferred and used DTs while tablets, electronic books, and MP3 players are less used. This means that the DTs mentioned above were available specifically for students with visual impairments, especially those with blindness. Silman et al., (2017) adds on this and says that eye gaze board, devices installed with speech synthesizers and voice output are the DTs available. Silman et al., (2017) on the other hand reported that lack of some technologies is one of the persisting challenges that hampers them to use DTs in teaching.

Senjam, (2019) in his study provides a list of ATs that are specifically for people with Blindness. CCTVs, smart watches, JAWS, NVDA, COBRA, DBT, and refreshable braille displays are among these. These were considered essential and easily accessed DTs to facilitate the learning of students with blindness. Tagore, (2022) in the study about Assistive technologies, mentions DTs such as smart canes, talking watches, NVDA, e-Speech, Voiceover, Shine Plus, Android phone inbuilt programs to mention but a few that are accessible for people with visual impairment where students with blindness in universities

are included. The researcher insists on making these technologies available at low and affordable cost for easier access and welfare of people with blindness.

In Ghana, Agyei (2013) conducted a study to analyze technology integration in preparing teachers. Although he discovered that the lack of modern technologies (DTs) poses a big challenge, he outlined computers and associated systems such as hardware and software and internet connectivity as the basic DTs for preparing teachers with ICT competencies. Similarly, a study by Ayiah (2017) reports that DTs such as electronic brailler, magnifiers, screen readers, stationed computers, laptops, large screen monitors, scanners, JAWS software, Dictation software and Interactive whiteboards are mentioned to be available and used in teaching students with visual impairments including those with blindness.

In a study conducted by Mugo (2013) and Kavinje (2020) in Kenya on assistive technology for students with blindness , DTs such as computers installed with screen reader software like NVDA, Braille display devices, braille printers embossers, note takers, voice recorders and thermoform are mentioned to be available in universities in the teaching of students with visual impairment and those who are blind. On the other side, the authors report that the unavailability of some necessary technologies is a challenge that may contribute to limited accessibility. Therefore, high-tech devices should also be availed for better achievements.

A study by Kisanga and Kisanga (2020) in Tanzania on access to assistive technologies in universities outlines different available DTs utilized in teaching students with visual impairments where students with blindness are part. These include but are not limited to computers, electric note-takers and screen reader software. On the other hand, they report that utilisation of digital technologies in teaching is highly limited due to the inadequacy of these tools and the poor infrastructure, such as unstable electricity and internet connectivity. Similarly, in their corresponding study, Kisanga and Kisanga (2020) point out DTs such as a

personal computer installed with assistive software like NVDA and JAWS, digital voice recorders, and electronic note-takers to be the preference of students challenged with vision in higher learning institutions, including students with blindness. They also report that inaccessibility to important digital technologies such as screen readers is affecting the learning of students with visual impairments, especially those with blindness.

The above literature reveals that DTs are available, although not in quantities that suit the needs of students with visual impairments. Unsupportive infrastructures are mentioned to be one of the factors that hinder the effective utilisation of DTs. Despite some hindrances, the available DTs seem suitable for students with blindness since they are there to assist them in academic tasks. However, most of the studies seem to focus much on the availability and access of assistive technologies for students with visual impairments, and they rarely discuss specifically digital technologies for students with blindness rather than generally mentioning visual impairments. On the other hand, low-tech assistive seem to be the focus. They only mention DTs as minor.

### 2.2. How DTs are Used/Utilized when Teaching Students with Blindness

The study conducted by Reynaga-Peña and López-Suero (2019) reports that students with visual impairments, including those who are blind, were using DTs such as Talking Lab Quest 2, which pairs with programs such as Vernier sensors to measure temperature and motion to access Science practical lessons. The author's impression is that teachers use DTs to deliver science lectures to students challenged with vision, including students with blindness, and to conduct science practical in an accessible way. Similarly, Gadiraju et al. (2021) explain that DTs like iPads are used in taking math lessons successfully when teaching. Juuti et al. (2022) observed that lecturers use DTs in teaching students with blindness when attending different physics lessons. For instance, by using a thermal camera.

The authors further explain that DTs are the gist towards learner's engagement in different teaching activities including those in science subjects. Again, Juuti et al. (2022) observe that DTs, such as simple computer software, are used by teachers (lecturers) and students to write when attending to different academic tasks and edit text documents to make them clear.

Gadiraju et al. (2021) observed that students with visual impairments, including students with blindness, have limited abilities to write and read. Therefore, technologies such as advanced typewriters, note-taking devices and adapted keyboards are the options lecturers use to ease their teaching process and make writing and reading possible. They mention that editing is another task that students could perform using DTs. Gadiraju and colleagues are supported by Singleton and Neuber (2020) who explain that some of the technologies used by lecturers when teaching students with visual impairments including those who are blind to read text documents include refreshable Braille displays, and a Kurzweil reading machine as well as teachers creating lessons on student's iPads. Similarly, Wiazowski (2009) observes that teachers and students with visual impairments, including those who are blind, use technologies such as electronic braille note-takers, voice recognition software, electronic braille displays and CCTVs, to mention but a few, to write and read documents. The authors specifically mention that teachers also use modified tools, such as braille translation software, embossers, and text-to-speech software, to prepare student learning materials to enhance their lessons. Also, Singleton and Neuber (2020) observe that students use DTs to read documents through navigation features during the teaching process.

According to Colclasure et al. (2020), teachers use assistive technologies in the form of DTs, such as video magnifiers, and audiobooks, to present information in accessible ways, while students with visual impairments, including those who are blind, use the same mentioned to access information that is laid, down to them in ordinary prints. They add that these

technologies enhance students' learning autonomously by allowing students with blindness to hear the audio lectures and translate them into a suitable format from which they can easily read. Likewise, Pacheco et al. (2017) observed that university lecturers use DTs, such as online media like emails, to deliver information to students through electronic learning resources. They also align with Gebrehiwot (2015), who observed that students with visual impairments, especially students with blindness, use DTs to record and save lecture instructions using digital recorders, which they can later listen to and learn. Gebrehiwot explained that the main challenge was that lecturers are rigid because they do not allow students to record them.

Lecturers and students with blindness also use digital technologies to motivate and inspire togetherness and teamwork through social media such as Facebook, email groups, and WhatsApp groups. In contrast, students with visual impairments, including students with blindness, use digital technologies to access different updates that are communicated throughout the course; they use them as tools towards social independence and means of coping with tertiary settings that may be challenging (Pacheco et al., 2017).

In their study, Regal et al. (2018) report that teachers (lecturers) use DTs, such as mobile-based applications supported with GPS, to train students with visual impairment, including those with blindness, with important navigation skills that are important for orientation and mobility. They further say that DTs for orientation promote students with motivation and eagerness to learn. Pacheco et al. (2017) also add that students with visual impairments, including those with blindness, use Google Maps on their assisted smartphones to successfully orient themselves and move around the university environment.

There are some challenges emerged as the hindrance to the utilisation of DTs among blind students, lecturers and technical staff. Gebrehiwot (2015) reported the case of stiffness

behavior in accepting the use of technology among users, Kisanga and Kisanga (2020) added on the case of lacking technological skills on operating devices for blind, unavailability of appropriate technologies, absence of specialist, insufficient budget to buy technologies for blind, lack of supportive policy on the use of technologies. Eligi and Mwantimwa (2017) also added the challenge of inappropriate related infrastructures like unstable electricity.

The above literature shows that the DTs available are used in teaching students with visual impairments, including students with blindness. Teachers use them to prepare their lectures, present information to students, prepare learning materials through writing and editing and teach students the concept of orientation and mobility. On the other hand, students with visual impairment, including those who are blind, use DTs to write, edit text, record information, carry out science practicals, and read different texts when accessing learning information. The literature reveals that the rigidity of lecturers, inadequate skills to operate them, the inadequacy of DTs, and poor infrastructures are the challenges that may undermine utilisation of DTs in universities.

It's also important to note that the reviewed literature does not clearly explain how different DTs are used to teach students with blindness, who are the focus of this study. Most of them are based on utilisation of DTs by teachers to teach students with visual impairment. This generality must be clarified if learning for this group of students is to be enhanced. Besides, most of the studies mention the advantages of DTs and fail to address the focus of this objective: how they are used.

## 2.3 The Perceptions of Lecturers, Technical Staff and Students on Utilisation of DTs in Teaching Students with Blindness

Perception refers to how a person considers something and provides his or her view on what it is like, regarding its usefulness, why it is important to use/have it, and what makes them think it is not worth their trust (Qiong, 2017). About this aspect, it is very important to determine how students with blindness think and consider utilisation of DTs in their learning and how lecturers perceive utilisation of DTs in teaching university students with blindness.

### 2.3.1. Students' perceptions of utilisation of DTs in their learning

According to Bouck et al. (2016) observe that students have the understanding that DTs is imperative to enhance their learning but some of them resist to use them during teaching process. For instance, students with visual impairments preferred to learn with ordinary textbooks, reasoning that it is easy to use and trace the errors.

Findings from Bader et al., (2021), show that, students perception on utilisation of digital tools depends mostly on students' familiarity of the available digital tool, its usefulness in accessing and finding the information for education purpose. On the one hand, some students who are not skilled with digital tools view them as unmanageable and time-consuming and think that staring at such tools as computer screens is tiring and distracting. On the other hand, students familiar with digital tools view them as manageable, time-saving and easier to work with as they promote interaction during teaching and learning activities.

Findings from Ubaidillah et al. (2020) indicate that students, including those who are blind, believe that technology is worth creating conducive learning environments from which they can develop skills to meet the requirements of the competitive world of work. This is in line with the findings in Abdullah et al. (2019) study, which show that students believe

technology is a gist towards easing learning experiences as it allows flexibility of learning through blended lectures, online learning resources, mobile learning and distance learning in universities.

Likewise, the findings of Charlene et al. (2016) show that students appreciated DTs as important to their learning because they motivated them, promoted independence in learning and were able to write correctly in a format that is easy for them. These findings align with those of Henderson et al. (2015), who observed that students, including those with visual impairments, particularly students with blindness, believe that DTs simplify and save time in performing tasks during learning in universities, and thus, they are supportive and worthwhile to use in their learning in university programs.

### 2.3.2. Lecturers and technical staff perception on using DTs in teaching students with blindness

Bouck et al. (2016) also stated that lecturers felt that DTs could help them easily teach students with visual impairments, including those who are blind. They also add that the lecturers' initial perception was positive and turned negative when they stopped insisting on students using DTs in every lesson. Likewise, Bader et al. (2021), in their explanation it is noted that educators (lecturers) perceived DTs to be useful because they used them to deliver learning information through the channels which were also used by students with visual impairments, including students with blindness, to access information.

Findings from Skenderi and Skenderi (2017) teachers, more especially the older ones, perceive technology as a burden, and it does not in any way help them in their classroom. Other teachers believed that change due to new technologies (digital technologies) in this era is inevitable. They add that some teachers consider technologies as helping tools. At the same

time, some of them believe the vice versa towards the teaching and facilitating learning by students including those with visual impairments and blindness. On the other hand, the authors indicate that determining the positive perception of teachers on utilisation of DTs is somehow complicated because it depends on how the environment is enabling or disabling. They argue that infrastructure and adequacy or inadequacy of DTs are the basis for teachers' feelings about the technology.

Spiteri et al. (2020) conducted a review study on factors affecting teacher's use of DTs. In their findings, it is noted that utilisation of digital technology is perceived as hard for teachers who are novices to its use because they lack confidence and competence to integrate it into their teaching, but they become confident soon after interacting with colleagues who are using it. On the other hand, they found that some teachers perceive DTs as something that can overtake their place. Although they may be aware that DTs help, it becomes hard for them to use them. Others do believe that DTs may help them deliver their lessons to students with visual impairment and blindness in a better way and hence motivate learners to use them.

The above literature reveals that the perceptions of lecturers, technical staff and students with visual impairment, including those with blindness, on utilisation of DTs in teaching and learning are positive for those who are familiar with and have the knowledge of how to use them, while those who are not familiar and ignorant on utilisation of DT's look at them in an adverse manner. The studies above show that the awareness of utilisation of DTs for teaching students with visual impairments, including those who are blind, is still low; therefore, this study ought to look for ways of raising awareness on utilisation of DT in teaching and learning of students with blindness in universities.

# CHAPTER THREE

# METHODOLOGY

## 3.0 Introduction

This study was intended to investigate utilisation of DTs in teaching students with blindness in universities in Dar es Salaam City, Tanzania. This study intended to investigate utilisation of DTs in teaching students with blindness in universities in Dar es Salaam City, Tanzania, with three objectives, which are to analyze the availability and adequacy of DTs, to explore how the available DTs are utilized in teaching students with blindness, and to investigate the perceptions of students, technical staff and lecturers on utilisation of DTs during teaching students with blindness. The chapter presents the procedures for this study, including research approach and design, area of study, target population, sample and sampling process, data collection, data analysis procedures, and ethical considerations that were considered when carrying out this study.

## 3.1 Research Approach

There are three research approaches this include, a research approach includes qualitative, quantitative, and mixed-method research (Gauttam, 2015). This study adopted a qualitative research approach to get participants' viewpoints. Qualitative research is a method of exploring and understanding the intricacy of human or social phenomena in a certain context or environment in which individuals or groups of people live (Creswell & Creswell, 2018). A qualitative research approach is ideal for this study because it enabled the researcher to come up with detailed information on utilisation of DTs when teaching students with blindness as it was obtained from the participants in real-life practices, that is, how lecturers use DTs to

teach students with blindness and how is useful for student to learn through DTs used by lecturers in their teaching process.

### 3.2 Research Design

This study used a case study design to explore utilisation of DTs in teaching students with blindness. A research design refers to the plans and formal procedures for conducting research; it covers the ideas from general to specific techniques for gathering, analyzing, and interpreting data (Creswell & Creswell, 2018). A case study entails a thorough, contextualized scientific investigation into real-world phenomena (Ridder, 2017).

This study was considered a case study design because it helped explore the teaching of students with blindness as enhanced by the digital resources in the real context of one university by gathering information from participants (lecturers, students with blindness and technical staff) in their academic life experiences.

### 3.3 Area of the Study

This study was conducted at one university in Dar es Salaam City, Tanzania. Dar es Salaam city is located in the coast of East Africa and is bordered by Tanga region in the north, Morogoro in the west, the coast region in the south and the Indian Ocean in the East. Dar es Salaam city has four (4) Public universities (TCU, 2020). Few of them accommodate students with disabilities, including those with blindness. University Y was chosen among the four because it admits students with special needs, including students with blindness. Due to its experience in accommodating students with visual impairments, especially those who are blind, it was believed to have a good potential for providing detailed information from a real setting and actual practice on using DTs in teaching students with blindness.

### 3.4 Target Population

The target population is a group of people with specific characteristics of interest and relevance from which the researcher can generalize the study result (Asiamah et al., 2017). This study targets lecturers, students with blindness, and technical staff (technical staffs) from the selected University Y in Dar es Salaam. There are 50 lecturers who closely teach and provide academic services to students with blindness, 40 students with blindness, and 10 technical staff who work collaboratively with lecturers to ensure students with blindness acquire equal and equitable education as other students without blindness. This population provided detailed information that fostered the completion of this study.

### 3.5 Sample Size

A sample is a subset of a population a researcher chooses to adequately represent the entire population (Creswell, 2014; Bryman, 2016). The sample helps a researcher to collect relevant information that will be used in generalizing the findings (Rusu, 2020). This study used 5 lecturers, 5 students with blindness, and 2 technical staff to make 12 participants who provided information on the availability and adequacy of DTs, how DTs are utilized and participants' perceptions of utilisation of DTs in teaching students with blindness.

***Table 1: Summary of sample size and Participant profile***

| SN | PARTICIPANT CATEGORY | TARGET POPULATION | SAMPLE SIZE |
|---|---|---|---|
| 1. | Lecturers | 50 | 5 |
| 2. | Students with blindness | 40 | 5 |
| 3. | Technical staff | 10 | 2 |
| | **Total** | **100** | **12** |

### 3.6 Sampling Technique

Sampling refers to choosing a suitable sample or a representative portion of a population to ascertain the parameters or characteristics of the entire population (Verma et al., 2017). This study used the Criterion purposive sampling technique, a non-probability sampling approach that include selection of cases that meet a specific criteria of interest (Patton 2002) it also selects particular contexts, people, or events on purpose to get crucial information that cannot be learned from other options (Leah 2024, Taherdoost 2017). The Criterion purposive sampling was chosen because it allows the researcher to obtain information from specific and quality participants.

For this study, participants were purposely selected based on different criteria, including roles and their working experience in using DTs in the teaching process; lecturers were selected based on professional development course in inclusive education, experience of less than three years in teaching classes having students with blindness and atleats they are aware of what DTs is. Students with blindness were purposely selected based on their disability status that should be total blind, should have experience of engaging in using DTs in more than one year and atleast attended training in any of DTs. Technical staff were selected due to their professional course of Special needs education and major in visual impairment, their role of providing academic and technical support services to students with blindness and Lecturers, specifically on the provision of DTs and training on how to use some of the DTs, should undergo training in some of DTs and experience of less than two years in performing their task as technical staff who work with students with blindness. the above criterias believe to provide the rich information as required.

### 3.7 Methods of Data Collection

Data collection methods involve a researcher's particular technique to acquire the required information from the field of study (Smith et al., 2020). The data collection methods in the qualitative research approach include interviews, observation, focus group discussion and document analysis (Yin, 2014). For the sake of this study, observation and interviews were used to obtain information from the study area and the participants. Multiple data collection methods in this study helped the researcher achieve validity of the collected information and add value to the trustworthiness of the collected information.

#### 3.7.1 Interview

Interview is a method for data collection that is mostly used in qualitative research that purposely collects information on an individual’s experiences, views and beliefs about a certain phenomenon of interest (Ryan et al., 2009). In today's world, an interview can be face-to-face, over the phone, or even online, with or without videos (Jain, 2021). There are three types of interviews: structured, semi-structured and unstructured. In this study, a semi-structured interview, which is a kind of interview guided by open-ended questions (Jamshed, 2014), was used to collect data from all participants on the availability and adequacy of DTs, their use in teaching students with blindness and in investigating the perceptions on utilisation of DTs. This method was ideal for this study because of its flexibility to allow the researcher to gain in-depth information by probing participants' ideas, views, perceptions and experiences on utilisation of DTs. This method was specifically used to collect data from lecturers, students and technical staff through an interview guide (Appendix i for lecturers, Appendix ii for students with blindness and Appendix iii for technical staffs) as a tool prepared for each category of participants to gather targeted information. The interviews were conducted in Swahili language and responses were translated to English language.

### 3.7.2 Observation

Observation is a method of data collection which involves active watching of things to gain an in-depth understanding of participants, social behaviour, and frequency and duration of events in the real setting while keeping a record of each piece of information gained (Kawulich, 2015). This study used a non-participant observation because it allows the researcher to obtain first- hand information from the real setting and life practices without involving in any of the activities (Creswell, 2018; Jamshed, 2014). Through this, the researcher gathered information about utilisation of DTs in teaching and learning of students with blindness in universities in Dar es Salaam City, Tanzania. Moreover, the researcher could ascertain the available digital technologies by watching from the special classes or resource center where DTs are kept. The observation checklist (Appendix iv) was prepared before going to the field.

## 3.8 Data Collection Procedures

Important procedures were considered before embarking on the process of data collection. The researcher sought approval from the supervisors and the Faculty of Special Needs and Rehabilitation at Kyambogo University to collect data. The Head of the Department provided the researcher with an introductory letter to be taken to the university administration, introducing the researcher and the purpose of the study. The researcher prepared a consent( Appendix v) form and asked participants to fill and sign it willingly to participate in the study and record audio and videos whenever necessary. Similarly, the researcher was organized with the participants for interviews. The observation was conducted to identify the available DTs in the special class where DTs are kept.

### 3.9 Piloting the Study

A Pilot study refers to a min-scale study that pre-tests possible research instruments to be used in a full-scale study. It provides an overview of the tools whether they can provide required data, and if not the researcher makes adjustment for them to fit the study (In, 2017). Generally, a pilot study helps researchers to get a picture of the findings of the main research project, suggests on the good protocol to be observed, proposed methods and appropriate instruments to be used and therefore improvement can be done. The piloting process for this study was conducted in one of the high institution in Dar es salaam city Tanzania, which accommodate students with blindness. Lecturers, students with blindness and technical staffs from the college where selected to taste the tools. The semi structured interview guide was used to find out that the DTs were available but not sufficient, the college challenged with unsupportive infrastructure and lack of knowledge in utilisation of available DTs. Regardless of the challenges still students with blindness and lecturers find the use of DTs being important in teaching. The observation checklist pointed out some available DTs like computer, note takers, software like NVDA and DBT.

### 3.10 Data Analysis

Data collected from the field are called raw data (interview responses, recorded data, and notes taken from observations in the field), and they bear no meaning. The raw data becomes meaningful in the study if it is analyzed. According to Miles (2014), data analysis includes selecting, interpreting, evaluating, organizing, and representing the information collected from the field that enables a researcher to draw conclusions. Data that were collected through semi-structured interviews and observation were analyzed thematically in relation to purpose, objectives, and research questions. Thematic analysis was used because it allows flexibility when searching for themes or ideas that attempt to answer specific questions of the inquiry

(Bryman, 2016). Data analysis was started at the beginning of the fieldwork, which focused on transcribing the audio data recorded during the interview into text. Transcribed data were translated from Swahili to English; thereafter, the data were coded under each objective. The researcher developed the pattern by grouping the coded data with the same characteristics; this enabled the creation of themes and subthemes for the study. Theme revisiting was done to see its connection with the codes. Lastly, the report was drawn through verbatim to maintain the originality of the findings.

### 3.11 Ethical Considerations

Research ethics are some of the genres that researchers adhere to protect study participants' rights when formulating research plans and establishing a rapport of trust with them (Rana, 2020). Some of the ethical conducts which a researcher should observe when undertaking a research study includes privacy and confidentiality, participant's consents, trustworthiness and cultural consideration as suggested by (Vicars et al., 2015). This study was bound to consider different ethical issues. Clearance and permission from supervisors and authorities, including Kyambogo University authority, were found before embarking on any data collection process. The purpose of the study was explained to the participants, the consent forms were filled by participants to agree or disagree engaging in a study. Anonymity and confidentiality were maintained through coding, and participant's identities were ensured using pseudonyms. Lastly, descriptions during analysis, presentation, and discussion were made with the researchers' utmost honesty to avoid deception. The place where other scholars' ideas were used, the acknowledgements were considered, and recognitions observed accordingly.

### 3.12 Trustworthiness of the Findings

Trustworthiness refer to the extent to which research report judge its concurrently to the real situation, that is if the study concurs with what is in the contextual situation as displayed by the researcher's view position (Gunawan, 2015). Trustworthiness composed with four aspects which are credibility, transferability, Dependability and comfirmability (Ahmed, 2024). This study ensures credibility through multiple methods of data collection (triangulation), i.e interview and observation and data were gathered from multiple categories of participants of lecturers, students and technical staff. Transferability was ensured through piloting the study and context thick description of the study that enable readers to view application of the findings in their areas, to ensure dependability the researcher asked participants to assess their findings and offer their recommendations and lastly comfirmability was ensured through verbatim report whereby the originality of findings are genuinely presented.

### 3.13 Limitation of the Study

When conducting this study, the following limitations were emerged.One of the limitations the researcher experienced when conducting this study was the issue of language where by the Swahili language was used to interview lecturers, technical staff and students with blindness and the report was drawn in English language, this bring difficulties in findings good terminologies to fit the original meanings of some Swahili word. To mitigate these fear, researcher consulted the professional translator to translate the Swahili word to English language. Second was the study conducted in single entity and therefore the sample of the study was not arrived and therefore it affects generalizability of the findings. However the researcher ensures that transferability of the findings was done through context transferable like thick description of the study area to make generalization of the findings possible.

# CHAPTER FOUR

# PRESENTATION, INTERPRETATION AND DISCUSSION OF FUNDINGS

## 4.0. Introduction

This chapter presents the findings of the study, which explored the utilisation of DTs in teaching students with blindness in universities in Dar es Salaam City, Tanzania. In this chapter, data is presented, analyzed, interpreted and lastly, provides a discussion with the support of the reviewed literature. The data were collected from one selected University. The findings are presented following the objectives of the study, which are to analyze the availability and adequacy of DTs for teaching students with blindness, to examine how the available DTs are used in the teaching of students with blindness, and to investigate the perceptions of lecturers, technical staff and students with blindness on utilisation of DTs during teaching students with blindness in universities in Dar es Salaam City, Tanzania. Also, the findings will be accompanied by verbatim voices to show the originality of the data collected. The participants are coded as L1-5 to represent Lecturers, S1-5 to represent students with blindness, T1-2 to represent Technical staffs and Y to represent the selected university. This is done to maintain anonymity and confidentiality.

## 4.1. Description of Research Participants

This section presents a description of the participants of this study. The researcher devoted time to collecting information and presenting them in categories as they are in the descriptive table below;

***Table 2. Description of the Research Participants***

| Category of Participants | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Lecturers | | | Students | | | Technical staff | | |
| Code | Gender | Year of experience | Code | Gender | Year of study | Code | Gender | Year of experience |
| L1 | Female | 7 | S1 | Male | II | T1 | Male | 5 |
| L2 | Male | 3 | S2 | Male | III | T2 | Female | 2 |
| L3 | Female | 3 | S3 | Female | II | | | |
| L4 | Male | 5 | S4 | Male | II | | | |
| L5 | Female | 8 | S5 | Male | III | | | |
| Total no of participants: 5 | | | Total no of participants: 5 | | | Total no of participant 2 | | |
| Total 12 | | | | | | | | |

**Source**: **Data collected in the field (2023).**

Table 2 above, presents a total of 12 participants who provided the vital information that helped the researcher to compile this report. There were 7 male and 5 female participants. Among them, 5 Lecturers were coded as L1, L2, L3, L4 and L5, 3 lecturers were female, and 2 were male with years of experience in teaching students with blindness from 3 to 8 years. Additionally, 5 students with blindness (4 Male and 1 female) were interviewed. They were coded as S1, S2, S3, S4, and S5, including 3 of them from year and two 2 of them from year 3. Lastly, two (2) technical staffs 1 male and 1 female, with experience in providing academic and technical assistance from 2 to 5 years were also interviewed. They were coded as T1 and T2. All targeted sample participants were contacted and interviewed, and they gave information as required by the researcher.

### 4.2 The DT's Availability and Adequacy for Teaching Students with Blindness in Selected University

In this sub-section, the researcher aimed to know the DTs available in selected University that were used in teaching students with blindness. These findings are vital to the study because effective teaching of students with blindness highly depends on the available DTs.

This information was mainly obtained through interviews with the participants and is presented verbatim to maintain their originality. Moreover, to add to the data values, the researcher conducted a non-participant observation to confirm the available DTs as narrated by the study participants. The researcher was also interested in the supportive infrastructures for DTs teaching students with blindness. The findings are presented hereunder;

***Table 3. The DTs available for teaching students with blindness in university Y.***

| SN | Name of Item | Availability | Status of sufficiency compared with total number of students with blindness in university Y (30) | |
|---|---|---|---|---|
| | | | Sufficient | Not sufficient |
| 1. | Smart white board | 00 | | ✓ |
| 2. | Computer | 20 | | ✓ |
| 3. | Microphone | 09 | | ✓ |
| 4. | Speaker | 09 | | ✓ |
| 5. | Digital Voice Recorder | 30 | ✓ | ✓ |
| 6. | Braille Printer (Embosser) | 03 | ✓ | |
| 7. | Note takers | 05 | | ✓ |
| 8. | Braille display note takers | 10 | | ✓ |
| 9. | Electrical Braille Machines | 03 | | ✓ |
| 10. | CCTV with OCR | 05 | ✓ | |
| 11. | Screen reader software | 02 | | ✓ |
| 12. | Talking calculator | 03 | | ✓ |
| 13. | Talking dictionary | 03 | | ✓ |
| 14. | Tablets and smart phones | 30 | | ✓ |
| 15. | Smart white cane | 20 | | ✓ |

**Source; Field data 2023**

Table three above reveals that some of the digital technologies for teaching students with blindness are available at selected University. It shows that some of the DTs available were sufficient to cater for the needs of students with blindness, while others were not sufficient. The sufficiency of these devices depends on the user and their use. For example, an embosser is a printer, so three printers are enough to print braille materials for 30 students with blindness. Things like note takers, smart white canes, note takers, and braille note takers are not sufficient because they are single-user devices, and to enhance learning, they should be used by one blind student all the time. There are some devices that are shared by students with other categories of disabilities and others who are not impaired; therefore, their number seems to be insufficient. Devices like computers, tablets, microphones, and speakers are shared by other students so they are not sufficient. Therefore, this describes that the teaching process of students with blindness could be hindered, and thus students could be facing challenges in accessing some of the educational opportunities dedicated to them.

When participants were asked to examine the available DTs that they were aware of, 6 participants (T1, S1, S3, L3, L2 and L4) explained that some of the DTs, such as Computers, CCTV, Braille displays, Digital voice recorder, Embosser, NVDA, JAWS, Microphones, speakers, talking dictionaries, and talking books were available and used by lecturers and students with blindness. One of the participants had this to say;

> DTs are available in the university; these include; computers with NVDA and JAWS software, digital voice recorders, headphones, braille display note-takers, embosser machines, and smart white canes, to mention a few. All these are used in teaching students with blindness. (T1)

Another one said that;

> The university is provided with DTs by MOEST through different projects like the Higher Education for Economic Transformation (HEET) project,

> where we provide Computers, digital voice recorders, note-takers and embossers. We appreciate these projects because the technologies provided will help in our educational achievements like other student. (S1)

Another participant added that;

> The DTs for teaching students with blindness are not enough compared to the number of students with blindness, lecture rooms, classes and laboratories around the university; I saw a few talking calculators, talking dictionaries and a few talking books in their special class and not anywhere else. On the other hand, there are classes, halls, laboratories or other places where students with blindness study from where DTs are not available." (L3)

The above narrations concur with the findings from observation. They showed that DTs dedicated to teaching students with blindness are available, though not enough, to create a comprehensive environment by which teachers could teach and learners access all the educational opportunities. These findings suggest that students with blindness in University Y have access to limited learning information because most of the necessary DTs like smart white board are unavailable, and the available ones do not cater to the needs and number of students with blindness. On the other hand, the data show that the availability of DTs in university Y is a result of the efforts made by the university authority, government through MOEST, NGO and other stakeholders who contributed much to providing those technologies in universities.

The finding above coincides with what is stated in TAM model by Fred Davis (1986) that the external variables like availability of DTs may influence utilisation of technology among users, it is difficult to make someone accept utilisation of technology while there is unavailability of technology expected to be used. Similarly, the findings assimilate the study of Senjam, (2019) who states that DTs should be made available, user friendly and reached at affordable cost for students with blindness to access different academics opportunities. Similarly, Colclasure et al. (2020) add that the availability of DTs made teachers teach

students with blindness in an advanced way; hence, the learning of students with blindness became successful. Also, Kisanga and Kisanga (2020) argue that the absence of DTs in teaching students with special needs, including students with blindness, hinders them from accessing their learning something, which fails to attain their educational goals. This is an alarming situation for university Y authorities and the governments to ensure DTs are available in quantity and quality that cater for the needs of students with blindness.

### 4.2.1. Supportive infrastructures

In this sub-theme, the researcher presents, interprets and analyzes the available infrastructure that supports utilisation of DTs in teaching students with blindness at University Y. The aim was to determine if DTs are available and, if so, in which condition they are to support utilisation of DTs. This information was gathered through interviews and complemented with observation with all the research participants. The findings are hereunder presented in the table below;

***Table 4. Status of Supporting Infrastructures for the Utilisation of DTs***

| SN | Item | Availability | | Status |
|---|---|---|---|---|
| 1. | Electricity | | ✓ | Unstable |
| 2. | Internet connection | | ✓ | Unstable |
| 3. | Computer lab | None | | - |
| 4. | Resource room | None | | - |
| 5. | Furniture (table, chair, shelves) | | ✓ | Not enough |

**Source: Field data, 2023**

Table four above shows the availability of some of the infrastructure such as electricity and internet connectivity, which are unstable, the resource room and some of the furniture including tables, chairs and shelves, which are all insufficient. Moreover, the data indicate

that a computer laboratory is not yet in place but rather in plan since it is important to use DTs effectively.

The above data were in line with responses from 5 other participants (L1, L3, S1, S2 and T1) who stated that some supporting infrastructures are available but either in bad condition or not well equipped to enhance utilisation of DTs in teaching students with blindness. One of the participants had this to say;

> The electricity is available but not stable; sometimes, it cuts off. There are some buildings which have generators, but there are many buildings that don't have standby generators. This goes hand in hand with the internet because it depends on electricity. When the electricity is off, the internet service also doesn't function, so it causes disturbance when you're in the middle of the lesson, and the power goes off, that means the lesson stops, and it distracts the lesson (L3)

This is corroborated by one of the participants who said;

> Electricity is available; there are standby generators in some buildings. The problem is still in buildings that don't have generators and technical issues like insufficient sockets and those that are not functioning. Internet service is also available but not stable and is found in some areas like libraries, but in areas like halls, the Internet is not connected. There is a class that is like a resource room where some of the computers are installed, and some equipment is kept, though not well equipped. This is because there are few shelves used to keep equipment; at least tables and chairs are there (S2)

Furthermore, another participant had this to say;

> We have a class used as a resource room; it keeps all DTs and other devices for students with special needs, and training on utilisation of those technologies is also performed there; the room is not big enough and not well equipped, but we expect new building with computer lab, equipped resource room from HEET project. (T1)

The verbatims above indicates the presence of some infrastructure dedicated to supporting the utilisation of DTs at the university. From the data, it is revealed that there is an electricity connection, which is not stable. However, the narrations unfold that the University authority

has tried to put an alternative source, a standby generator, in a few buildings. It also reveals that since the internet connection depends on the reliability of electricity, which in this case is unreliable, the internet connection is also unstable and only set up in a few places. Furthermore, the data revealed that no building was specially constructed to serve as a resource room; instead, one classroom was made a resource room, and it serves as a storage room for most of the DTs, including those for students with blindness. On the other hand, data showed that furniture such as tables, chairs and shelves are important and available but not sufficient to cater to the needs of students with blindness to use DTs satisfactorily.

The findings above indicate that the teaching and learning of students with blindness in the University may be limited due to poor, scarce and/ or absence of the necessary infrastructure that could enhance lectures to use DTs in teaching and for students with blindness to minimize huddles in their learning process. For instance, absence of the resource room and computers lab may limit lecturers' preparation of suitable lectures. In the same manner, students may not have a suitable space where they can work on their assignments, do personal reading and seek close assistance from technical staffs. Internet helps lecturers and students to access information through online media; it is unfortunate that its reliability is daunting note something which may be limiting students with blindness to access some of the learning opportunities.

The finding is consistent with Lintangsari and Emaliana, (2020) who argue that for teachers to contentedly and confidently facilitate the learning of students with blindness using the DTs, the supportive infrastructure such as electricity, internet services and supportive environment is of prominence. In similar position, Stošić (2015) observe that one of the thing which hinders utilisation of DTs in teaching students with special needs including those who are blind is deficient supportive infrastructure. Stošić pointed electricity and internet

services as the most important infrastructure that should be availed, and that if they are not adequately availed they may hamper the learning and in the end be the source of poor academic performance for learners.

### 4.3. Use of the available Digital Technologies (DTs) in Teaching Students with Blindness

Objective two aimed at finding out how lecturers, technical staff and students with blindness make use of DTs in order to enhance the teaching process. The findings are organized basing on the emerging subthemes which include lecturers' utilisation of digital technologies for teaching, and the associated challenges that lectures face when using DTs to teach Students with blindness as arose from the analysis process.

#### 4.3.1. How Lecturers' use Digital Technologies in teaching students with blindness

Digital technologies were found to be the vital components that assisted lecturers in their struggles to enhance the learning process of students with blindness through adapting them in their teaching process. To acquire this information, the researcher posed a question for participants to state different ways lectures were putting DTs in use.

**Preparation of lessons**

From the data, 7 participants (L1, L2, L4, S1, S3, S5 and T2) mentioned that lecturers use DTs to prepare the lessons. They particularly explained that they use different DTs to type, print and emboss materials that they give to students with blindness. When asked, one of the participants had this to say;

> I use DTs in preparation of my lesson, as a teacher I have to do prior preparation before going to class, I mostly use computer for downloading teaching materials, typing and printing when I prepare teaching materials for students with blindness. I prepare typed soft copy documents which can

> be embossed to get tactile materials that enable blind student to read through (L1).

Another one added that;

> I prepare my lesson when going to teach students with blindness by looking at what I'm going to teach. I prepare embossed and tangible teaching aids like maps or diagrams. I mostly use computer, tablets or smart phone preparing soft teaching materials and notes from internet sources (L2).

Another one added

> Before students with blindness go to class we usually prepare for them note takers, voice recorder, computer installed with NVDA or JAWS and some of them use smart phones too. In the class also we check the microphone and speaker if they function well. We also prepare embossed documents, diagrams and pictures and other teaching aids (L4).

The data indicate that lecturers use DTs when they prepare for their lesson. They use DTs for searching and downloading materials from the internet, the preparation of soft copy materials by typing, and tactile materials like braille prints by embossing them.

The findings indicate that lecturers are utilizing DTs to address the challenges they encounter when accommodating the needs of students with blindness, particularly in the current emphasis on inclusive learning. From the findings, lecturers utilized DTs in planning and organizing their lessons to ensure that all essential learning materials are provided in formats that enable students with blindness to engage in various learning activities. This makes DTs important tools for lecturers to ensure the accessibility of curriculum content for students with blindness whose challenge towards inaccessibility is frightening and in the end improve their academic performance.

The findings above are in line with Rawang et al. (2023) where they stated about the importance of technology in teaching preparation. They suggest that teachers, in this case lecturers should be experts in teaching subjects especially designs for students with blindness.

They say that, the only way to do this is to use Media and technology which in this study is termed as digital technology to prepare textbooks in braille, media reliefs and models for science lessons. Likewise, Reynaga-Peña and López-Suero (2019) insist on using digitalized technology models, tools and equipment which help in preparation of practical such as Talking laboratory Quest installed with screen reader, tactile graphics tablets and computerized models in teaching students with blindness  science subjects. All these bring to an attention that, DTs should be made accessible and its use promoted for learning of students with blindness.

**Lesson presentation to students**

Other 9 participants (L1, L2, L3, L4, L5, S1, S4, S5 and T2) said that lecturers make use of DTs to present their lessons. They specifically pointed out that they use microphone and speaker in lecture halls to present lessons. One of the verbatim from one of the participant was;

> Utilisation of DTs in teaching students with blindness depends on the teaching environment. In university we mostly use lecture halls and therefore microphone and speaker is common technology we use, in small classes at least we can group them and provide them with embossed tangible materials and teaching aid like raised maps, drawing and 3D teaching aids which look like actual thing, they can also record the lesson through their voice recorders or smart phones (L3)

Another one said;

> I usually choose friendly technology that goes hand in hand with my method and intended content. If it is just lecture, I use microphone and speaker for them to get audio materials and allow them to record by a digital voice recorder. In group discussion I prefer them to use computer or braille display device that they can note points of others (L 5)

The voice of the lecturers was elaborated by participant S5 as stated below;

> When lecturers are teaching, they use microphone and speaker so that we can hear clearly what they are teaching and get the audio information which we mostly depend on. They sometimes provide us with embossed materials like raised diagrams which we read through (S5)

The above unveils the fact that microphone and speakers are common technology used by lecturers in lesson presentation. On the other hand, it shows that digital voice recorder was also used by students to engage in lecturers' presentations by recording what was presented.

The findings above indicate that accessibility of presented lessons by students with blindness in lecture halls depend on the nature of halls, the lecturer's method and available DTs for students that will help them to capture the presentation. Moreover, the findings indicate that whereas students with blindness depended on audio to access information, there is only microphone and speaker in lecture hall for lecturers something which may hitch the accessibility. This suggests that whereas lectures tried their best to use DTs during presentation, the University is still in crisis of lacking modern digitalized tools to use. The findings are seconded by TAM model especially in Actual Use (AU) as predetermined by BI construct. From the findings, DTs are put into actual use by lectures in teaching students with blindness because they have intent to use them. On the other hand, lecturers do use DTs because they believe DTs to be vital in easing the process of teaching to students with blindness as determined in aspects such as PU (Davis, 1989).

Similarly, the findings align with Rawang et al. (2023) who observe that Media and technology, in this case DTs are intercessors towards transformation of knowledge and experiences from the instructor to the students especially those with difficulties such as students with blindness. They mention advanced devices including a computer, Android and IOS to be vital tools that may create conducive learning environment for students with

blindness through enhancing the teaching process. This suggests that DTs should be considered important and used by lectures and technical staff if they want to present their lessons in a standard way.

**Assessment of students' progress**

Other 4 participants (S3, S1, T2 and L4) said that DTs are used by lecturers to assess student's progress. They mainly pointed out that, they use computers with their associated assistive software to prepare and produce tests and university examinations. A response from participant was that;

> We use computer installed with DBT to print emboss tests and examinations. students with blindness can also access tests and examinations through braille displays note takers. They can also use a computer installed with screen readers like NVDA or JAWS to do their test, exams and even assignment by writing through electrical braille machines or braille note takers (T2).

Another one said;

> students with blindness use embossed tests and examinations to read through and respond. They also use note takers to do their tests and exams by writing through the same. We give them Computers installed with NVDA and talking calculators to perform their assessment activities (L4).

Another participant said:

> We do our tests, quizzes and exams in a special classroom where we write exams and test using computer with screen reader software for those who know how to use computer, some are skilled in using braille note takers or braille machines in writing exams and tests (S3)

The above findings showed that DTs are vital tools that are used by lecturers to assess academic progress and students use them to respond to the assessment activities given by lecturers. It is specifically revealed that lectures are able to prepare assessment tools such as tests, university examinations, quizzes and assignments through using an embosser, computer

with associated software such as a Duxbury Braille Translator. On the other hand, students with blindness use computer with NVDA or JAWS to perform different assessment activities.

The findings above unfold the fact that lecturers are aware of the potentiality of DTs in ensuring that assessment as a vigorous part of teaching and learning process is made inclusive to all including students with blindness. Although most of the DTs such as clear readers, victor readers to mention but few that could enhance more accessibility to assessment tool are not available, lecturers are attempting to use the available DTs to produce test and exams in a format that is accessible and durable to students with blindness.

These findings are in line with Cadwallader and Tonin, (2021) in their study about utilisation of technologies in assessment, found the potential of DTs such as text to speech software, word computer reader software as reasonable adjustments to make accessibility of assessment process for students with visual impairments especially those with blindness possible.

**Orientation and Mobility**

Other participants (S1, L3, T2) were of the view that, DTs are utilized by lecturers to train students with blindness on orientation and mobility. They specifically explained that smart white cane enhanced teachers' ability to teach students with blindness how safely they can interact with their learning environment.

On the same question, one of the participants said that; *"I use a white cane to instill awareness on how to use it and insist to them (students with blindness ) to use it for their movement, it helps them to study their learning environment and know if it is safe or not*" (L3).

A response from one of the participants was;

> Lecturers help us understand how to move around when doing or attending our lessons by using a smart white cane. We also use a white cane for mobility, any movement we make during teaching and personal reading day and night depend much on utilisation of smart white cane to secure our movement from harm. It helps us to be safe by detecting dangerous objects in and outside classroom (S1).

The above narration shows that DTs are used by lecturers as instructional teaching aids. It indicates that lecturers were able to facilitate the learning of orientation and mobility skills through using a smart white cane as one of the very important digital technology. Moreover, the findings indicate that through the instilled skills, students with blindness were then using the same smart white cane to navigate different learning milieu while assured of safety.

The findings above therefore suggest the fact that lectures and technical staffs have the knowledge that learning of students with blindness is impossible due to the fact that their ability to interact their learning environment in limited and therefore, to help them is to teach them how to safely move around and interact with stimulating environment. On the other hand, only a white cane is mentioned to be available and used by lecturers, technical staff and students with blindness. This situation may suggest that the modern or current DTs that could enhance the teaching of Orientation and Mobility like the ultra cane, haptic groves, voice helmet just to mention the few as explained by  Sanz et al., (2013) in his book ICT for orientation and mobility for blind people, are less or not accessible in the University.

The findings concur with those of Reynaga-Peña and López-Suero (2019), Juuti et al. (2022) and Viner et al. (2020) who observe that assistive technologies especially the digital devices are helpful tools that assist teachers and lecturers to teach different subjects such as Mathematics and Physics to students with visual challenges including those with blindness. Hakobyan et al. (2013) display a pull of digital technologies including Smart vision, Mobile

Eye, Haptic direction indicator, Guide cane, and various smart phones with assistants from which a person with visual impairment in school including those who are blind can choose to use for navigation. On the other hand, Hakobyan and colleagues recognize the important of teaching students on how to use them. Hakobyan et al. (2013) study suggests that Universities have not yet done enough to ensure utilisation of DTs for teaching and therefore more should be done.

Table five below is a summary showing how different DTs are being used by lecturers to teach students with blindness in selected University.

***Table 5: Summary of DTs used in teach students with blindness and their functions***

| SN | ITEM NAME | FUNCTION |
|---|---|---|
| 1. | Computer | Lesson preparation through typing and editing |
| 2. | Microphone | Sound amplification when teaching |
| 3. | Speaker | Sound amplification for students with blindness to hear |
| 4. | Digital Voice Recorder | Recording audio presentations by students |
| 5. | Braille Printer (Embosser) | Emboss braille/tactile materials for accessibility |
| 6. | Note takers | Taking notes during lesson and discussion Writing |
| 7. | Braille display note takers | Taking notes during lesson and discussion Writing |
| 8. | Talking calculator | Calculating. |
| 9. | Tablets and smart phones | Writing, recording and listening. |
| 10. | Smart white cane | Teaching concepts of orientation and mobility |
| 11. | DBT software | Installed in a computer to enhance an embosser to function |

**Source: Field data 2023.**

**Emerging Issue as Challenges on the use of DTs**

The study findings reveal that lecturers, technical staff and blind students were facing challenges in the utilisation of DTs in process of teaching blind students while attempting to utilize different DTs. From the follow up, different issues including inadequate knowledge in using DTs, challenges on infrastructure, scarcity of DTs, expensiveness of most DTs, lack of experts and inadequate time for DTs use and training came to light. These issues are hereunder presented.

**Inadequate knowledge in using DTs by lecturers and students**

One of the major issues that came out was inadequate knowledge in using DTs by lecturers and students. Most of the participants (T1, T2, S3, S5, S2, L1, L2, L4 and L5) stated that inadequate knowledge on using different DTs is a common challenge among lectures and students. They specifically explained that because they are not trained, they do not have enough knowledge to use DTs when teaching. A response from one of the participants was;

> We do not get any training on utilisation of DTs, we can operate DTs that are common and we experienced in our life like computer, smart phone, microphone but there are some technical DTs which we cannot operate because we don't have that knowledge and we are not trained" (L5)

A response from one participant from another group of participants was:

> There is no training provided rather than computer which is taught for only first year in first semester, we are not trained on the use of any other DTs other technologies, few use prior knowledge from their lower level of education on how to operate some technologies like note takers (S3).

The other one added that; "*We mostly depend on IT expertise or Technical staff to operate those DTs, but we as teachers we don't get any training on utilisation of those DTs"* (L1).

The data above indicates that lecturers and students are confident in using common digital technologies such as computers and smartphones, but lack the knowledge to operate more technical DTs like braille display note taker due to lack of training.

The findings highlight the importance of digital literacy and training in today's education focus where students with blindness need to be fully included. This is because, while many lecturers and students with blindness are comfortable using common DTs like computers and smartphones, they may struggle with more technical such as Orbit readers, Orcam My Eye, Victor readers to mention but a few devices due to a lack of knowledge or training. This

underscores the need for ongoing education reform in Universities including training to improve their proficiency with advanced DTs which could enhance quality and equitable teaching and learning of students with blindness by supporting the effective utilizing of a variety of DTs.

The findings are in line with TAM model under the PEOU which suggest that if individuals have what it takes (skills) to use the system, then they will perceive it possible to use (Davis, 1989). In connection to these findings, lecturers and students with blindness are inadequately confident with using more technical DTs, something that may undermine their motivation to use DTs for improved teaching of students with blindness.

Similarly, the findings corroborate with those of the study of Kirboyun (2020) who observes that poor training made teachers inadequately skilled to use most of the technologies something which undermine the teaching of students with visual impairment including those who are blind. In line with this, Nanjwan and Igba, (2019) comment that it is important for teachers to be trained on using technologies if students with blindness are to learn in an improved learning environment. All these suggest the need for a combined effort of University authorities, and other stakeholder like MoEST and NGO's to ensure effective training for lectures, technical staff and students on utilisation of different DTs.

**Poor infrastructure**

Another issue reported by 4 participants (L2, L1, S1, S5 and L4) is poor infrastructure. Participants reported that most of the infrastructure was not in place and even those that were available were not sufficiently enough. When asked, one of the participants narrated that;

> Infrastructure is one of the challenges we face in using DTs in teaching students with blindness , classes have unstable power supplier, and internet

> connection is not available in all buildings, and internet is affected by electricity because its server depend on it (L2)

Another one said;

> DTs rely on electricity, that means if electricity is not there or stable, it affects its use. Some classes have only one socket, some are not functioning, so if the class is having more than one student who is blind or who use a computer which need power to function, and at the same time a lecturer need to use the socket, it will be a round. The same applies to internet service, which is weak due to large number of users (L4)

A student participant had this to share;

> One of the challenges we face when talking about utilisation of DTs is infrastructure, the university environment lack many facilities which facilitate utilisation of DTs like computer lab, resource room, electricity and internet are not stable. Internet is not found in all areas specifically where we reside, in many lecture halls and some of classes, is only library where you can find internet and is not powerful due to large number of users, many students depend on library internet service (S1)

The responses above indicates that lack or unreliable infrastructure that support the utilisation of DTs in teaching students with blindness is the main challenge facing University Y. It shows that, there are issues with unstable power supply, limited internet connectivity, and overcrowding internet users due to its concentration in some few areas of the University and possible low bandwidth supply. This makes it hard for lecturers and students with blindness to effectively use computers and other DTs in the classroom. The findings also sheds light on the fact that internet is dependent on electricity, and that if power is off then internet is also not stable. This may be affecting the teaching process of students with blindness.

The findings above agree with TAM model under PEOU which illustrates that reliable infrastructure will motivate people to accept and use technology in this case, DTs, for better performance and the vice versa is true. Similarly, Kisanga and Kisanga (2020) observe that poor infrastructure, including poor power supply and absence of resources rooms and

computer labs is a challenging issue that affect utilisation of technology in teaching including DTs as assistive technologies for students with blindness in higher learning. This expression calls for well identified efforts by authorities to ensure reliable infrastructure for effective use of DTs for improved teaching of students with blindness.

**Inadequate DTs**

Other participants (L4, S1, L2 and S3) explained that inadequate DTs is a scaring challenge that undermine utilisation of DTs in teaching students with blindness. They specifically stated that lack of some or inadequate DTs hampers the teaching of students with blindness which results to poor learning. One of the participants reported that;

> I only know microphone and speaker, and is only DTs which I saw and use in teaching that also fit students with blindness because the hear sound, we need more DTs for teaching blind these we have are not enough (L2)

Another participant said;

> I wish we could have smart board in lecture halls and rooms, is good when we teach students with blindness, but we depend much on microphone and speaker as a main source of communication with students with blindness so that they can understand a lesson which is not enough for them" (L4)

Moreover, it was reported by one participant that;

> We use computers, braille display, sound recorder, but still are not enough, we wish we could have more DTs that could be used by lecturers directly when teaching like smart white boards (S1)

The above narration shows that University Y lacks most of the DTs for teaching students with blindness. It also indicates that the available DTs are not sufficiently enough to enhance the teaching process of students with blindness.

The findings bring to the light that institutions including Universities that accommodate students with disabilities more especially those who are blind are still lagging behind and depend much on digital technologies such as microphone and speakers which are very limited. DTs like computers, braille display and the alike are not directly used by lecturers but are used by students with blindness in completing classroom tasks. This may be the reason as to why lecturers have not achieved much in teaching students with blindness, something which may be the reason to why these students are lagging behind their counterparts in academic performance. The findings relate to TAM model which in the PEOU aspect suggests that ensuring availability of technologies, in this case the DTs will motivate users (lecturers and students with blindness) to use DTs in teaching and learning (Davis & Venkatesh, 1996). Likewise, Kirboyun (2020) who, in his study observed limited technologies which in this study are referred to as DTs such as a computer limit their utilisation in classroom and as the result teaching of students with blindness is undermined. It is with this reason, the study enlightens the need to strengthen combined efforts to ensure the availability of DTs to enhance the teaching process of students with blindness.

**High cost of DTs**

Another emerging issue related to the scarcity of DTs is expensiveness of DTs. When asked, participants (T1, L2) reported that one of the reasons to why most of the DTs were not available satisfactorily was high cost of most of the DTs in the world market. When asked, one of the participants reported that;

> It's true that DTs for blind are expensive, most of them are imported, I don't think we produce any of them, so these technologies are costly since they are made in advanced technology, are universally designed to cater for more than one category of persons and many of them are from abroad (T1)

Another participant said;

> I tried to look for DTs for teaching students with blindness but I found them being very expensive, for example smart white board, I though may be by using internet to search for the price, but I once met the university supplier and asked for the price of smart white board I realized it is difficult for individuals to afford unless the government supplied (L4)

The narration above shows that most of the DTs for teaching students with blindness are not available due to the fact that they are too expensive for individuals and institutions (University) to afford at once. The findings unfold to the fact that expensiveness of DTs that are dedicated for teaching students with disabilities including those with blindness is still a daunting note to crack. It indicates that because of this, most of the DTs which could efficiently improve teaching and learning are unavailable, something which may lead to poor performance of students with blindness academically. These findings align with Nanjwan and Igba, (2019) who in their study observe that, one among the hindrances towards effective utilisation of DTs during teaching students with blindness is costliness of technologies, especially the high-tech used by students with blindness in their learning. This brings countries including Tanzania towards efforts in implementing the National and international policies to ensure inclusivity in education. Specifically, in the CRPD model of accessibility in Article 4(1-g) where states are obliged to ensure ease of accessibility to technologies (United Nations, 2006). This calls for state, MoEST and University management in collaboration with other stakeholders to ensure the price of DTs for blind are reached at affordable price for the benefit of all.

### 4.4 Lecturers, technical staff and Students' Perceptions on utilisation of DTs during teaching students with blindness

In this objective 3, the researcher sought to investigate how lecturers, technical staff and students with blindness perceive utilisation of DTs in teaching. Two sub-themes which are;

the negative and positive perceptions were derived. The data was gathered through one-on-one interviews with participants and are presented basing on the issues raised.

### 4.4.1 Positive Perceptions on utilisation of DTs

In this sub-section, the research was finding out how lecturers, technical staff and students with blindness positively perceive utilisation of DTs in teaching. To obtain relevant data, the questions were posed for participants to respond. Under the positive perceptions, the issues raised were DTs are potentially useful, some of the DTs are user-friendly, lecturers and students with blindness seem to have some extent of willingness to adapt the DTs. These issues are here under presented below;

Most of the participants (S1, S4, S5, T2, L1, L3, and L4) noted that DTs are potentially useful. They specifically stated that using DTs such as microphone make lessons smooth and students get chance to listen, write and participate in the lesson. For example, a response from one of the participants was;

> I thought it will be a bit of challenge teaching students with blindness after knowing that my class have students with blindness, but later I realized that with utilisation of Digital technology, my teaching will go smoothly since technology helps students with blindness to listen, write, and participate well in teaching sessions, I use microphone and speaker which helps them to listen to all my lectures, they take notes and summary using note takers and braille display and many other, so I really encourage utilisation of DTs in teaching since it helps students with blindness to participate well in their lessons (L1)

Another participant narrated that;

> I experienced using different devices in my life but DTs are best especially here in university since they help us do our classroom tasks independently, It saves time and assurance of what I did, for example, when I use braille display note takers, it helps me to take note and summary during lesson (S4)

Another one said;

> DTs are very important for students with blindness here in the university, the nature of teaching without these technologies could be a challenge for them. DTs help students with blindness to work and participate well and independently in their lesson, and also for lecturers using DTs make their class being inclusive that they can accommodate both students with and without disability especially students with blindness (T2)

The above narration shows that, lecturers and students with blindness believed DTs to be of importance in their teaching and learning process. The data affirms that teaching students with blindness without the assistance from DTs could be an encumbrance to lecturers and students with blindness and a trap of inaccessibility to most of the learning information. Moreover, the findings reveal that DTs saves time, enhance participation and promote equitable quality education to students with and without disabilities.

The findings above corroborate with Bouck et al. (2016) whose in their study, observe that lectures felt that DTs could help them teach students with visual impairments including those who are blind easily. On the other hand, Bouk and colleagues reported that students had appreciated DTs for enhancing their learning process. Likewise, Bader et al., (2021) observe that students' perception on utilisation of DTs relay mostly on students familiarity of the tool accessible, and its worth in accessing information for education purpose. Similarly, Skenderi and Skenderi (2017) expressed that although some of the teachers believed differently, most of them confirm to the fact that change due to new technologies (digital technologies) in this era is inevitable. All these, give an essential massage to lecturers and students with blindness in universities to consider use of DTs in teaching as positive and not the other way around. This may be a catalyst in effective utilisation of the DTs to enhance better learning for students with blindness.

On the other hand, participant (L1, L3 and S2) expressed that lecturers and students with blindness have some extent of willingness to adapt and use DTs. They specifically pointed out that, because some of the DTs are available and fit the needs then they are ready to use them. When asked, one of the participants had this to say;

> I'm willing to use DTs since is vital when teaching students with blindness. I will try my best to spare time to learn some of them especially those which could be connected with computer since I have the idea of computer, doing so I will be able to access the braille print in normal text. This will help me in marking exams direct instead of waiting for technical staffs to change braille materials into normal text (L3)

Another participant said;

> I got blindness when I was already admitted to university, so there is no way of leaving studies. Instead I willingly learn computer as was the best option by the time since it is the device which I had an idea instead of Perkins braille machine which I saw for the first time here at the university. Therefore I will learn more DTs instead of manual devices (S2)

Another one said;

> The issue is only time but I wish I could get time to learn and use them (digital technologies). I believe they may be of much help to me and to students with blindness. I'm interested with braille display note taker which allows the connection with other familiar devices like computer, tablet and smart phones (L1)

The narrations above indicate eagerness of using DTs among lecturers and students with blindness despite the existing challenges. They demonstrate an upbeat attitude in seeking out ways to improve their work that present a positive attitude towards embracing new DTs to improve their teaching and learning process.

The above findings suggest that the spirit of willingness highlights lecturers and blind student's determination to overcome obstacles, improve teaching, make learning inclusively managed through adaption to changing circumstances such as use of DTs. This also, is a call

towards authority (University Management) to ensure that lecturers do access all the services related to use of DTs enhancement including ensured training and availing to the availability of adequate DTs in Universities.

The findings above corroborate with Satsangi et al. (2019) who in their study, observed that willingness of teachers and staff is central towards acceptance and engagement in changes that create opportunities for students who have blind or low vision. Likewise, Klingenberg et al. (2020) observes that fondness and willingness to use digital textbooks is an essential aspect that promote consideration and effective utilisation of new technologies for better learning and academic improvement.

### 4.4.2 Negative Perceptions on utilisation of DTs

In this sub-section, the research was interested in finding out how lecturers and students with blindness negatively perceive utilisation of DTs in teaching. To obtain this data a question was posed for participants to respond. Issues such as rigidity in adapting the new technologies, utilisation of DTs may be a source of frustration since as it requires a lot of time to learn how to use it, manual technologies are best than the DTs came up and are presented below;

Participants (S2, T1, L2 and L5) expressed their reluctance in adapting utilisation of DTs. They specifically explained that DTs are expensive, and that they are hard to use since they don't have enough knowledge. When asked, one of the participants stated that;

> It is true that DTs are expensive, so students refuse to use them because after finishing their study they left them here in the office, and most of them cannot afford buying on their own. For example the embosser machine cost USD 4,695. That is too much money for individual to afford (T1)

Another participant said;

> Most of these (Digital technologies) are useful but we are discouraged to use them because they need enough money to get them. But as you can see we don't have money and even the knowledge on how to operate them (L5)

Another one said;

> There are some of technologies, meaning DTs which are manageable in its operations like microphone, but other DTs that require extra knowledge and experts like those with braille displays I cannot use them (L2)

The narrations above indicate that lecturers and students with blindness were rigid and reluctant towards adapting to utilisation of DTs. It further explains that the reason behind this reluctance is due to the fact that most of the DTs are too costly and not affordable to lectures and students as well as lacking skills in using the DTs. This may be due to the limited budget dedicated to utilisation of DTs in most of the Universities as it is in selected University.

The findings therefore, unfold to the fact that institutions of higher education, including universities have not yet to a satisfactory extent created conducive environment which may promote the adaption and use of digital technologies to improve the teaching and learning process of students with blindness. This is because, while lecturers, technical staff and students may be struggling to acquire the DTs, knowledge on how to operate them and expensiveness of most of the DTs is another limit. The findings align with the TAM model specifically in the PEOU which explain how people perceive that the system's ease to use will influence them to adapt the system and vice versa. In this case, people (lecturers, technical staff and students with blindness) believe that the system is hard to use because they lack knowledge and costliness of the system that is why most of them are unwilling to adapt and use the technologies (DTs). Likewise, the findings corroborate with Spiteri et al. (2020) who observe that utilisation of digital technology is perceived hard for teachers especially who are novice to its use because they lack confidence and competence to integrate it in their teaching. Similarly, Kaplan-rakowski and Heap, (2023) report that utilisation of technology is

discouraged when the user and people around them lack knowledge on how to operate those technologies. These studies are the gist towards government and University authorities to ensure supporting environments for utilisation of DTs.

Other participants (S3 and L5) opined that utilisation of new technologies may be the source of frustration. They specifically explained that they don't take training with seriousness because it is too short and they even don't have time to sit and learn new things. When asked one of the participants narrated that;

> We trained here after arriving in university for almost ten days but I did not take the DTs training serious because is of no help for me since time is not enough. Sometimes trainings are conducted during the timetable when you are needed to be in class for other lessons. It actually confuses and not comfortable at all (S3)

Another one added that; *"There are some technologies which are manageable in operations like microphone, but other DTs that require extra knowledge and experts like those with braille displays I cannot use them" (L5)*

The data above suggest that the lecturers and students with blindness perceive DTs as a source of frustration and time wastage. This is due to the fact that effective utilisation of DTs demands lecturers and students with blindness to devote their time for learning how best they can be operated, something seems to be difficulty due to the nature of the University timetable. The findings, suggest that commitment among stakeholders, the authority of concern, lecturers and students is of most importance. Issues of training have to be regulated to motivate lectures, technical staff and students with blindness to acquire the knowledge and hence be ready to adapt to utilisation of DTs.

The findings above are supported by Skenderi (2017) who observes that teachers more especially the older ones perceive technology as a burden due to the reason that it demands a

lot from in term of time to learn about it. This study is directly connected to what lecturer and students with blindness think in selected University and it is a call that should be answered if DTs are to be effectively utilized for improved teaching of students with blindness.

One of the participants (S5) expressed that manual technologies are good than the digital technologies. The participant specifically mentioned that manual Perkins Brailler which was familiar to him since primary level to advanced level, was the best in use for his studies. When asked, the participant said;

> I can participate in class without using DTs, I use other manual devices like manual Perkins Brailler and it has helped since secondary school and I find it comfortable rather than learn new technologies (S5)

Another one added that;

> There are some technologies which are manageable to use, like a microphone but others like braille display and software are hard, I don't use them. I encourage students with blindness to learn through their remaining senses (L5)

The narration above suggests that individuals (lecturers and students with blindness) finds comfort in using traditional manual devices like the Perkins brailler instead of digital technologies in class.

The above data unfolds to the fact that there is a need to consider individual preferences and comfort levels when implementing utilisation of DTs in teaching and learning of students with blindness. Moreover, the findings explain that some students may have established effective methods of learning and participation that do not necessarily involve DTs. This data emphasizes the need for a diverse range of tools and accommodations to cater to the individual needs and preferences of students, including those who may prefer manual devices over DTs.

The findings concur with Kisanga and Kisanga, (2020) on the limitation of technology use among students with blindness in higher leaning institutions where they found that, some students with blindness were comfortable with manual devices like typewriters and they think that using the DTs can bring stress during examinations and therefore they are using manual devices since they are comfortable with them. Therefore, the findings are similar with the findings of university Y where utilisation of manual devices and remaining senses comfort some students with blindness rather than learn and use DTs although they have an opportunity of learning and using DTs.

# CHAPTER FIVE

# SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

## 5.0 Introduction

This study aimed at exploring utilisation of DTs in teaching students with blindness in universities in Dar es Salaam City, Tanzania. The study focused on three objectives which are; to analyze the availability and adequacy of DTs for teaching students with blindness; to examine how the available DTs are used in teaching students with blindness; and to investigate the perceptions of lecturers and students on utilisation of DTs during teaching students with blindness. Therefore, in this chapter the summary, conclusion and recommendations are presented basing on the aforementioned objectives of the study. Furthermore, the chapter highlights the gaps which are recommended for further studies.

## 5.1 Summary of the Findings

The summary of this study is presented hereunder following the arrangement of the study objectives as follows;

### 5.1.1 The availability and adequacy of DTs for teaching students with blindness

This study found out that University Y has some of the DTs necessary for teaching students with blindness. Despite the fact that the government through MoEST in collaboration with stakeholders made efforts to ensure their availability, most of the DTs necessary for students with blindness to access learning information are still limitedly available. This suggests that the available DTs are not sufficient or adequate to improve the teaching process of learners with blindness. Equally, the study found that insufficient DTs was not the only case, rather

the supportive infrastructure for utilisation of DTs are unavailable and the few available are in poor condition.

### 5.1.2 How the available DTs are used in teaching students with blindness

The study revealed that the available DTs were minimally used by lecturers in the process to teach students with blindness. They were used in lesson preparation, presentation, as instructional teaching aids and in academic assessment whereas students with blindness use DTs to write, record, listen, calculate, and for orientation and mobility. On the other hand, it was also found that its limited use was contributed by different challenges including inadequate knowledge in operating DTs, unreliable and poor infrastructure, inadequate DTs and expensiveness of most of the DTs.

### 5.1.3 Perceptions of lecturers and students on utilisation of DTs during teaching students with blindness

The study found out that lectures, technical staff and students perceived DTs both negatively and positively. On one side lecturers and students with blindness expressed rigidity, felt reluctant and experienced technophobia in using DTs with the reason that, using DTs is costly and they also lack skills to operate them. On another side, some lectures and students with blindness viewed utilisation of DTs as source of frustration and wastage of time. Also, some lecturers and students with blindness viewed that DTs saves time, enhance participation, promote equitable quality education to students with and without disabilities and that they felt comfortable to use them.

## 5.2 Conclusions of the Study

The purpose of this study was to explore the utilisation of DTs in teaching students with blindness at Universities. Based on the findings, the following conclusions are drawn:

### 5.2.1 The availability and adequacy of DTs for teaching students with blindness

The study has established that DTs in Universities are available and are used for teaching students with blindness, but they are still clouded with inappropriate and inadequate DTs that could not enhance the teaching and learning process of students with blindness, and that poor supportive infrastructure contributes highly towards poor utilisation of the few available DTs.

### 5.2.2 How the available DTs are used in teaching students with blindness

DTs are used in teaching students with blindness especially during lesson preparation, lesson presentation and assessment process. Although, lecturers are willing and have compassion of assisting students with blindness to access learning information through utilisation of DTs as vital tools in teaching, they are still hindered by voluminous challenge including inadequate training.

### 5.2.3 Perceptions of lecturers and students on utilisation of DTs during teaching students with blindness

DTs are perceived negatively and positively by lecturers, technical staff and students with blindness. Regardless of recognition that DTs are important tools that improves teaching and learning, they are still clouded by the negative perceptions that seem to be the source for underuse of DTs in different academic activities.

Generally, based on the findings, this study concludes by suggesting a number of actions to be done to ensure effective utilization of DTs in universities. 1. The Tanzanian teacher education system to provide training on how to handle inclusive classes by using DTs to teach students with disabilities. 2. Regular Capacity building to technical staff as new technologies are discovered daily to strengthen their abilities and knowledge when facilitating academic performance of students with blindness in universities.3.DTs and its supportive infrastructure made accessible, available and adequate for its effective utilization. 4. Awareness rising to Universities community on importance of using DTs to students with blindness so as to avoid negative perceptions toward them.

### 5.3 Recommendations

Following the gaps and challenges identified to meager utilisation of DTs in improving the teaching process while creating learning opportunities for students with blindness in universities, this study provides the following recommendations basing on the objectives of the study;

#### 5.3.1 The availability and adequacy of DTs for teaching students with blindness

The government of Tanzania through Ministry of Education Science and Technology (MoEST) should put enough budget to ensure the DTs are available and enough to cater for the academic needs of students with blindness in higher learning institutions as well as Stakeholders including NGO's, parents, political parties, donors and others should join hands in providing and distributing technological devices for students with blindness in universities. Policy makers to create laws that will enhance the availability and use of DTs in higher learning institution and to make follow up of on its implementations.

### 5.3.2 How the available DTs could be used when teaching students with blindness

The government through MoEST should ensure that all lecturers through different programs including teacher education and professional development obtain adequate knowledge and skills on how to handle inclusive classes with utilisation of DTs and to improve the related infrastructures to allow smooth utilisation of the available DTs.

University authorities should plan for regular capacity building of specialists (technical staffs) on new technologies. This is due to the reason that, in this era new technologies for blind are highly being discovered.

### 5.3.3 Perceptions of lecturers and students on utilisation of DTs during teaching students with blindness

The university authority should plan for regular awareness training to lecturers and university community on disabilities issues where utilisation of DTs and handling inclusive classes will be highlighted to accelerate positive mind and enhance academic achievement of all categories of leaners including those with blindness.

## 5.4 Suggestions for Further Research

Based on the findings of this study and participants' views, the following further research are suggested to enhance utilisation the of DTs in teaching students with blindness in universities in order to bring great academic achievements to students with blindness in higher learning institutions;

The purpose of this study was to explore the utilisation of Digital Technologies in teaching students with blindness, the findings show that lecturers prepare their lesson in teaching blind students but the use of technology seems to be diminutively used and therefore It

recommended that other studies to look on *Lecturers' preparedness in teaching students with blindness with the aid of digital technologies in universities.*

Participants suggest the further research to look on *'Lecturer's readiness in DTs utilisation towards improving teaching and learning practices for better academic performance of students with blindness.'* Since the findings of this study unveil the fact that the willingness of lecturers on the use or not to use technology is influenced by their readiness, but this study was only focused on the utilisation of DTs and not readiness of lecturers to use technology in their teaching.

Blind students were one of the key participants on the aspect of teaching, findings encourage to recommend further studies to research on *'Educational struggles among students with blindness towards utilisation of digital technologies'* to see the learning part of it if technology is well utilized by students with blindness and its importance.

In this study, Lack of knowledge emerged as a hindrance among technology user towards the utilisation of Digital technologies in universities, It suggested for further studies to research on '*Status of capacity building on technology use among visual impairment specialists in higher learning institutions'.* This will unveil the efforts made by specialists to gain more knowledge on operations of digital and new technologies for students with blindness.

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Digital Resources Definition | Law Insider

# APPENDICES

## Appendix i: Interview Guide for Lecturers

**KYAMBOGO UNIVERSITY**

**FACULTY OF SPECIAL NEEDS AND REHABILITATION**

**DEPARTMENT OF SPECIAL NEEDS STUDIES**

**INTERVIEW GUIDE FOR LECTURES WHO TEACH STUDENTS WITH BLINDNESS**

**DEAR**

My name is Hadija Suleiman, I am a student from Kyambogo University in Uganda, pursuing Master's Degree in Special Needs Education. I am conducting research on utilisation of Digital Technologies in teaching university Students with blindness. This university has been selected for this research.

**Y**ou have been chosen as a respondent in this study. I am kindly requesting to conduct interview with you to obtain information about the study. The interview will be less than an hour, and I request to record the interview. All responses obtained from this interview will be kept confidential and you will be identified in it, and information will be only for academic purposes as per the Kyambogo University Policies on research.

I beg for your cooperation.

**SECTION A: BIODATA**

Gender: Male [ ] Female [ ]

Number of years as a Lecturer teaching Students with blindness ….. years

**SECTION B: Availability and adequacy of Digital Technologies for teaching Students with blindness**

1. Do you have an idea about Digital Technologies for Students with blindness ? Mention some please.
2. What are the different Digital technology available in the university that used in teaching Students with blindness?
3. Do you think the DTs available in the university meet the educational requirement of Students with blindness? If yes how? If no how?
4. How adequate are they to meet to the need of students with blindness?
5. Can you explain the status of related infrastructures that supports its use?
6. Which DTs you think would suit the teaching of Students with blindness? How?
7. In your view, what you think should be done to improve the current status of DTs concerning it's the availability and adequacy?

**SECTION C: Utilisation of DTs in teaching Students with blindness**

1. Explain the way you use DTs in teaching Students with blindness?
2. Apart from the above what are other ways do you make utilisation of DTs to facilitate the learning of Students with blindness.
3. What challenges do you face when using different DTs to teaching Students with blindness?
4. In your views, what do you think can be done to address the challenges regarding utilisation of DTs in teaching Students with blindness?

**SECTION D: The perception of Lecturers on utilisation of DTs in teaching Students with blindness**

1. What are your views on utilisation of DTs in teaching Students with blindness in university level?

2. Do you think utilisation of DTs is helpful for the teaching Students with blindness? How helpful are they?
3. What are your opinion about utilisation of DTs in teaching Students with blindness in university level?
4. Do you have anything to say concerning utilisation of DTs in teaching Students with blindness?

**Appendix ii: Interview Guide for Students with blindness**

**KYAMBOGO UNIVERSITY**

**FACULTY OF SPECIAL NEEDS AND REHABILITATION**

**DEPARTMENT OF SPECIAL NEEDS STUDIES**

**INTERVIEW GUIDE FOR STUDENTS WITH BLINDNESS**

My name is Hadija Suleiman, I am a student from Kyambogo University in Uganda, pursuing Master's Degree in Special Needs Education. I am conducting research on utilisation of Digital Technologies in teaching university Students with blindness. This university has been selected for this research.

**Y**ou have been chosen as a respondent in this study. I am kindly requesting to conduct interview with you to obtain information about the study. The interview will be less than an hour, and I request to record the interview. All responses obtained from this interview will be kept confidential and you will be identified in it, and information will be only for academic purposes as per the Kyambogo University Policies on research.

**SECTION A: BIODATA**

Gender: Male [ ] Female [ ]

Year of study……..

**SECTION B: Digital Technologies available for teaching Students with blindness**

1. What are the different Digital technologies available in the university that Lecturers used in teaching Students with blindness?
2. Do you think the DTs available in the university are adequate enough to meet you're educational needs?
3. What is the status of supportive infrastructures in utilisation of Digital technologies?
4. Which DTs you think would suit the facilitation of your learning?
5. What do you think should be done to improve the current status of DTs in terms of availability and adequacy?

**SECTION C: Utilisation of DTs in teaching Students with blindness**

1. What are the digital technologies used by lecturers during teaching?
2. How do lecturers use DTs during their teaching for learning faciliataion?
3. What challenges do you face concerning utilisation of digital technologies in teaching?
4. In your views, what do you think can be done to address the challenges regarding utilisation of DTs in your studies?

**SECTION D: The perception of Lecturers on utilisation of DTs in teaching Students with blindness**

1. What are your views or opinion concerning utilisation of DTs in teaching Students with blindness in university level?
2. Do you think utilisation of DTs in teaching Students with blindness beneficial?
3. What are your opinion about utilisation of DTs in teaching Students with blindness in university level?

## Appendix iii: Interview Guide for Technical Staff

**KYAMBOGO UNIVERSITY**

**FACULTY OF SPECIAL NEEDS AND REHABILITATION**

**DEPARTMENT OF SPECIAL NEEDS STUDIES**

**INTERVIEW GUIDE TECHNICAL STAFF**

My name is Hadija Suleiman, I am a student from Kyambogo University in Uganda, pursuing Master's Degree in Special Needs Education. I am conducting research on utilisation of Digital Technologies in teaching university Students with blindness. This university has been selected for this research.

**Y**ou have been chosen as a respondent in this study. I am kindly requesting to conduct interview with you to obtain information about the study. The interview will be less than an hour, and I request to record the interview. All responses obtained from this interview will be kept confidential and you will be identified in it, and information will be only for academic purposes as per the Kyambogo University Policies on research.

**SECTION A: BIODATA**

Gender: Male [ ] Female [ ]

Number of years working with Students with Blindness ….. years

Duties performed as Technical staff……

**SECTION B: Digital Technologies available for teaching students with blindness.**

1. What are the available DTs for Students with blindness that used for teaching?
2. Who provide these DTs, and which criteria used for its provision in the university?
3. The university infrastructure support utilisation of DT's?
4. Do teachers have knowledge of the available DTs and how they are used? How do you help them?
5. What do you think should be done to improve the current status of DTs in terms of availability, adequacy, suitability and use?

**SECTION C: Utilisation of DTs in teaching students with blindness**

1. Explain different ways in which teachers use DTs in teaching students with blindness.
2. Are Lecturers competent in using the DTs during teaching students with blindness? Do you have training programmes for lecturers regarding utilisation of DTs for Students with blindness?
3. Based on your experiences what challenges do teachers and students with blindness face when using DTs? What do you do to resolve them?
4. What are stakeholders' effort (the government, NGOs just to mention the few) in minimizing the challenges regarding utilisation of DTs for students with blindnessat university?
5. What would you suggest on utilisation of DTs by lecturers when teaching students with blindness?

**SECTION D: The perception on utilisation of DTs in teaching students with blindness**

1. In your views, how do lecturers and students with blindness perceive utilisation of DTs during teaching?
2. How do you rate the willingness of lecturers and students with blindness in using DTs and why?
3. Do you think utilisation of DTs when teaching students with blindness is of importance in university level?
4. What would you suggest to change those with negative attitude on utilisation of DTs when teaching students with blindness?

5. What advice would you give to the university authorities to increase utilisation of DTs based on the benefits it provide to the learning of students with blindness?

## Appendix iv: Observation checklist guide

***Observation checklist guide***

| ASPECT TO OBSERVE | EXPECTED ITEM TO BE AVAILABLE IN THE SCHOOL | AVAILABLE IN THE UNIVERSITY | COMMENTS |
|---|---|---|---|
| **1. DT enabling infrastructures** | - Laboratory/resource Room | | |
| | - Electricity | | |
| | - Suitable classrooms | | |
| | - Internet connectivity | | |
| | | | |
| **2. Digital technologies** | - Computers with screen readers | | |
| | - Smart white board | | |
| | - Smart watches | | |
| | - Note takers | | |
| | - Braille display note takers | | |
| | - CCTV with OCR | | |
| | - Digital Audio recorders | | |
| | - Mic | | |
| | - speakers | | |
| | - Braille Printer(Embossers) | | |
| | - Smart White canes | | |
| | - Victor readers | | |
| | - Talking Calculators | | |
| | - Talking Dictionary | | |
| | - Tablet and Smart phones | | |
| | - Electrical Perkins Braille | | |
| | - Projectors | | |
| | - Digital books/DAISY | | |
| | - Braille duplicators/ Thermoform | | |
| | | | |
| **Soft wares** | - Duxbury Braille Translator | | |
| | - OCRs and OCR software | | |
| | - NVDA/JAWS | | |
| | - Win braille | | |

## Appendix v: Consent Form

## INFORMED CONSENT FORM

Dear Research participant, I'm Hadija Suleiman, from Kyambogo University in Uganda, student with the registration number 21/X/GMSN/14160/PE. Please provide your informed consent to participate in the study titled *Utilisation of Digital Technologies in teaching students with blindness in one university in Dar es Salaam city Tanzania.* You are invited to take part in a research study because you are one of a number of resourceful persons in this important research.

a) **The purpose of this research:** The purpose of this study is to explore the utiliszation of DTs in teaching students with blindness at universities in Dar es Salaam city, Tanzania
b) **Names of the research team:** The data for this study will be collected by Hadija Suleiman.
c) **Procedures:** I kindly invite you participate in complete my interview guide. As a research participant, you will be required to respond to the interview questions that will be asked by the researcher. Moreover, the interview will be recorded for preservation and constant reference point during the data analysis.
d) **Benefits:** You may receive no direct benefit from participating in this study. But the information gained may be useful to university authority, policy makers, academicians and students with blindness.
e) **Time commitment:** The exercise is expected to take 30 to 50 minutes to complete.
f) **Privacy and confidentiality:** Information you will provide will remain confidential and your identity will not be revealed. You or your institution will be referred by using letters so as to conceal your identity and to ensure confidentiality.

g) **Voluntary Participation:** You are free to participate, decline or withdraw your participation in this study at any point without consequence. Your decision will have no influence on your job. You are free to ask any question for more clarification before making decision on whether to participate or not in this research.

h) **Sharing of results:** The findings of this study will be published online in peer reviewed journals. The hardcopy of this research report will be available at Kyambogo University Library.

i) **Contact information**: You may contact the following for any information:

1. **The researcher**: Hadija Suleiman, mobile number 0716751164 or my e-mail hadijamtani96@gmail.com**.**

2. **Declaration:** "I have read what is required to me if I take part in this research. I understand what I am required to do. I agree to participate in the research".

**Name……..Signature……(Research participant)**

**Name……...Signature…… . (Researcher)**

## Appendix vi: Introductory letter for Data Collection.

UNITED REPUBLIC OF TANZANI

MINISTRY OF EDUCATION, SCIENCE AND TECHNOLOGY

UNIVERSITY OF DAR ES SALAAM

**DIRECTORATE OF RESEARCH AND PUBLICATION**

In replying please quote:

**Ref. No.** AB 269/319 /01 27th July, 2023

I

Dean
School of Education
University of Dar Es Salaam

II Dear Manager
School of Edu
please assist
27/7/2023

RE: INTRODUCTORY LETTER

Kindly refer to the subject mentioned above.

2. This is to introduce **Ms. Hadija Suleiman** who is a student of Kyambogo University Kampala, Uganda. **Ms. Hadija Suleiman** is at the moment conducting data collection as part of her studies. The title of her research is **'The use of digital technologies in teaching blind in universities in Dar Es Salaam City, Tanzania'.** The student has been granted research clearance by the University.

3. This is to request you to grant the above-mentioned student any help that may enable her to achieve her study objectives. The period for which this permission has been granted is for July to September, **2023**.

4. Yours sincerely,

Dr. Mussa I. Mgwatu
**DIRECTOR OF RESEARCH AND PUBLIC ATION**

c.c. Deputy Vice Chancellor - Research
cc. **Ms. Hadija Suleiman**

Cranford Pratt. Building, University of Dar es Salaam, PO Box 35091, Dar es Salaam.
Phone +255 22 2410500-13 Ext. 2084, Phone: +255 22 2410727 - Direct, Email: research@udsm.ac.tz, Website: www.udsm.ac.tz

**Appendix vii: Research Clearance form from University.**

# KYAMBOGO UNIVERSITY

Faculty of Special Needs and Rehabilitation

Tel: 041 – 22935/285584 Fax: 041 -222641

***Office of the head, department of Visual impairment Studies***

20th June 2023

**The DEO/DIS/Head Teacher/ Teacher/ Community Opinion Leader/ Religious leader**

UNIVERSITY OF DAR-ES-SALAAM

DIRECTORATE OF RESEARCH AND PUBLICATION.

Dear Sir / Madam,

**RE: INTRODUCTION OF RESEARCH STUDENT FOR DATA COLLECTION**

This letter serves to introduce Rev / Dr / Mr/ Mrs\Ms HADIJA JULEIMAN

Registration No. 21/X/GMSN/14160/PE, who is a bonafiede student of Kyambogo University in the faculty of Special Needs and Rehabilitation, Department of Visual impairment Studies. He / she is required to conduct a research study as partial fulfillment for Masters degree program.

The purpose of this letter is to request you to allow him / her have access to information from your office/school / area of operation necessary for the study.

Kyambogo university will be grateful for any assistance rendered to the student.

Yours sincerely,

Niyisabwa

Dr. Niyisabwa Odette Tumwesiye

**HEAD OF DEPARTMENT**

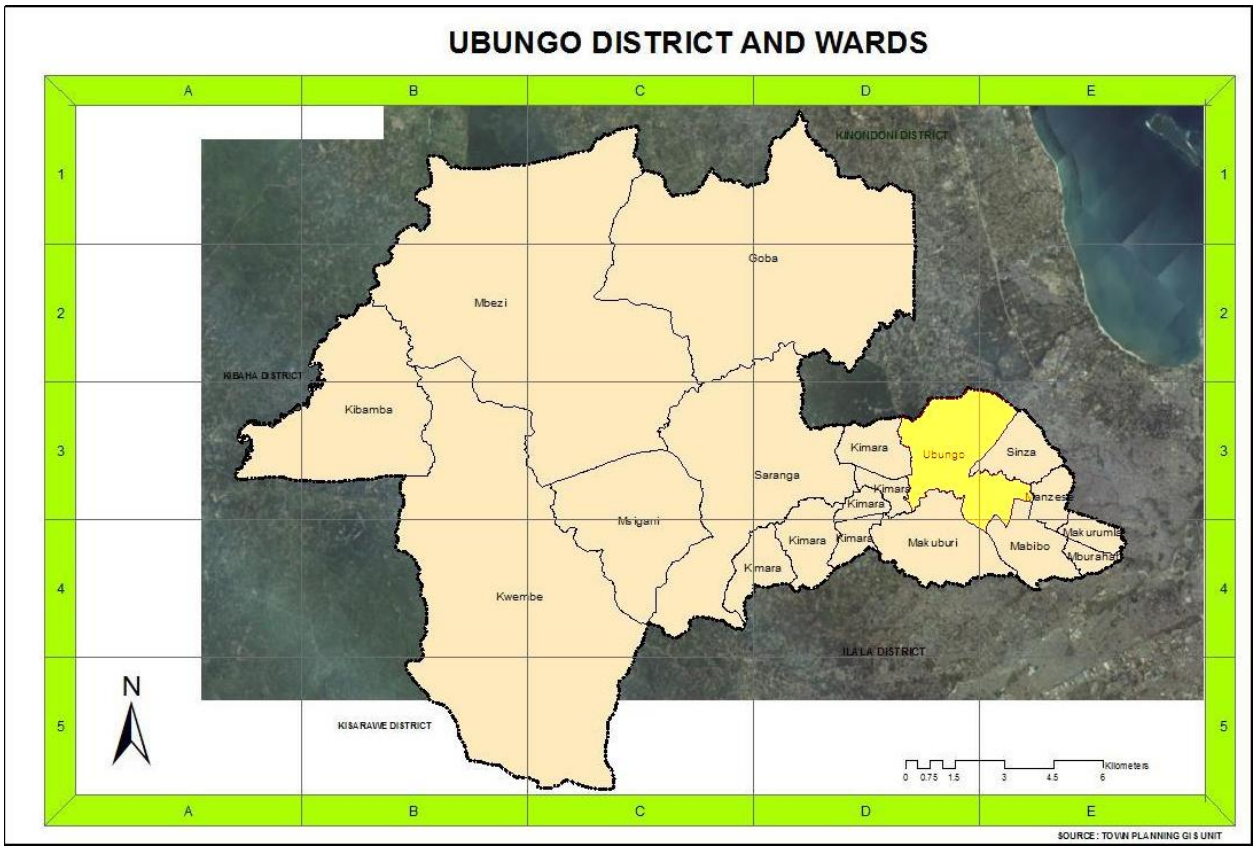
**Appendix viii: Map of Tanzania showing Dar es salaam City, Tanzania**


***Source: United Republic of Tanzania (URT) 2023***

**KEY**

**Study area**

**Appendix ix: Map of Dar es salaam showing study location area.**




***Source: United Republic of Tanzania 2023***

**KEY**

**Study area**