

**INFLUENCE OF TECHNOLOGY MEDIATED TEACHING AND LEARNING IN
THE PREPARATION OF PRE-SERVICE TEACHERS WITH DISABILITIES**

BY

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**Thesis submitted in fulfilment of requirements for the Degree of
Doctor of Philosophy with specialisation in Curriculum Studies with focus on
Inclusive Education for pre-service teachers with disabilities**

In the

Department of Curriculum Studies and Higher Education

Faculty of Education

UNIVERSITY OF THE FREE STATE

Bloemfontein, South Africa

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July 2023

DECLARATION

I, **Fanuel Manyinyire** declare that the thesis, **Influence of technology mediated teaching and learning in the preparation of pre-service teachers with disabilities**, submitted for the qualification of **Doctor of Philosophy with specialisation in Curriculum Studies** at **the University of the Free State** is my own independent work.

All the references that I have used have been indicated and acknowledged by means of complete references.

I further declare that this work has not been previously submitted by me at another university or faculty for the purpose of obtaining a qualification.

SIGNED:



DATE: 03/07/2023

DEDICATION

The thesis is dedicated to my wife and children, who supported my research activities in numerous ways: encouragement, support and patience during the studies.

ACKNOWLEDGEMENTS

I am deeply indebted to several individuals for their immense contributions in various capacities towards realisation of this thesis. My profound gratitude goes to Doctor Maria Tsakeni for her invaluable intellectual insights and expert scholarly guidance as my research supervisor and mentor. Her professionalism and patience made it possible for me to pursue and achieve my lifetime dream of attaining a PhD degree. She instilled confidence and inspiration with unparalleled passion and precision. May the dear lord continue to shower her with abundant blessings. To Professor L.C. Jita, the SANRAL Chair, I profoundly acknowledge and appreciate his timely generous financial support and opportunity to participate in focused off-campus special tutorial and support sessions.

Special mention goes to several work and study colleagues who critiqued my work and provided unconditional moral support which helped me to soldier on. To the principal at the research site institution, teacher educator and pre-service teacher participants, I can't thank you enough; you were wonderful, stay blessed.

To my wife, Grace and children, the emotional, spiritual and moral support you provided was immeasurable. Together we triumphed, thank you.

ABSTRACT

Enrolment of students with disabilities in teacher education and other higher education programs has increased steadily, following policy reviews and advocacy by civic society (WHO, 2017; Pitman, 2022; FOTIM, 2011). Efforts have been on reducing learning barriers for students with disabilities by integrating technologies in pedagogic contexts (Jenson et al., 2010; Bekteshi, 2015). Nevertheless, studies on use of technologies to support learning for pre-service teachers with disabilities are limited, which inspired this study. Adoption of Universal Design for Learning, as the theoretical framework helped appraise inclusiveness, while Substitution Augmentation Modification and Redefinition helped establish extent to which technologies were integrated in pedagogic contexts (Rose & Meyer, 2002; Meyer et al., 2014). This study employed the social constructivism paradigm which influenced adoption of purposive and snow ball sampling of three teacher educators, a principal and twelve pre-service teachers, who provided study data through: interviews, observations and focus group discussions (Neuman, 2014; Cohen et al., 2018). Data was analysed through a thematic approach (Lincoln & Guba, 1985; Creswell & Creswell, 2018). Results reveal inclusive enrolment, some infrastructural adaptations, some technology mediated teaching and learning and improvisation, as inclusive practices that benefitted pre-service teachers with disabilities. While teacher educators used technologies in presenting content, instructions and learning tasks, their efforts were impeded by inadequacy of technologies and inappropriate facilitation strategies. Effectiveness was also influenced by perceptions, attitudes and facilitation skills of particular educators. Students with dysfunctional or missing limbs used technologies for note capturing, presenting, researching and compiling assignments, which enhanced their social presence, participation and autonomy in learning processes. Despite predominant use of the technologies at substitution and augmentation, this promoted multiple presentations, expression and engagements (UDL). Notwithstanding lack of explicit policies on inclusive education, the institution availed several technologies, although these were not particularised to students with specific disabilities. Furthermore, these technologies were not easily accessible to pre-service teachers with disabilities, who largely relied on personally owned technologies. Findings from this study are fundamental on inclusion and responding to disabilities, as the recommendations highlight enhanced access to appropriate functional technologies, capacitation of teacher educators and infrastructural adaptation, as well as and apposite policies on use of technologies and its monitoring.

Keywords: Technology mediation, disabilities, teacher education, pre-service teacher

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LIST OF ACRONYMS

A level....	Advanced level
CAB.....	College Academic Board
CAST....	Centre for applied special technologies
CCTV....	Closed-Circuit Television
CTR.....	Committee for Title Registration
CUD.....	Centre for Universal Design,
DTE.....	Department of Teacher Education
DVS....	Descriptive Video Services
EC.....	European commission
EFA	Education for All
ESD.....	Education for Sustainable Development
FGD.....	Focus Group Discussion
FM.....	Frequency Modulated
FOTIM....	Foundation of Tertiary Institutions of the Northern Metropolis
GHREC...	General Human Research Ethics Committee
HEOA	Higher Education Opportunity Act
ICT.....	Communication Technology United States
ISO.....	International Standards Organization
JAWS.....	Job Access with Sound
LAN.....	Local Area Network
LCZT.....	Leonard Cheshire Zimbabwe Trust
MDGs.....	Millennium Development Goals
MHTEISTD.	Ministry of Higher and Tertiary Education, Innovation, Science and Technology Development
NDS1.....	National Development Strategy number 1
NGOs.....	Non-Governmental Organisations

O level.....Ordinary level

OCROptical Character Recognition

OECD..... Organization for Economic and Community Development

SADC.....Southern Africa Development Community NASCOH

SAMR.....Substitution Augmentation Modification Redefinition

SAP.....Second Audio Program

SDG.....Sustainable Development Goal

SRC.....Student Representative Council

TDD.....Telecommunication Device for the Deaf

TERC.....Teacher Education Research Conference

UCE.....United College of Education

UD.....Universal Design (UD)

UDL.....Universal Design for Learning

UFS.....University of the Free State

UK.....United Kingdom

UN-CRPD...United Nations- Convention on the Rights of Persons with Disabilities

UNESCO....United Nations Education Scientific and Cultural Organization

USAUnited States of America

US-OET.....United States, Office of Education Technology

US-OETOffice of Educational Technology

UZUniversity of Zimbabwe

WHO.....World Health Organisation

CHAPTER 1: ORIENTATION AND BACKGROUND TO THE STUDY

1.1 Introduction

The world human population comprises 15% of persons with various disabilities (World Health Organization (WHO), 2017; 2011). This translates to almost one billion people and, of these the World Health Survey Report of 2002 – 2004 confirms that about 650 million are adults of over 18 years (WHO, 2004). This has irked governments, civil society organisations and other proponents of social justice with a penchant to uphold human rights and sustain equity in social services, like education. The cited age range comprises persons that should drive development in various spheres of society. Munemo and Bekele (2020) acknowledge that persons with disabilities have limited access to higher education, though related provisions are imbedded in the Universal Declaration of Human Rights of 1948, Article 26. However, McKinney and Swartz (2022) applaud development in global non-discrimination legislation for enhanced opportunities to pursue higher education studies by students with disabilities. In that context, Dr Chan, the then Director General of WHO, and Mr Zoellick, President of the World Bank Group acknowledged substantial increase in cases of disability, which they attributed to effects of emerging chronic diseases and inevitable human ageing (WHO, 2011: xi). Such developments seem to have further enthused higher education institutions to adopt inclusive enrolment practices that accommodate those affected. According to Evans et al, (2017), these mainstreamed contexts have necessitated changes in the facilitation of learning processes in higher education. Such perceptions justify the need to explore how responsive initiatives like technology mediated teaching and learning support students with disabilities in the acquisition of skills for teaching. As technologies have capacity to enhance learning for pre-service teachers with disabilities, it becomes prudent to establish how these help nurture the students into professionals with competencies that compare with colleagues. Focus is on strengthening inclusive practices through use of technologies that benefit pre-service teachers with disabilities.

1.2 Background to the Study

The United Nations report of 2015 and WHO (2011) acknowledge significant societal response to human disabilities as from the 1970s. This is evidenced by multi-faceted initiatives designed to enhance enrolment of students with disabilities in higher education (UN, 2015; WHO, 2011). These responsive interventions upheld human rights and also promoted social justice (Thompson, 2017; Riddell, 2013). Besides advocacy for justice,

equity and broader access to essential services, governments and civic society organisations further strengthened efforts on enhancing opportunities for students with disabilities to pursue tertiary education studies (Pitman, 2022; Jameel, 2011). De Bruin (2019) admits that these moves also supported mainstreaming of students with disabilities in regular education contexts, in line with the Salamanca Statement and Plan of Action. Related developments include enactment of the European Disability Strategy by the European Commission (EC) and ratifying the United Nations Convention on the Rights of Persons with Disabilities (EC, 2010; UN-CRPD, 2012). The enrolment of students with disabilities in tertiary education is supported by international conventions like: The World Programme of Action Concerning Disabled People of 1982; The Convention on the Rights of the Child of 1989 and The Standard Rules on the Equalisation of Opportunities for People with Disabilities of 1993. These proclamations complement the UNCRPD of 2006.

A study conducted in South Africa by the Foundation of Tertiary Institutions of the Northern Metropolis (FOTIM, 2011), noted significant influence from civic and statutory bodies on enrolment of students with disabilities in higher education pursuits, like teacher education. Morina (2017) and NCSEHE (2020) similarly reported global increase in admission of students with disabilities in tertiary institutions. Findings of the FOTIM study resonate with the scenario in Zimbabwe perhaps due to the fact that both nations are in the Southern Africa Development Community (SADC), which creates periodic platforms for sharing education practices among member states. SADC countries like Zimbabwe have instituted reforms in their education systems to increase the provision of essential support for students with disabilities in higher education. Mugumbate and Nyoni (2013) report that 75% of persons with disabilities are in developing nations like Zimbabwe, while WHO (2011) indicates that nearly 1.8 million people in Zimbabwe have various disabilities, which constitutes approximately 10% of the national population. However, NASCOH (2013) alleges that only 7% of these pursue higher academic levels like university and teacher education. While Mutasa, Goronga and Tafangombe (2013) reported on historical marginalisation of students with disabilities, Majoko (2018) has conversely noted heightened enrolment of such students in higher education institutions of Zimbabwe.

In spite of the increased enrolment, participation in learning engagements by students with disabilities remains comparably low due to limited access to essential support (Cotton, Nash & Kneale, 2017; Vornholt et al., 2018; Riddell & Weedon (2014). Ben-Naim (2017) views the scenario as perpetuation of the exclusion which these students often experience in lower

stages of educational pursuits. To meet academic demands, these students are often compelled to invest more effort and time than colleagues without disabilities. Mattingly and Ratisifandrihamanana (2016) blame this on traditional practices that are entrenched in pedagogical processes. WHO (2011) therefore, advocates for responsive interventions considering that disabilities often predispose students to low participation and low achievement in education processes. WHO (ibid.) further alleges that poor developing nations have the larger fraction of persons with disabilities, yet, they have low capacity to provide appropriate education trajectories, which often results in according less priority to the integration of technologies in learning processes. Seale et al. (2015) similarly argue that students with disabilities often lack requisite resources to support their own learning at tertiary level.

Based on a study in Tanzania, Thompson 2017:30 says, “While substantial progress has been made towards ... and supporting students with disabilities, challenges still remain.” Among these challenges is inadequate monitoring of the use of resources, like technologies allocated to enhance learning for students with disabilities (Thompson, ibid). This deficient monitoring was a major impediment such that designated resources were diverted to other initiatives without trace. In spite of the above cited sentiments, Fordyce, Riddell, O’Neill and Weedon (2014) reported on enhanced enrolment and support for students with disabilities in some states. Among these was the Netherlands, which had 30 % of students in higher education comprising those with various disabilities (Deutsche & Wissenschaft, 2015). Similarly, Swedish universities had 17% of their students constituting those with disabilities (Riddell, 2013). In the United Kingdom, Riddell, Tinklin and Wilson (2005) noted that 11.3% of fulltime time undergraduate for the period 2013 to 2014 had various disabilities, while Fundacion Universia (2018) admitted that higher education institutions in Spain had registered an escalated admission of students with disabilities. This statistical information demonstrates conformity to the Salamanca Statement and Plan of Action of 1994, which compels inclusivity that mainstreams persons with disabilities in education contexts (Hassanein, 2015). This makes the Salamanca Plan of Action a declaration that gives legitimacy and traction to national initiatives that promote inclusive education (Kart & kart, 2021).

In Zimbabwe, section 83 of the national Constitution obligates government support for education and training that enhance self-reliance and active participation in social activities by persons with disabilities (Government of Zimbabwe, 2013). However, this study lacks

capacity to appraise achievements accrued through adherence to this section, vis-a-vis access and equity in learning engagements. This could have helped appraise the extent to which the law benefitted pre-service teachers with disabilities in Zimbabwe or influenced their career preparation. Nevertheless, existent volatility in global economies should galvanise government and institutional authorities to re-invigorate support for integration of technologies in the preparation of pre-service teachers with disabilities. This stands to ensure the students' acquisition of teaching skills that sustain competitiveness on the shrinking job market.

Literature indicates that most higher education institutions now view disability through the social model of disability, which influences enhanced admission of students with disabilities (Rudhumbu, 2021). The social model blames society and institutions for most obstructions encountered in learning engagements by students with disabilities, since these often emanate from negative attitudes and failure to reduce effects of environmental barriers (Majoko, 2018). This social interpretative model inspires responses that help to reduce learning obstructions associated with disability. It also posits that social structural constructions significantly influence inequalities and infringements on the dignity of persons with disabilities. Similarly, McCarthy, Quirke, and Treanor (2018) concede that disability is a socially constructed phenomenon, which then compels adoption of inclusive practices like use of technologies, to support learning for the affected students. Disabilities often reduce students' autonomy in learning processes unless they are provided with essential resources and accommodations. According to Jairos Jiri Association (2013), it is incumbent upon institutional authorities and educators to strive on reducing barriers that cause disproportionality, besides avoidance of exclusionary practices on differently-abled students. In the strategic plan for 2011-2015, the Ministry of Higher and Tertiary Education, Innovation, Science and Technology Development (MHTEISTD) vowed support for the enrolment and access to essential learning resources by students in higher education that have disabilities (MHTEISTD, 2011). Significant influx of pre-service teachers in Zimbabwe's higher education institution illustrates institutional efforts on conforming to government expectations, global trends or conventions like Education for All (EFA) and the Millennium Development Goals (UNESCO, 2015a). The Organisation for Economic and Community Development (OECD) designates these actions and policies as strategies that seek to improve the quality of teachers (OECD, 2009). This inference resonates with WHO (2011) on the

need for continuous reforms in education provision designed to keep in step with innovative technological developments.

In spite of the above cited strides, concern remains on less suitable pedagogic practices still experienced by students with disabilities (UNESCO, 2013; Fernandez-Batanero et al., 2022; Pitman, 2022). UNESCO however acknowledges efforts by other educators to effectively include these students through facilitating the use of various technologies (UNESCO, *ibid*). McNicholl et al. (2021) adds that use of technologies reduces barriers encountered by students with disabilities and promotes inclusive education practices. Xu (2018) similarly asserts that educators can transform traditional learning contexts into more inclusive set-ups through the use of technologies. In the same context, Adebisi, Liman and Longpoe (2015) regard competent educators as those that integrate hard and software techno-scientific technologies to accommodate diverse learning needs and challenges in pedagogic processes.

However, Blomstrom and Kokko (1998) view technology as an abstract concept that has diverse conceptual perspectives that are influenced by academic and career persuasions of particular individuals. Nevertheless, Lan and Young (1996) perceive technology as an embodiment of different ways of knowing or the use of particular equipment, knowledge and skills to yield specific results. Adebisi et al. (2015) add that technologies include mobile, digital or personalised devices used to support teaching and learning processes, while Fernandez-Batanero (2022) views these as tools that support students in accessing the curriculum. Jenson, Taylor and Fisher (2010) then designate the use of such equipment as technology mediated teaching and learning, which maximises learning for differently abled students. This approach enhances quality of education, in line with the Sustainable Development Goal number 4, by availing alternative ways of approaching learning tasks by those with disabilities (UNESCO, 2015b; Fernandez-Betanero, 2022). Similarly, Wachira and Keengwe (2010) submit that technology-based practices enhance inclusive delivery of learning content, as well as instructions.

However, Balmeo et al. (2014) express concern over institutional authorities that marginalise allocation of funds for acquisition of essential technologies, which impedes effective inclusion of students with disabilities. Nevertheless, Bekteshi (2015:340) avers that, “While use of technologies is beneficial and assists students in educational tasks, concern is on the design and usability of some of these.” In some instances, the operational design of some technology equipment fails to accommodate students with particular disabilities. Another

concern is on side-lining educators' input in critical forums on the use of technologies; yet, their decisions influence technologies and facilitation strategies used in pedagogic contexts (Bitner & Bitner, 2002).

Furthermore, Yankova (2019) and Ertmer (2005) consider perceptions and attitudes of the educators as pivotal on extent, effectiveness and frequency to which technologies are used in pedagogic engagements. Similarly, the educators' views on benefits accrued from using technologies and their level of preparedness to integrate these are equally fundamental (Kent & McNergney, 1999). Curricular designers, as well as ministry and institutional authorities should therefore recognise the critical role of educators by involving them in discussions on inclusive practices, like the use of technologies. Furthermore, effectiveness in the use of technologies depends on the skills of individual educators (Yankova, 2019; Doyle & Reading, 2012). Therefore, the educators require knowledge and perceptions of the efficacy associated with integrating technologies in pedagogic processes. While Naylor, Campbell and Maloney (2015), as well as Clouder et al. (2019) argue against a linear narrative on imparting teaching skills, their conviction affirms that use of technologies is a strategy that makes pedagogic processes more inclusive for students with disabilities. Such views make this study fundamental in the preparation of pre-service teachers with disabilities.

It is therefore, prudent that educators in Zimbabwe adopt dynamic teaching approaches through continuous sharpening of skills and knowledge of integrating technologies that suit students with disabilities (Yankova, 2019; UNESCO, 2005). In cognisance that pace of grasping concepts differ, Rensburg (1999) views use of technologies as a strategy that would help accommodate all the students. Furthermore, Cox and Mond (2008) advance that use of technologies gives students with disabilities opportunities for more insightful learning. Nevertheless, effectiveness in the use of technologies and implementation of other inclusive practices require relevant guiding policies from both the ministry and institution. While Abosi (1996) cited Zimbabwe among nations with policies 'supporting inclusive education processes, this study sought to establish whether aspects of technology integration in teacher education processes are included as well. The study therefore focuses on examining practices and experiences in the use of technologies at on teacher education institution in Zimbabwe including how they influence preparation of pre-service teachers with disabilities.

1.3 Rationale for this Study

Attention accorded to learning processes for students with disabilities depends on national education systems (Gronlund, Lim & Larsson, 2010). Nevertheless, most developing nations borrowed substantial influence from philosophies and ideologies of former colonial masters. Zvobgo (1994) claims significant influence on education trajectories in Zimbabwe from those of the United Kingdom (UK), its former coloniser. Although Riddell (2013) lauds the United Kingdom for providing quality tertiary education to students with disabilities, this does not seem to be the case in Zimbabwe. Efforts on emulating trajectories from the UK seem to have been in vain, particularly for students with disabilities that pursue teacher education in Zimbabwe. This necessitates further research into academic initiatives that involve students with disabilities, especially in Zimbabwe and other developing nations (Brownell, 2003; Fernandez-Batanero, 2022).

Majoko (2018) laments the non-existence of explicit policy framework on inclusive education in higher education, which Gronlund et al. (2010) considers as a deficient matrix in the provision of education. This necessitates examining the processes in teacher education to establish how the use of technologies influences learning for students with disabilities. The United States - Office of Educational Technology (US-OET) underscores the need for teaching strategies that assist students to adapt to changes in psycho-social expectations so that they sustain global competitiveness in education provision (US-OET, 2017). Educators also need to develop common 'language' in the integration of technologies to prepare pre-service teachers with various disabilities (Neal, 2016; Yankova, 2019). Although students with observable disabilities often get deserved attention, this does not usually apply to those with non-visible disabilities, especially in higher education (Eckstein, 2022; Hurst & McCarthy, 2001; MHTEISTD Strategic Plan, 2011-2015). These views compel use of technologies that accommodate students with diverse disabilities. Nevertheless, research on issues of disability in higher education has largely focused on western countries like the United States of America (USA), with few of these conducted in African states, such as Zimbabwe (Hassanein, 2015; Hawkrigde, Vintcent & Hales, 2018). The resultant findings may not apply to Zimbabwe, whose contextual settings differ from those of these western countries. For instance, cultural backgrounds and perspectives of disability differ, whereas these have significant influence on beliefs and practices. Fernandez-Batanero et al. (2022) and Brownell (2003) concur that research studies on students with disabilities and the use of technologies are still limited, especially in developing countries like Zimbabwe. This makes

it prudent for this study to further examine aspects of disability vis-a-vis the use of technologies through an African lens and based on perspectives from Zimbabwe.

The study context is in Professional Studies, a generic subject in teacher preparation, where the mass-lecture approach is predominantly applied to a large group of students. At the research site, Professional Studies comprised: Classroom management, Educational media technology, Classroom communication, Health and life skills education, as well as National strategic studies. These modules are complementary in moulding students into professionals endowed with appropriate morals and competencies to preside over learning at secondary school level.

My experience as a teacher educator in Zimbabwe enabled noting how educators facilitated use of technologies to enhance learning, which however, revealed little effort on using these in ways that maximised benefits for students with particular disabilities. Although use of technologies is not the sole strategy that enhances preparation of pre-service teachers with disabilities, it remains an integral cog that needs examining. Bekteshi (2015) affirms use of technologies as a transformative approach that allows students to master targeted concepts at their own pace, and as influenced by their intellectual capability. Use of technologies enables students with disabilities to be better collaborators when addressing challenges in learning contexts and other life encounters (OET, 2017; Balmeo et al., 2014). Recommendations from this study are envisaged to stimulate an inclusive and more efficient preparation of pre-service teachers with disabilities.

In Zimbabwe, the Centre for Teacher Education and Materials Development, formerly the Department of Teacher Education (DTE), at the University of Zimbabwe (UZ) and the Ministry of Higher and Tertiary Education, Innovation, Science and Technology Development (MHTEISTD) superintend over standards in teacher education. However, they seem to accord peripheral attention to the use of technologies that enhance learning for pre-service teachers with disabilities. As evidence, the ministry vowed to rekindle support for students with disabilities, which infers earlier neglect (MHTESTD Strategic Plan, 2011-2015). This study sought to augment and energise such efforts by providing newer perspectives on how technologies can be used to support learning processes of pre-service teachers with disabilities.

WHO (2017:9) avers that, “Despite varied possible policies, systems and provision of technologies ... many countries still lack relevant policies and systems.” Majoko (2018)

confirms that Zimbabwe is in that category, as it does not have explicit policies that guide use of technologies to benefit students with disabilities (Balmeo et al., 2014). Mattingly and Abdullah (2016) however reported that policy makers and politicians were currently seized with enhancing inclusion and active participation of students with disabilities in education pursuits. These efforts have potential to stimulate crafting of policy guidance on mainstreaming issues of disability in teacher education processes. Similarly, this study could inspire inception of new or reviewing of existent policies at both national and institutional levels, which would imbed inclusiveness and use of technologies for pre-service teachers with disabilities. Eventually, teaching and learning processes for these pre-service teachers would become more efficient and appropriately structured (Hagrass, 2005). The study may also illuminate the need to integrate technologies in pedagogic engagements as an inclusive practice that reduces learning impediments induced by disabilities (Gaulin & Dunn, 2005; Fernandez-Batanero et al., 2022).

The advent of diverse and more complex technologies compels educators to be innovative as well as hone their capacity to select apposite technologies for particular student groups (Adebisi, Limani & Longpoe, 2015). Gray and Ruedel (2015) implore educators to adopt high ingenuity and skills to support the more efficient functioning and accomplishment of pedagogic tasks by students with disabilities. The notion is supported by Kurt (2010) who acknowledges that use of technologies helps educators reconfigure learning contexts to enable students develop higher+ order thinking skills, which this study sought to unravel. The study findings and recommendations could also enthuse redesigning of learning environments and contexts into more accommodative setting for pre-service teachers with disabilities. Heightened integration of technologies would thus facilitate elimination of students' inhibitions in oral, written expressions or listening, including engagement in learning processes. The use technologies would also help educators in conceiving strategies that transform disabilities into learning differences, which then plugs learning gaps due to effects of disabilities (O'Connell et al., 2010). This study is anticipated to reflect on benefits and provide newer perspectives on how both teacher educators and pre-service teachers with disabilities can use technologies in pedagogic processes.

The study also sought to stimulate teacher educators on singularly or collectively reflecting on perspectives related to the use of technologies in everyday practice. Ultimately, the study sought to influence inclusion of aspects of disability in new or reviewed policies by both institutional and government authorities. While Hassanein (2015) and Majoko (2018) claim

that Zimbabwe lacks explicit policy on inclusive education at tertiary phases, hence, this study sought to verify authenticity of such claims, particularly, in teacher education.

1.4 Thesis Problem

Research reveals significant government and civic bodies' efforts on enhancing enrolment of students with disabilities in higher education (UNESCO, 2022; Fernandez-Batanero et al., 2022). Thompson (2017) and FOTIM (2011) applaud such efforts for promoting equity, social justice and human rights in social services. Studies further affirm use of technologies as a strategy that boosts knowledge and skill acquisition by students in higher education, especially for those with disabilities (Eckson, 2022; Bekteshi, 2015; Shute & Rahini, 2017; Schrok, 2018). WHO (2017) similarly acknowledges that increased diversity in students' disabilities has been exacerbated by global population growth. Such developments necessitate integration of befitting technologies to buttress learning to help reduce effects of disability on learning processes of the students (Fernandez-Batanero, 2022; OET, 2017; Mackun & Wilson, 2011). However, the extent to which the use of technologies influences learning processes of students with disabilities is unclear due to limited research (Bishop & Spector, 2014; Arpacik et al., 2018; Fernandez-Batanero et al., 2022). Broader diversity in students' disabilities gives impetus to re-examine the nature of interactional learning processes that involve pre-service teachers with disabilities (Kena et al., 2014). The various social dynamics related to incessant shifts in population demographics also oblige educators to adopt responsive instructional approaches (Evans et al., 2017; Yankova, 2019). These include use of technologies to accommodate students' diverse learning needs, which necessitates further re-examining (McNicholl et al., 2021; Yvel et al., 2014). Further concern relates to facilitation strategies used by educators in mainstreamed contexts that integrate use of technologies and the effects they have on the preparation of pre-service teachers with disabilities. The use of technologies has a 'spill over' effect on learning and societal development; hence, this requires robust guiding and monitoring frameworks. How do these frameworks support or influence the use of technologies and to what extent does use of the technologies influence preparation of pre-service teachers with disabilities?

1.5 Research Questions

This study is guided by this main question: *How does technology-mediated teaching and learning influence preparation of pre-service teachers with disabilities?* The primary question is braced by the following sub-questions:

- 1) *What are the inclusive **practices** in the preparation of pre-service teachers with disabilities?*
- 2) *How do teacher educators **facilitate** technology-mediated teaching for pre-service teachers with disabilities?*
- 3) *How do pre-service teachers with disabilities **experience** technology-mediated teaching and learning?*
- 4) *How can practices and experiences of technology-mediated teaching and learning for pre-service teachers with disabilities be **understood** and **explained**?*

1.6 The Aim and Objectives of this Study

This study aims to: *establish the influence of technology-mediated teaching and learning in the preparation of pre-service teachers with disabilities for the profession.* This aim is buttressed by the following objectives:

- i) To establish inclusive practices in the preparation of pre-service teachers with disabilities.
- ii) To explore how teacher educators facilitate technology-mediated teaching for pre-service teachers with disabilities.
- iii) To establish the experiences of technology mediated teaching and learning for pre-service teachers with disabilities.
- iv) To explore ways in which technology mediated teaching and learning can be comprehended and articulated.

1.7 Justification for the Study

This study acknowledges efforts on mainstreaming students with various disabilities at various levels of education, which includes teacher education. The study, therefore, sought to broaden knowledge on how to assist pre-service teachers with disabilities in developing teaching skills that equate to colleagues without disabilities. The study also sought to provide newer knowledge on the integration of technologies, as a strategy that supports quality teaching and learning engagements for students with disabilities. The study, therefore, sought to assist teacher educators and institutional authorities in articulating the efficacy associated with the use of technologies in preparing pre-service teachers with disabilities.

The study further sought to provide an appraisal on the support afforded pre-service teachers with disabilities from the use of technologies in learning contexts, as informed by observation of learning processes, perceptions and attitudes of teacher educators, as well as affected students. It also endeavoured to identify the enablers of and obstructions to the use of technologies in pedagogic contexts that involve pre-service teachers with disabilities. Such knowledge was anticipated to eventually strengthen educators' efforts to reduce impediments encountered by students as they strive to acquire essential teaching skills through the use of technologies. Strategies conceived through recommendations from this study are envisaged to help develop students' competencies and confidence to serve in either local or foreign education systems. This study could also raise awareness about prudential resource allocation, monitoring, as well as the need to evaluate how resources like technologies are used to support the preparation of pre-service teachers with disabilities. The outlined benefits from this study could enhance quality in education provision as envisioned in the United Nations Sustainable Development Goal number 4 (UN, 2015).

1.8 Delimitations

This study was confined to one institution in Zimbabwe, which facilitated gathering of in-depth data. Although every pre-service teacher deserves exposure to technologies in pedagogic contexts, this study limited its focus on those with visual, hearing and physical disabilities. While more than thirty-five pre-service teachers with detectable or known disabilities were enrolled at the institution, only twelve were sampled as participants in this study. These were drawn from final year groups from different study intakes and study programmes. Nevertheless, students not sampled as study participants would also benefit from the study recommendations when these are implemented in the inclusive learning contexts, as this arrangement promotes interactional sharing of information.

Study data was largely gathered from teaching and learning contexts of Professional Studies, a generic subject that provided opportunity to examine how pre-service teachers with diverse disabilities experienced the use of technologies. Three educators from Professional Studies and the principal were the other study participants. Since Professional Studies lays the foundation for teaching, it was then found prudent to examine how technologies supported preparation of students to teach various subject areas (Naylor, Campbell & Maloney, 2015).

The single case design adopted for this study enabled examining the use of technologies based on actions and behaviours noted in live lecture sessions, which are naturalistic

contexts. It further availed opportunity for one-on-one interactional data gathering, where study participants provided personal perspectives on the use of technologies and its influence on learning for students with disabilities (Yin, 2014). The case study design also supported examining, comparing and contrasting of participants' attitudes towards the use of technologies, which assisted in establishing the significance attached to the use of technologies and how this influenced structuring of learning contexts for pre-service teachers with disabilities. Study data was gathered through interviews and focus group discussions, which brought out evidentiary experiences on the use of technologies, which was complemented by data from the observations of lecture sessions. Observations of live lectures gave opportunities to note, interpret and analyse how technologies were used, including related successes and glitches. These strategies helped to obtain insightful findings on how preparation of pre-service teachers with disabilities is influenced by the use of technologies. Thus, similar findings are likely to be obtained from institutions with similar settings, which makes recommendations adaptable there and perhaps even beyond.

1.9 Key Concepts Clarified

This study uses key terms like *pre-service teachers*, *teacher education*, *disability*, *technologies*, *technology-mediated teaching and learning*, whose meanings are explained below, as influenced by the context of this study.

1.9.1Pre-service teachers: Teaching is a multi-dimensional process, which requires skills to facilitate it with rigour, sensitivity and flexibility. Students enrolled for teacher education are then pre-service teachers and these are exposed to empirically tested theories and practices that help to mould them into qualified teachers. The Organisation for Economic and Community Development (OECD) asserts that students aspiring to become teachers engage in processes that nurture practical skills and in-depth understanding of theories or principles that inform teaching and learning (OECD, 2009). These engagements help to nurture positive attitudes and skills to facilitate, support and manage learning processes (Cox, 2004). A pre-service teacher is, therefore, a student that seeks to develop teaching skills through the acquisition of knowledge on learner characteristics, subject content, diverse learning environments, planning for learning, as well as the practical art of teaching. This study views a pre-service teacher as a student enrolled at an accredited institution to pursue a study programme of teaching, under the guidance of experienced tutors, referred to as teacher educators or lecturers.

1.9.2 Teacher education: Preparation of pre-service teachers is not a parochial activity that can be approached in a slapdash manner. Illingworth (2012) describes teacher education as a process that seeks to develop and transform students into change agents that have capacity to mould the lives of learners and to quest for continuous professional growth. Teacher education is offered in different institutions that enrol students with requisite entry qualifications. However, the institutions use dissimilar approaches and this makes it challenging to yield a non-contestable definition. Studies in teacher education seek to initiate students into teaching through the ability to impart skills and knowledge in a specific subject to learners. Engagements in such processes assist pre-service teachers to conceptualise the meaning of being and how to become an effective teacher (Kraglund-Gauthier, 2014). This study views teacher education as an embodiment of planned engagements that are designed to inculcate requisite qualifications by supporting students' acquisition of empirically tested principles, methods and techniques for teaching and learning in an accredited institution, where exit qualification is either a diploma or degree that certifies completion of the approved teacher education study course.

1.9.3 Disability: The Convention on the Rights of Persons with Disabilities (CRPD) affirms disability as a complex, dynamic and multi-dimensional concept (UNCRPD, 2012). Disability emerges when impairment impedes the one affected from engaging in interactional activities to equal levels with colleagues and this is often exacerbated by barriers in the environment or attitudes from members of society. According to Mugumbate and Nyoni (2013), impairment often progresses from handicap to ultimately become a disability. For instance, loss or deficiency in a body limb creates impairment that often affects efficient functioning. Students in such circumstances seek to use various technologies that then support vital daily functions. The adverse effects of disabilities are usually worse in environments that lack vital support provisions, hence, those affected often struggle to participate in activities through ways considered standard for a person (Kaplan, 2000). The Disabled Persons Act of Zimbabwe defines a disabled person as:

One with a physical, mental or sensory disability, including a visual, hearing or speech - functional disability, which gives rise to physical, cultural or social barriers inhibiting him from participating at an equal level with other members of society in activities, undertakings or fields of employment that are open to other members of society (Disabled Persons Act Chapter 17:01 of 1992).

However, Mtetwa (2011) argues that disability should not be defined based on one's impairment, because disability often depicts lack of suitable responses by society. Initiatives that address obstructions to interactional engagements are therefore, critical for persons with particular impairments. This study views disability as a condition that affects physical, cognitive, mental, sensory, visual, auditory or communicatory functions of an individual. Whether these are present singularly or in multiples, these often affect participation and engagement in learning processes.

1.9.4 Professional Studies: This is a generic subject in the teacher education curricular whose title varies with institutions. The subject seeks to equip pre-service teachers with empirical knowledge and skills to facilitate learning in a sound, professional and culturally acceptable manner. This study conforms to the stance of the Centre for Teacher Education and Material Development (CTEMD), formerly DTE, at the University of Zimbabwe (UZ), where Professional Studies include Classroom management, Education media technology, Classroom communication, as well as Health and life skills education (UZ, DTE, 2014).

1.9.5 Technologies: Perspectives on technologies are diverse; hence, it is often challenging to give a universally accepted definition (Blomstrom & Kokko, 1998; Reddy & Zhao, 1990)). Lan and Young (1996) noted that definitions on disability are largely influenced by the author's context or area of study. Kumar et al. (1999) consider technologies as physical components of products, tools, equipment, techniques, and processes that are used to enhance efficiency in the execution of tasks. Lan and Young (1996) also perceive technologies as devices that are operated through specific skills and knowledge, which helps to reduce glitches in the execution of pedagogic tasks or attainment of specific targeted results. Technologies are linked with physical and cognitive interactional processes that involve the use of machines and tools in teaching and learning contexts (Lin, 2003). Therefore, technologies are empirical inventions and processes that bring efficiency in teaching and learning processes or in other human activities. Thus, technologies epitomise applied science where hard and software components are embraced. Nevertheless, these technologies are ever evolving, which results in obsolescence, hence, they need frequent replacement with newer versions (Basalla, 1988). This study views technologies as selected tools, equipment, processes and ideas that are applied to enhance efficiency and effectiveness in pedagogic processes.

1.9.6 Technology mediated teaching and learning: Technology mediation is characterised by the use of modern educational tools and allied software to support learning, which then reduces the challenges encountered by students of diverse dispositions (Adebisi, Liman & Longpoe, 2015). Taylor and Fisher (2010) view the process as the use of technologies to support or optimise learning for students that are differently abled. In cognisance of the above assertions, this study considers ‘technology mediated teaching and learning’ as instances where technologies are used singularly or in combination to enhance students’ access to resources, activities, colleagues and the educator, in managed learning environments (Freiermuth, 2001). It is therefore, a supportive initiative that embraces the use of technologies that help to plug learning obstructions encountered by students with disabilities.

1.10 Organisation of this Thesis

This thesis has five chapters that comprise: Chapter 1, which gives background and orientation to the study. Chapter 2 provides theoretical and conceptual frameworks for the study, as well as review of related literature. Chapter 3 elaborates on the research methodology, whilst Chapter 4 outlines data analysis. Chapter 5 presents discussions of major findings, summary, conclusions and recommendations. Each of these chapters is briefly explained below.

1.10.1 Chapter 1: Background and Orientation of the Study

This chapter provides the background to the enrolment of students with disabilities in higher education, as well as global and regional initiatives in the integration of technologies in pedagogic processes. It also looks at the statement of the study problem, research questions, aim, objectives, the rationale, significance and delimitations. The chapter further explains the key terms used in this study.

1.10.2 Chapter 2: Literature Review

Chapter 2 reviews literature germane to the enrolment of and support provided to students with disabilities in institutions of higher learning. It also looks at initiatives in the use of technologies in the Western world and the SADC region. The chapter further explores, explains and justifies the selection of the Universal Design for Learning (UDL) and the Substitution Augmentation Modification Redefinition (SAMR), as the theoretical and conceptual frameworks used in this study. It also examines links between UDL and SAMR,

highlighting how they complementarily support the use of technologies, as well evaluating their effectiveness in pedagogic processes. It further explores literature on the use of technologies in different contexts and settings in tertiary education, which highlights benefits, inhibitions and suggestions for effective use.

1.10.3 Chapter 3: Research Design and Methodology

Chapter 3 explains the research approach, design, site and the target population. It further elucidates the sampling of participants, role of the researcher, type of instruments for gathering data and strategies for its analysis. The chapter also explains how the researcher ensured trustworthiness in the findings.

1.10.4 Chapter 4: Data Presentation and Analysis

Chapter 4 provides an outline of the study participants; their biographical data, qualifications, and the experiences of teacher educator participants, as well as nature of disabilities that pre-service teacher participants had and their study programs. The chapter also covers analysis of data, in which a thematic approach was used. Only themes related to sub-questions one, two and three are dealt with in this chapter, and these are complemented by corresponding sub-themes.

1.10.5 Chapter 5: Discussion of Findings, Recommendations and Conclusions

Chapter 5 presents discussions of major study findings based on commonalities and peculiarities in participants' submissions, as well as observations of learning engagements that involved use of technologies. The chapter provides an interpretive analysis of patterns in the data and themes pertaining to the use of technologies by teacher educators and pre-service teachers. The interpretive outcomes then informed findings of this qualitative single case study. The chapter provides a summary of major study findings and the resultant conclusions. These conclusions are then used to deduce implications for stakeholders and provide recommendations on technology mediated teaching and learning processes in the preparation of pre-service teachers with disabilities.

1.11 Chapter Summary

This chapter has revealed global awareness on the importance of mainstreaming students with disabilities pursuing teacher education in higher education. Such inclusive initiatives have

enthused both novice and seasoned educators to adopt facilitation approaches designed to match students with disabilities. Studies further indicate how educators integrated technologies in learning processes of students with disabilities, which illustrates efforts designed to achieve effective inclusion of the disadvantaged students. This chapter revealed supporting initiatives provided by governments, civil society organisations and other educationists towards enhancing enrolment and pedagogic processes for students affected by various disabilities. The foregoing opened the chapter, where reference has been made to related initiatives that include use of technologies to address the plight of students with disabilities. This chapter has also outlined the study's problem statement, which revealed the extant scenario versus submissions from authorities regarding preparation of pre-service teachers with disabilities. Also presented were research questions, aim and the objectives. Other aspects presented are the rationale, justification and delimitation of the study.

Information presented in this chapter is the foundation for the next chapter, which examines literature on use of technologies in teaching and learning processes for students with disabilities.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

This chapter examines literature on the use of technologies to support teaching and learning of students in higher education. It further explores how such use is influenced by the learning environment and perspectives of education practitioners, as well as other critical factors. The use of technologies seems to be mere substitution of traditional teaching and learning approaches and thus, insufficient to strengthen the learning for students with disabilities. This scenario necessitates further examining on how technologies are integrated in mainstreamed contexts of higher education, in order to establish how these benefit students with disabilities. Review of literature in this chapter falls under seven sub-themes that revolve around research questions gleaned in Chapter 1. These include: the theoretical framework; conceptual framework; situating technology use in contexts of teaching and learning; efficacy in the use of technologies in teaching and learning processes; prevalent disabilities among pre-service teachers and essential technologies for students with disabilities.

2.2 Theoretical Framework: Universal Design for Learning (UDL)

This study focuses on the influence of technology mediated teaching and learning on preparation of pre-service teachers with disabilities. The study is based on the UDL framework, which is a well-established philosophy and approach that promotes the development and implementation of responsive curricula. UDL promotes teaching and learning approaches that conform to and satisfy the needs of majority stakeholders, as well as other beneficiaries of specific education trajectories (Rose & Meyer, 2002). UDL also seeks to empower educators in tackling challenges of learner diversity (CAST, 2018). UDL further provides reprieve for students with disabilities, who are often forced to endure inflexible linear ‘one - size fit all’ educational instructions (CAST, 2011). In its broadest sense, UDL facilitates cohesion and equity among the students (CAST, 2018).

2.2.1 Origins of UDL

Universal Design for Learning is credited to the Centre for Applied Special Technologies (CAST) whose aim was to improve teaching and learning processes (Chandler et al., 2017). This theory developed from the Universal Design (UD) approach whose ideation focused on ensuring that architectural designs, products and related services are also accessed by persons with disabilities.

In conceiving ‘universal design’ in architectural design, Ronald Mace deplored aesthetic and ergonomic design trajectories that mainly focused on product development that fulfilled needs of the so-called ‘average’ consumers (Yvel, 2014; Tobin & Behling, 2018). The UD concept envisioned environments, products and facilities that imbedded access by all, regardless of any disabilities. In that context, CAST (2018) posits that UD upholds usability of products and environments by the majority, without further functional adaptations. Thus, Universal Design entails ‘designing for all’, where products, services, and environments are accessible to everyone, without the need for additional accommodations (Burgstahler, 2017). This makes access a fundamental principle, as opposed to an add-on or a reactive initiative (Riddell, Tinklin & Wilson, 2005). Universal design, however, deplores exclusive focus on persons with disabilities, but promotes designs and products that suit every other person (Tobin & Behling, 2018). Similarly, Wray and Houghton (2019) assert that exclusive focus on students with disabilities is a potential barrier to inclusion and equitable treatment in learning contexts.

Universal design philosophy harnesses empirical knowledge of the functioning of human brain to influence curricular instructions that accommodate diversities among students. The Centre for Universal Design (CUD) asserts that UD is a philosophy that supports students with various disabilities in academic pursuits (CUD, 1997). These conceptions influenced adoption of UDL, which emerged from UD, as the theoretical framework for this study.

2.2.2 The meaning of Universal Design for Learning (UDL)

In line with with universal design, the UDL philosophy also informs strategies, essential resources and instructional techniques that make teaching of students living with disabilities more efficient (TEAL, 2010). This position UDL as a pedestal for efficient curricula implementation, as it informs on essential accommodations for students, in spite of disabilities, age or other predispositions. The Higher Education Opportunity Act (HEOA) explains the UDL philosophy as:

A scientifically valid framework for guiding educational practice that provides flexibility in the ways information is presented, in the ways students respond or demonstrate knowledge and skills, and in the ways students are engaged, and reduces barriers in instruction, provides appropriate accommodations, supports and challenges, and maintains high achievement expectations for all students, including students with disabilities and students who are limited English proficient (HEOA, 2008).

According to Shawer (2022), the three UDL principles avail opportunities for more efficient and effective learning engagements by helping to create inclusive environments. CAST (2018) designates the UDL principles as anchorage for more engaging, flexible and user-friendly teaching and learning environments for students of diverse backgrounds.

2.2.3 Principles of Universal Design for Learning

The three principles of Universal Design for Learning are Multiple; representations, expressions and engagement (CAST, 2018). Each principle facilitates integration of technologies to bridge gaps in skills, interests and needs, especially for students with disabilities (Rose & Meyer, 2002). Likewise, Nisbet (2020) views UDL as a philosophy that supports educators in conceiving responses that suit the students' diversities and ensure inclusiveness in learning contexts. Subsequent sections of this study examine and explore how each principle of UDL supports students in teaching and learning contexts.

2.2.3.1 The principle of multiple means of representations

Multiple representations are at times referred to as multiple presentations of content for learning. This principle promotes flexible methods that support students' acquisition of knowledge and skills, irrespective of their diverse learning styles (Rose & Meyer, 2002). Representation involves use of language, symbols and expressions to deliver the '*What of learning*' which is content in a particular study discipline (Zehner, Chen & Aladsani, 2017). In view of the foregoing, Schelly, Davies and Spooner (2011) urge educators to incorporate multiple representations as they design teaching and learning sessions thereby influencing adoption of facilitation strategies that are in sync with the content. Achievement of multiple representations compel anticipation and projection on ways students are likely to perceive targeted concepts, hence, informs facilitation strategies and technologies to be used (CAST, 2011). As students use the senses of touch, visual and hearing in processing and assimilating information, educators need to integrate technologies that promote harnessing of these senses during content delivery.

Multiple representations are linked to the '*recognition network*' of human brain function, where focus is on the 'what' or content for learning (Rose & Meyer, 2002). Educators can therefore use technologies to conceive flexible instructional options and structure learning content in ways that promote effective conceptualisation (Rose et al., 2005). To reinforce the foregoing notion, Meyer et al. (2014) propose that contemporary practices should elude over-dominance by the print medium (an invention of the 14th century) through the integration of

appropriate conventional technologies. While Meyer et al. (ibid.) highlight the importance of the print environment in pedagogic processes; concern is that it should not influence students' access to and expression of knowledge, which then obstructs implementation of UDL.

Ralabate (2011), however, applauds educators that demonstrate recognition of students' diversities through adoption of facilitation strategies that promote equal benefit in learning encounters. Similarly, they use technologies to present content, which enhances equity and effectiveness in the support accorded to learning processes for students with disabilities.

2.2.3.2 The principle of multiple means of expression

Multiple expressions influence adoption of facilitation strategies that give students multiple options to demonstrate evidence of content learnt and comprehension of targeted phenomena (Schelly, Davies, & Spooner, 2011). The principle also supports students to use verbal and non-verbal expressions or tactile actions to communicate evidence of learning, which counteracts linguistic barriers associated with disabilities. This principle stimulates use of appropriate technologies in augmenting the students' communicative expressions (Ohio State Partnership Grant, 2011). In the same context, the Council for Exceptional Children (2011) implores educators to deliver content and instructions through use of techniques that accommodate students with auditory, visual, physical and other disabilities. Similarly, students can use the same to communicate and exhibit evidence that learning has taken place.

Rose and Meyer (2002) similarly, assert that 'multiple expressions' are linked to the 'strategic network' of human brain function, which is the 'how' aspect. This view infers that instructional strategies should integrate use of diverse technologies to spruce up teaching and learning. This further obligates educators to reflect on anticipated effectiveness of their instructional strategies and evaluate these against student diversity, especially for those with disabilities (Meyer et al., 2014). Facilitation strategies adopted for particular contexts must support the use of technologies that enable students to demonstrate evidence of prior and newer knowledge gains, especially where disability is an albatross (Meyer et al., 2014; Rose & Meyer, 2002). Vygotsky (1978) advances that students' knowledge construction is largely influenced by the nature and extent of interactions they experience in learning engagements. Labow (as cited in Bourdieu, 1995), similarly acknowledges that suitable interactions inspire autonomous learning, strengthen collegial relatedness, especially in contexts that integrate suitable technologies. This subscribes to an assertion by Ettekal and Mahoney (2017) that

human behaviour is influenced by complex interactions within and between individuals in their immediate environment.

2.2.3.3 The principle of multiple means of engagement

The third principle in UDL is ‘multiple means of engagement’, which compels use of facilitation strategies that sustain students’ efforts and self-regulation in learning processes (Hitchcock et al., 2005). Thus, educators should conceive learning activities that are sufficiently exciting to stimulate and capture students’ interest and desire to learn (Rose & Meyer, 2002). This principle obliges educators to tap into students’ common interests by incorporating content that inspires concentration and heightens expectations from learning engagements (Hitchcock et al., 2005).

Multiple engagements link with the ‘affective network’ in the human brain function, which represents the ‘why’ of learning (Rose & Meyer, 2002). This principle supports strategies that enable students to constantly reflect on the extent to which learning engagements support knowledge acquisition and provide adequately challenging encounters, based on their expectations. To that end, Meyer et al. (2014) encourage use of technologies that make learning engagements more flexible and accommodative to students’ diversities. Multiple means of engagement enable educators to facilitate dynamic interactions among students, which improves quality of education for the benefit of those with disabilities (UNESCO, 2005). Besides outlining the three UDL principles, this section highlighted how they influence acquisition of knowledge and skills by students with disabilities, which positions UDL as a befitting theoretical framework for this study.

2.2.3.4 Why adopt UDL in this study?

Universal Design for learning is considered befitting as a theoretical framework since its three principles support educators in projecting inclusive learning contexts for students with disabilities. The principles also inform presentation strategies, as well as facilitate effective expressions and engagements by students in learning processes (Ohio State Partnership Grant, 2011). Constant reference to UDL supports examining how the integration of technologies facilitated restructure of learning environments into set ups that are conducive to students with disabilities. UDL further influences the institutional culture on student inclusion in all pedagogic processes (McMaster, 2013; Moriña, 2017).

The principles of UDL provided newer perspectives on examining interpretations, perceptions and attitudes on use of technologies in preparing pre-service teachers with disabilities (Access Project, 2011). These viewpoints further influenced strategies for gathering data, engaging study participants, as well as structuring questions and statements in the data instruments (Denscombe, 2014). However, the UDL philosophy seemed relatively nascent in developing countries like Zimbabwe; hence, anticipation was that constant reference to it would help examine its relevance in local-based teaching and learning engagements (Zehner, Chen & Aladsani, 2017). Furthermore, my experience in teacher education had revealed that teacher educators often took the use of technologies for granted, perhaps due to inadequate awareness on evaluation benchmarks, like the UDL principles (Zehner et al, *ibid*). It was envisaged that reference to UDL principles would stimulate teacher educator participants to reflect on personal competences in the integration of technologies, to inspire conception of intervention strategies.

It was also anticipated in this study that the three UDL principles would assist in determining the effects of integrating technologies in the preparation of pre-service teachers with disabilities (Meyer, Rose & Gordon, 2014). The principles further helped to appraise the significance of inclusive practices, like the use of technologies, in responding to students' diversities (Rose, Hasselbring, Stahl & Zabala, 2005). Emphasis on 'multiple means' in UDL illuminates the merits of exposing students with disabilities to varied teaching and learning strategies. This study immensely borrowed from the UDL philosophy, particularly on aspects related to the use of technologies to make learning environments more conducive to strengthen students' interplay with curricular components like learning goals, teaching methods, subject content and means for assessment (Rose et al., 2005; Meyer et al., 2014). Interestingly, Rose et al. (2005) regard UDL as a philosophy that foregrounds the use of technologies to satisfy curricular components and inform better pedagogic practice. UDL therefore, helped to examine and reflect on strategies used to facilitate the use of technologies in teaching and learning processes (Yvel et al., 2014). UDL further influenced adoption of Substitution Augmentation Modification and Redefinition (SAMR) as the conceptual framework for this study.

2.3 Conceptual Framework: Substitution, Augmentation, Modification and Redefinition (SAMR)

Substitution, augmentation, modification and redefinition (SAMR) is the conceptual framework for this study. The framework was conceived Dr Ruben Puentedura to promote integration of technologies in teaching and learning processes (Schrok, 2018). Although advancement in technologies continuously brings more complex technologies, SAMR is well positioned to inform their integration in current and future teaching and learning processes (Castro, 2018). Hilton (2017) posits that educators from pre-school level up to pinnacles of higher education have integrated technologies in their practice with varying successes. In that light, Romrell, Kidder and Wood (2019) recommend use of SAMR stages as benchmarks that educators use to evaluate effectiveness in the use of technologies in pedagogic processes.

2.3.1 The meaning of SAMR

The SAMR framework provides guidelines on integration and evaluation of how technologies are used in education provision (Myers, 2014; Castro, 2018). Hilton (2017) similarly views SAMR as a blueprint that promotes integration of current and emerging technologies in teaching and learning engagements. The SAMR framework recognises four hierarchical levels that signpost breadth and depth to which technologies are integrated in teaching and learning processes. The basic level of SAMR is *substitution* in where technologies are used as alternatives to traditional ways of executing learning tasks, which does not bring significant functional changes in task execution. On the other hand, the subsequent SAMR level, *augmentation*, entails use of technologies to yield direct functional improvement in the way learning tasks are carried out (Schrok, 2018; Johnson et al., 2016). The two cited SAMR levels fall under enhancement, which represents fledgling use of technologies to boost teaching and learning.

The third and fourth upper tiers of SAMR comprise *modification* and *redefinition*, where technologies are used to make teaching and learning processes more transformative. At modification, technologies may be used to make adaptations to learning tasks, while the use at redefinition facilitates conception and attainment of more innovative tasks that might be inconceivable without use of particular technologies (Johnson, et al., 2016; Puentedura, 2013). The four SAMR levels are further explained in the subsequent sections.

2.3.2 Levels in the SAMR framework

The continuum of using technologies in the SAMR framework comprises four levels; *substitution*, *augmentation*, *modification* and *redefinition* (Schrok, 2018). The first two levels

are **enhancement** stages, whilst the last two are **transformational** in learning processes. Besides examining the four SAMR stages, the following sections link these to levels of structuring learning processes in relation to the adapted version of Bloom's taxonomy (Churches, 2008).

2.3.2.1 Substitution

Hockly (2013) affirms substitution as the lowest rung in SAMR, which can be achieved easily when integrating technologies in teaching and learning contexts. Use of technologies at this level supports execution of learning tasks that could still be accomplished without using technologies (Hilton, 2017; Romrell, Kidder & Wood, 2019). For instance, note-taking and compilation of assignments on the computer could still be done with pen and paper. While computer-aided presentations are effective, the educator can also dictate or write notes on the board. In the cited cases, the use of technologies has minimal advantage, as it merely replaces modes of content presentation. Substitution can also be exemplified by use of digital learning management systems, like Google Class to share learning content (Christopher et al., 2022).

2.3.2.2 Augmentation

The second SAMR level is augmentation, which PuenteDura (2013) describes as use of technologies for functional improvement in carrying out learning tasks. For instance, the use of word processing applications like spell and grammar check to perfect learning tasks. These applications do not only substitute use of the hard copy dictionary, but also support fast and more efficient accomplishment of learning tasks (Loescher, 2018). Other word processing applications like copy, cut and paste facilitate alterations or deletion of undesirable detail from written text. These substitute use of rubber or corrective fluid and support students with disabilities in accomplishing academic tasks. The cited techno-aided applications support editing of written academic tasks before submission for assessment (Loescher, 2018). These applications illustrate how the use of technologies can support students with visual, auditory or other inhibiting disabilities in submitting standard academic work for assessment. Substitution and augmentation constitute the enhancement stage in SAMR, which lays foundation for more complex use of technologies at transformative levels of modification and redefinition (Hockley, 2013). Blundell et al. (2022), however, argue that use of technologies at substitution and augmentation levels is more educator-centred, whilst the transformation levels of modification and redefinition are more student-centred.

2.3.2.3 Modification

Modification is the third level of SAMR, where technologies support transformational teaching and learning activities (Hockley, 2013). According to Puentedura (2013), the use of technologies at this stage helps to significantly restructure academic tasks to enhance students' learning. For instance, facilitating access to instant feedback on assessed work or checking plagiarism in written work through software like Turnitin (Traxler, 2010). Other examples of modification include use of virtual learning platforms like Moodle that support submission and receiving of marked assignments, hence, provides opportunity for students to regulate own learning processes (Butler & Winne, 1995). The exemplified cases of modification support elimination of disparities between students' initial intentions and outcomes that emerge from their written tasks before submission for assessment (Nicole & Macfarlane, 2006).

2.3.2.4 Redefinition

Redefinition is the pinnacle level at which technologies are used in the SAMR framework (Johnson et al., 2016). Puentedura (2013) admits that use of technologies at this stage enables students to engage in more innovative learning processes or educational tasks. These may be tasks which students might not imagine executing without the technologies (Liu & Tsai, 2013). The foregoing can be exemplified by instances where technologies are used to illustrate situations or processes that could be risky to engage in practically (Moore, 2014). For instance, technology-aided simulations that incorporate sounds and animations depict technology-aided presentations at the redefinition level of SAMR. The technologies therefore, help to plug deficiencies related to speech and mobility inhibitions in learning engagements. The four SAMR levels facilitate effective planning and evaluation of extent to which technologies are used to strengthen learning (Lund, 2015; Kihoza, Zlotnikova, Bada & Kalegele, 2016).

2.3.3 Relating SAMR to Bloom's reviewed taxonomy

The legendary Bloom's taxonomy continues to influence structuring of learning content and processes that enhance students' concept acquisition. The taxonomy initially comprised six stratified cognitive stages that spanned from knowledge, comprehension, application, analysis and synthesis up to evaluation in ascending levels of complexity (Forehand, 2011). Although implementation of the taxonomy has been sustained in teaching and learning processes, its levels have been reconfigured to: remembering, understanding, applying, analysing, evaluating and creating phases (Churches, 2008). Nevertheless, the levels have maintained

significant influence, which is complemented by the SAMR framework, especially on planning, implementation and evaluation on the integration of technologies (Castro, 2018; Bada & Kalegele, 2016). The lower stages of the taxonomy that include remembering, understanding and applying are linked to foundational phases of substitution and augmentation in the SAMR framework (Puentedura, 2014). Such correlation is fundamental since use of technologies at enhancement levels of SAMR merely improves on traditional ways of task execution, which relates to foundational learning in the three lower phases of the taxonomy.

The higher SAMR levels of modification and redefinition link closely with the analysing, evaluating and creating levels of the taxonomy (Kirkland, 2014). Use of technologies in the upper phases of SAMR relates closely to the structuring of learning processes at higher levels of the taxonomy because both support transformational learning where students engage in newer and previously unimaginable academic tasks. The three higher phases in the taxonomy facilitate analysis and origination of newer knowledge, just like when students use technologies at modification and redefinition levels in SAMR. This substantiates complementarity between SAMR and the taxonomy in upholding activities that support attainment of targeted goals in teaching and learning processes (Kirkland, 2014). Links between the SAMR framework and Bloom's taxonomy bring out how the use of technologies broadens learning horizons for students with disabilities (Kennedy, Thomas, Meyer, Alves & Lloyd, 2014; Myers, 2014).

2.3.4 Why adopt the SAMR framework in this study?

Choice of SAMR as conceptual framework was influenced by its capacity to inform the use of technologies from basic substitution to more complex redefinition levels in teaching and learning contexts. Lund (2015) admits that SAMR provides guidance in evaluating integration of technologies in pedagogic contexts, as the four levels can help establish extent to which use of technologies benefits pre-service teachers with disabilities. This positions SAMR well to help determine how the use of technologies influences preparation of pre-service teachers with disabilities (Myers, 2014).

The SAMR framework provided insight into levels to which technologies were used, as well as appropriateness of the strategies used, vis-a-vis learning for students with disabilities (Kihzoza, Zlotnikova, Bada, & Kalegele, 2016). Technologies could for instance, be used to augment learning without necessarily altering the content at the enhancement levels of

SAMR, where traditional delivery methods could suffice as well (Loescher, 2018). Anticipation was on embracing SAMR in ascertaining whether the use of technologies enhanced efficient functioning of both teacher educators and pre-service teachers in pedagogic engagements (Bras, Miranda, & Maroco, 2014; Loveless & Ellis, 2003). SAMR can provide insight on how the use of technologies benefits students with disabilities, through sustenance of inter-connectedness of learning content and practices in teacher education. Worth of note is how students with disabilities often avoid pedagogical engagements that seem impeded by their impairments. However, SAMR helped to establish how use of appropriate technologies stimulates these students to also engage in more complex and challenging tasks they often spurn (Emiliani, Stephanidis & Vanderheiden, 2011; Duffy & Bryan, 2014). The SAMR framework further helped to establish existing scenario on integration of technologies in teacher education processes, versus ideal situations for efficient and more effective preparation of pre-service teachers with disabilities.

SAMR further assisted in establishing how the use of technologies influenced learning engagements for pre-service teachers with disabilities. Although the enhancement levels of SAMR proved important, reference to this framework highlighted need for the technologies to be used also at higher levels of modification and redefinition. Thus, SAMR is an evidence-based approach that helped to expose the existing status on use of technologies in teacher education (Romrell, Kidder & Wood, 2019).

SAMR provided a sequential trajectory on the use of technologies, which enabled the study to examine levels to which both teacher educators and pre-service teachers applied technologies in pedagogic processes. Ideally, educators are expected to design, develop and infuse technologies to yield transformative learning experiences (Johnson et al., 2016). Thus, SAMR supports students with disabilities to acquire adaptive learning skills, which empowers them to function in diverse learning contexts. SAMR therefore, helped to ascertain the influence and effectiveness of using technologies in the preparation of pre-service teachers with disabilities.

2.4 Situating the Use of Technologies in Pedagogic Contexts

Literature reveals that technology mediation is an expansive and contested concept, whose multiple interpretations often fail to yield a universally accepted definition (Adebisi et al., 2015). This necessitated a pragmatic approach so that the scenario in teacher education could speak for itself. Shield (2016) perceives technology mediation as teaching and learning

processes that incorporate the use of computers. However, this perception sounds minimalistic, narrow and exclusionary to other technologies used in pedagogic contexts. On the other hand, Walimbwa and Mayende (2014) advance that technology mediation involves using computer-based technologies to deliver learning content and instructions, especially for students and educators that are not in the same vicinity. Although this view illuminates the use of technologies in distant pedagogical processes, it also infers using these in face-to-face engagements. This view however, skews more towards the computer, while ignoring other technologies and pertinent imperatives regarding the use of technologies to accommodate students with particular disabilities.

Alavi and Leidner (2001) consider technology-mediated teaching and learning as the use of varied tools, equipment and gadgets to support students' interaction with curricular content, learning instructions or their colleagues. This highlights diversity in the technologies used and further identifies the beneficiaries. This study views technology mediated teaching and learning as instances that involve the use of technologies either singularly or in combination to enhance students' access to learning content, activities, the educator, and colleagues in managed pedagogic contexts (NcNicholl et al., 2019; Freiermith, 2000; Houlden & Veletsianos, 2019). This study further narrows it to instances where technologies of varied structure and complexity are used to support learning processes for pre-service teachers with disabilities. A restricted focus was motivated by upsurge in the enrolment of students with disabilities in higher education. This development necessitates enhanced use of technologies to improve learning for these students (Morina, 2017; NcNicholl et al., 2019). Nganji, Brayshaw and Tompsett (2011) report that higher education institutions in countries like the United Kingdom (UK) had of late registered an increase in the enrolment of students with various disabilities. The UK even enacted statutes designed to compel parity learning encounters for all students despite their disabilities. Nevertheless, Nganji et al. (ibid) report that initial integration of technologies for the students was mired by incompatibility with existing learning environments, hence, only a few benefitted. This further compelled designing particularised technologies for students with specific disabilities. This also yielded minimal success until the designs were personalised to specific students (Nganji et al., 2011). Notwithstanding that scenario, Xu (2018) noted that several education systems were striving to promote use of technologies that benefit students with various disabilities. This study therefore, sought to establish the extent and influence that such efforts have on teacher education processes, at one institution in Zimbabwe.

In a study at the University of Elbasan, Bektashi (2015) noted that participation in academic tasks by students with disabilities increased when they got opportunity to use technologies and they further admitted gaining independent learning. Xu (2018) adds that using technologies strengthens students' autonomy in learning processes. According to the Bektashi study, using technologies equalised learning opportunities for the students, despite their various disabilities. Bektashi (2015) then suggests that students inhibited by expressive speech or the use of language can use the 'chat programme' to aid communication, while those with visual impairment can use 'text to speech' technologies to decipher learning material. This affirms existence of special software programmes that assist students whose learning can be impeded by particular disabilities.

The use of technologies often assists educators in adopting flexible and diverse facilitation strategies that accommodate students with disabilities and other dissimilarities (Bolliger & Halupa, 2018). Although Anderson (2006) affirms that technologies support efficient execution of learning tasks, concern is on designers and manufacturers that prioritise production of technologies that largely serve majority 'normal' end users, while giving peripheral attention to those used by the minority with disabilities. As a result, operational functions and configurations often impede access or use by the latter group, who often require customised adapted versions (Anderson, *ibid*; Stephanidis & Savidis, 2001). In such cases the students' interest to use technologies gets deflated, despite awareness that use of these can complement traditional approaches of accessing curricular content and instructions (Mathews et al., 1997). Reiser (2001) therefore, urges educators to constantly facilitate use of various technologies in pedagogic engagements. However, with time and usage, the technologies become old or obsolete and need periodic replacement, while educators require capacitation to use newer technology versions and implement suitable facilitation strategies.

2.5 Efficacy in the Use of Technologies for Teaching and Learning Processes

Although Zimbabwe achieved 96% literacy rate, this should go beyond competencies in just reading and writing (Zimbabwe, MHTESTD Strategic Plan 2019-2023). Kress (2000) posits that functional literacy entails ability to engage different cognitive operational levels in multi-varied contexts, where suitable communication modes support diverse social interactions. Otismo (2018) then asserts that educators should facilitate access to alternative methods of note taking and communication for students with disabilities. This notion spotlights the need to integrate technologies in teaching and learning processes of students with disabilities

(Lankshear, Snyder & Green, 2000; Maphosa, 2021). Adebisi (2015) adds that all teaching and learning endeavours should incorporate the use of technologies, especially in developing countries that seek education trajectories that conform to global standards. Adebisi (ibid) further asserts that using technologies enable students to process, internalise and share pedagogical information, hence, circumvent impediments often induced by various disabilities. Using technologies also nurtures students with disabilities into more effective professionals endowed with lifelong learning skills and capacity to confidently compete on the job market (Rudhumbu, 2021; WHO, 2011). It also helps them adapt to current and future global knowledge economies that value graduates exposed to student-centred pedagogies (WHO, ibid). Rudhumbu (2021) acknowledges that integrating technologies in higher education pedagogic processes helps students in adapting to the digitalised world of work. OECD (2001) similarly views the dwindling job opportunities as a factor that necessitates integration of technologies in pedagogic processes to support facilitation strategies that accommodate students' multiple learning needs for inclusion and equality. Maiteny, as cited in Wade (2007), exonerates education itself from being problematic, but argues that teaching and learning strategies used often fail to match demands of the contemporary techno-savvy society.

Peters, as cited in Chapman (2003) emphasizes that the value of education is not in mere obtaining new status, but in the transformation of students' attitudes and perceptions as well. Judson (2010) stresses the need to expose students with disabilities to facilitation strategies that integrate apposite technologies. Such an initiative helps them in developing and articulating progressive diverse ideas in learning encounters. Schrok (2018) and Bektashi (2015) further concur that using technologies enable students to cherish activities they may have aspired to do but impeded by disabilities. The technologies therefore, expand the students' intellectual and professional horizons, deepen awareness, as well as understanding of innovative pedagogic transformations (Liu et al., 2020; Chapman, 2003). Contemporary society expects educators to use technologies that immerse students in pragmatic learning processes, rather than limiting them to abstract theoretical imaginations (Rudhumbu, 2021; Allen, 2009). The foregoing view reveals how important it is for educators and students to use technologies, as this optimises acquisition of requisite skills and knowledge for a particular profession.

2.6 Frameworks That Support the Use of Technologies

Arguments from Naylor, Campbell-Evans and Maloney (2015) acknowledge that provision of education is dynamic, which necessitates periodic review. Similarly, The United States Office of Educational Technology (UOET) (2017) cites shifts in the socio-economic and political landscape as factors that compel periodic reform in education practice. These reforms often stimulate contextually responsive teaching strategies that should incorporate the use of contemporary technologies (Chapman, 2003).

Although Zehner, Chen and Aladsani (2017) acknowledge that academic qualifications increase chances for employment, this may not be obvious for persons with disabilities. Travers et al. (2014) caution that requisite job qualifications may not necessarily guarantee employment for persons with disabilities, who usually get second priority, as prospective employers often consider their qualifications compassionate and not bonafide achievements. This necessitates societal re-conscientisation on inclusive practices to make it clear that students with disabilities are exposed to similar learning trajectories with others. However, these students should be exposed to enriched transformative pedagogies that integrate use of technologies to cushion them against snubbing by prospective employers (Fovet & Mole, 2013). Since education is fundamental for social change and development, its provision requires guidance from contextual national and institutional frameworks like policies (UNESCO, 2005; Ettekal & Mahoney, 2017). Wade (2007) adds that education systems require robust supportive frameworks that help accommodate needs, views and perspectives of diverse students. It then makes it imperative for such frameworks to be reinforced through integration of technologies to yield rich and inclusive learning contexts. This study also sought to establish frameworks that supported integration of technologies in the preparation of pre-service teachers with disabilities. WHO (2011) cites the United Nations Convention on the Rights of Persons with Disabilities (UNCRPD) as one of the supportive frameworks.

2.6.1 The United Nations Convention on the Rights of Persons with Disabilities

The United Nations Convention on the Rights of Persons with Disabilities (UNCRPD) is a significant global decree that seeks to advance the welfare of persons with disabilities (WHO, 2011; UNCRPD, 2012). Upon promulgation of the CRPD in 2006, more than 112 nations ratified it within a year, which evidences global acceptance and commitment to support it (CRPD, 2012). De Bruine (2020) acknowledges this convention as binding obligation for Zimbabwe and other member states of the United Nations (UN). This should compel

authorities to enforce compliance with this fundamental convention in social engagements like teacher education. Through its articles and principles, CRPD informs society on appropriate ways of responding to the diverse needs of persons with disabilities. These serve as blueprints for policies that uphold the welfare of persons with disabilities. For instance, Article 1 articulates the purpose of the CRPD as to “promote, protect and ensure full and equal enjoyment of all human rights and fundamental freedoms by all persons with disabilities, besides promoting respect for their inherent dignity” (UNCRPD, 2012:5). This is critical for Zimbabwe, which is among developing nations reported to have higher proportion of persons with disabilities (WHO, 2011). This notion infers strong links between poverty and prevalence of disabilities which UNICEF (2008) asserts as precursors of nutritional deficiencies, inadequate provision of health needs and poor pre-natal care. Although the notion is contestable, it appears imperative for education systems and institutions in countries like Zimbabwe to urgently address challenges experienced by students with disabilities.

The CRPD’s Article 3.3 recommends mainstreaming persons with disabilities in all societal engagements, as well as support for their maximum participation in societal engagements (UNCRPD, 2012). It further proposes extra accommodation for them in instances where others get routine treatment. In addition to being integrated in education contexts and other social engagements, students with disabilities need further support through the use of appropriate technologies. Article 2 in the CRPD focuses on reducing any form of discrimination by recommending equal opportunities, especially where blind students are assisted to access computer-based technologies that incorporate synthetic speech, which enables them to read text from the computer screen (UN-CRPD, 2012). The CRPD is therefore, a global convention that explicitly articulates provisions and accommodations designed to uphold human rights and support access to fundamental freedoms for students with disabilities. Its emphasis on inclusivity is unambiguous, as it compels nations and institutions to consciously address the needs of persons with disabilities by integrating issues of disability in relevant national policies and programmes (WHO, 2011). The UNCRPD therefore, informs and guides policies on inclusive initiatives like the use of technologies (Wondwosen, 2022).

2.6.2 National and ministry guiding frameworks

Support for teacher education and other academic pursuits in Zimbabwe is enshrined in the national constitution (Government of Zimbabwe, 2013). This demonstrates commitment to promote access to education despite the individual’s socio-economic or disability status.

Section 20.1a in the Constitution of Zimbabwe Amendment Act of 2013:20 says, “The state and all institutions and agency of government at all levels must take reasonable measures to ensure... access to appropriate education and training.” There are two ministries of education, namely; the Ministry of Primary and Secondary Education (MoPSE) and the Ministry of Higher and Tertiary Education, Innovation, Science and Technology Development (MHTEISTD). The latter superintends over teacher education through policy guidance and monitoring implementation processes, as outlined in the national constitution.

Mpofu (2004) acknowledges inclusive practices in education institutions as evidence of compliance with regional and global conventions like the UNCRPD and the Salamanca Plan of Action. Nevertheless, concern is on the lack of home-grown policies that guide inclusive education in Zimbabwe, especially for teacher education (UNESCO, 2022). Although Zimbabwe established special institutions for students with various disabilities years back, upon exiting secondary education the students had limited chances of progressing to tertiary education, because there were no matching special tertiary institutions. Majoko (2018) however, noted reprieve for such students around the 1990s when teacher education and other tertiary institution started to embrace students with disabilities in their intakes. Liasidou, as cited in Hassanein (2015), however, laments how the initial enrolments were mired by various challenges, like the lack of explicit national vision on inclusive practices. Such observations probably prompted the ministry and other stakeholders to re-examine existing practices. For instance, the ministry expressed desire to make teacher education processes more accommodative to pre-service teachers with disabilities (MHTEISTD Strategic Plan 2011-2015). Perhaps, such efforts also targeted enhanced integration of technologies to support learning for students with disabilities. While these initiatives do not necessarily justify non-existence of explicit policy on inclusive education, they however, illustrate efforts to uphold inclusivity. Section 83 of the Constitution of Zimbabwe similarly says, “The State should take measures that are necessary to ensure that persons with disabilities realise their full potential, including the provision of special facilities for their education.” (Government of Zimbabwe, 2013:39). Furthermore, Section 22.2, b and c, ascribe priority to specific requirements and provision of befitting modes of communication for persons with disabilities (Government of Zimbabwe, 2013:21). It seems global conventions and strategy imperatives on the rights of persons with disabilities had significant influence on inclusive practices at the institution. Besides the UNCRPD, policymakers could also draw guidance from practices and

policies of regional countries and, perhaps, beyond, as Majoko (2018) indicates that most nations were refocusing on human disabilities to strengthen observance of human rights.

2.6.3 Ministry and institutional strategic plans

In this section, I examined the latest strategic plan documents for the parent ministry and for the institution. These were efforts to obtain evidence on support for inclusive practices such as using technologies by students with disabilities and these are presented below.

2.6.3.1 The responsible ministry's strategic plans

The responsible ministry's earlier strategic plan (MHTESTD, 2011) sounded more explicit on addressing the needs of students with disabilities, whilst the current one seemed to just infer (MHTEISTD Strategic Plan 2019-2023). In the latest strategic plan, the Minister, Professor Murwira said, "teaching shall use the local environment in making technology simple and be understood, for concepts can be expressed in any language" (MHTEISTD, 2019:1). This sounds like a call for multiple modes of communication that perhaps include Braille and Sign language for the visually impaired. The minister also implored staff-members to transform into change agents that embrace technologies in conceiving novel ways of task execution.

The Permanent Secretary, Professor Tagwira, similarly remarked that institutions in India had embraced use of information communication technologies (ICTs) in education processes. This statement indicates desire to emulate best practices from sister nations. On another note, the minister Professor Murwira said the following about strategic plan, "The strategic plan is a framework and guide regarding where we invest ministry resources, i.e., time, effort and money" (MHTEISTD, 2013:11). The strategic plan appears definitive of the ministry's vision and plans on projected achievements as outlined in the goal indicators. This made the strategic plan a comprehensive blueprint that supported implementation, monitoring and evaluation of ministry programmes. Worth noting is the subtle desire to monitor effectiveness in the use of technologies and aligning ministry policies to the national constitution through reviews (MHTEISTD, 2019). Such moves demonstrate desire to ensure that educational programmes conform to global best practices.

The strategic plan also highlighted plans to craft apposite policies and training of staff in the use of more novel technologies. The Permanent Secretary further envisioned provision of education that has predictable order and potential of being valued by the outer world (MHTEISTD, 2019). It was anticipated that positives in the ministry strategic plan would

cascade to the institution's plans, vision and other related deliverables. It then became necessary to examine some of the institution's documents to deduce pointers on support for inclusive practices like the use of technologies. One such document was its strategic plan for the period 2019 to 2024, which is examined below.

2.6.3.2 The institution's strategic plan for 2019 to 2024

The institution's latest strategic plan revealed intentions to improve the quality of teaching and learning through the provision of technologies in all departments. This move subscribes to inclusiveness and the ideals of the parent ministry, the national constitution, as well as those of the UNCRPD.

The strategic plan outlined core values that point to respect for all pre-service teachers, irrespective of characteristics that include disabilities. The focus of the strategic plan seems to have been on creating conducive environments for learning perhaps through the promotion of facilitation strategies that nurture essential teaching competencies. Its core values highlighted inclusive and progressive pedagogic strategies that possibly embraced use of technologies. Another strategic core value sought to stimulate creative thinking, where students would use newer technologies in executing academic tasks in more novel ways than before.

Also noted was Strategic Goal Number 3, which focused on enhancing self-sufficiency through the embrace of science and technology. This goal illustrates commitment to the acquisition of essential hard and software technologies, as proof of effort to promote the use of technologies from substitution up to redefinition levels of SAMR. The strategic plan further articulates plans to create policies that guide and promote technology integration in learning processes. Also worth noting is the *result chain* that revealed explicit desire to raise staff awareness of inclusive practices for the benefit of students with disabilities. The envisioned initiatives and cited policy frameworks appeared well positioned to guide and support integration of technologies in the preparation of pre-service teachers with disabilities.

2.7 Disabilities Found among Pre-Service Teachers

Disabilities that affect pre-service teachers are varied and their extent of severity differs on individuals and others can be more prevalent. UNESCO (2006) asserts that any disability triggers vulnerability on those affected, in spite of how minor some might seem. Pacey (2011:3) defines vulnerability as, "Openness to being hurt or permanently damaged physically and or emotionally, including the effects of... mental or physical handicap." The nature and severity of disabilities should therefore, inform technologies and facilitation

strategies used in pedagogic engagements (Muntaner, 2014). Disabilities are categorisation based on the nature of impairments, which include; physical, visual, hearing and the cognitive (Laabidi et al., 2014). However, this study only focuses on students with visual, hearing and physical disabilities, who are constantly referred to in examining how using technologies influences their preparation for the teaching profession.

2.7.1 Visual disabilities

Visual disabilities are often characterised by compromised sight that affects optimal learning (Kavcic, 2005). In efforts to accommodate the affected students, educators often seek to appropriately adapt instructional strategies, learning material, as well as the pedagogic contexts (Mishra, Sharma & Tripathi, 2010). While the students may already have visual disabilities at enrolment, others develop these in midstream of their studies. This compels vigilance among educators to facilitate early detection of those affected and then institute timely interventions, like supporting their learning with matching technologies (Laabidi et al., 2014; Freeman et al., 2007).

Congenital visual disabilities emerge before birth, whilst those of adventitious nature occur after birth (LCZT, 2016; Pacey, 2011). Congenital visual disabilities are associated with hereditary or environmental factors, as well as infections and pre-term or trauma experienced at birth (LCZT, 2016). Hereditary factors could be gene transference from the parents, which may present as albinism, retinitis pigmentosa and others (Freeman et al., 2007). Environmental factors comprise conditions and disorders that occur during the mother's pregnancy, which may manifest as eye malformations such as malformed ball, cornea, lens and muscles of the eye (Scott, 1982; LCZT, 2016). Visual disabilities may also be triggered by infections like rubella, meningitis and diabetes, while others result from excessive exposure to oxygen in the incubator for pre-term births, which then affects retinal veins, causing retinopathy (Freeman et al., 2007). The baby might also contract infections like gonorrhoea from the birth canal of an infected mother (WHO, 2011).

On the other hand, adventitious visual conditions often result from trachoma conjunctivitis, keratitis and tuberculosis, diabetes or kidney infections (LCZT, 2016). The eye cornea can also degenerate due to kwashiorkor induced by malnourishment, which leads to conditions like kerato-malacia. Other adventitious visual impairments are caused by eye infections, nutritional deficiencies, injuries and age-related sight degeneration (LCZT, 2016). Similarly, injuries, scalds, blows on the head and contact with corrosive chemicals can damage eye sight

as well (Rauh, Landrigan & Claudio, 2008; Carney et al., 2003). Just like any other person, pre-service teachers are susceptible to these various factors that cause visual challenges. As a result, educators often strive to facilitate learning through strategies that promote inclusiveness, regardless of when the disabilities emerged (Laabidi et al., 2014; UNESCO, 2013). According to Pacey (2011), inclusive set-ups are characterised by contexts that are conducive to learning for all students, irrespective of their physical, emotional and other personalised characteristics. O'Connell et al. (2010) therefore, urge educators to acknowledge the diversity and uniqueness of the students through the use of appropriate technologies in pedagogic contexts. According to Winnic (2011), the nature and severity of visual disabilities vary with individuals, which should influence the technologies and strategies used to facilitate their learning. Students may be long sighted (hyper-metropia), where vision is clearer on distant objects or short sighted (myopia), which gives clearer vision on closer objects (Mogk & Goodrich, 2004; LCZT, 2016; Pacey, 2011). This often compels educators to facilitate use of technologies that provide better visuals of presented text to all students.

Other visual impairments include, nystigmus, cataracts, keratitis and tunnel vision, to cite a few (Winnick, 2011). Nystigmus is characterised by non-voluntary flickering of the eye, which makes visual tracking and fixation difficult, whilst a cataract clouds the eye lens causing blurred or loss of vision (Winnick, *ibid*). Keratitis inflames the eye cornea, while conjunctiva restricts vision to the outline of an object, with the rest appearing as fading light (LCZT, 2016).

2.7.1.1 Indicators of visual impairment

Regardless of lack of expertise to effectively diagnose visual impairment, there are indicators which educators can use to detect affected students. These include avoidance of eye-to-eye contact, inflamed or blood shot eyes, swollen eyes and drooping eyelids (Winnick, 2011; LCZT, 2016). Eyes may also produce excessive tears involuntarily or have squint in one or both, while other students may exhibit low attention span or poor hand to eye coordination (Pacey, 2011). Affected students may position reading material farther away or closer to their eye, which indicates long and short sightedness (LCZT, 2016). In some instances, a student moves the head continually while reading instead of just moving the eyes. Others struggle to read screened text, which is often accompanied by a forward bent sitting posture (Kavcic, 2005).

2.7.1.2 Responding to challenges posed by visual disabilities in learning engagements

Students with severely compromised sight often depend on alternative senses like sound, smell, touch and muscle movement to acquire targeted knowledge and skills (O'Connell et al., 2010). Educators then support learning of students with visual disabilities by facilitating the use of appropriate technologies, which gives students a sense of recognition. However, for effectiveness, electronic presentations need to be accompanied by explanations from the educator. These are fundamental initiatives which can help address social and environmental factors that affect the students' academic processes (Pacey, 2011). Other students use technologies with braille provisions and computers with special software like the Job Access with Sound (JAWS) or technologies that support multi-sensory learning (Mishra, Sharma & Tripathi, 2010; Mayer, 2008). Those with mild visual impairment are often provided with large print text and are encouraged to occupy front seats (LCZT, 2016). Additional provisions include use of tactile diagrams, models and techniques that boost conceptualisation (Pacey, 2011).

2.7.2 Hearing disabilities

Hearing impairments are largely obscure, painless and silent, which makes them less detectible (LCDZT, 2016; Kavcic, 2005). Such disabilities can emerge at any age, although these may be exacerbated by ageing (Amedofu, Ocansey & Antwi, 2006). Impaired hearing might also affect speech and language proficiency, which are critical for interpersonal communication in teaching and learning processes (Nwadinobi, 2019; Hawkrigde, Vincent & Hales, 2019). The affected students usually experience isolation and social exclusion unless they are given the necessary support. This obligates high alertness among educators tenable early detection of those affected so that any adverse effects on their learning are offset through the use of appropriate technologies (Mayer, 2008). Teaching and learning are social activities where information and ideas are shared; hence, the need for educators to facilitate use of technologies that counteract challenges associated with compromised hearing (Hawkrigde, Vincent & Hales, 2019; Walimbwa & Mayende, 2014; TechMedInstru, 1997). Hearing impairment ranges from mild to profound levels that manifest as hard of hearing to total deafness (Kavcic, 2005). Profound hearing can inhibit effective processing of linguistic information, unless interventions like use of hearing aids or other alternate modes of communication are made (Hawkrigde, Vincent & Hales, 2019). Winzer (1996) reports that hearing levels of 5% of the human population falls below the expected range. This necessitates high vigilance among educators to detect those affected early so that they are not

excluded from any pedagogic engagements in which they may be in attendance physically (Laabidi, et al., 2014; Wray, 2011).

Educators need to be aware of various factors used to categorise hearing impairments (Kavcic, 2005). The classification can be based on the severity of impairment and this range from mild, moderate, severe to profound levels (Laabidi et al., 2014). Alternatively, this can be based on pre and post-lingual onset of hearing impairment, where hearing loss occurs before or after attainment of basic language proficiency (Pacey 2011). Another classification strategy is dependent on whether impairment occurred before birth (congenital) or comes after birth (adventitious) (LCZT, 2016).

Infections like maternal rubella or German measles occur before birth, which may result in loss of hearing (LCZT, 2016). The Swimmer's ear (Otitis) is another condition that emerges after birth which may result in hearing impairment (Nwadinobi, 2019). Malformations like under-developed canals (*atresia*) and small pinna (*micotia*) also affect hearing, just like foreign bodies or excessive accumulation of wax in the ear (Amedofu, Ocansey & Antwi, 2006). LCZT (2016) adds that excessive noise and hereditary conditions also affect hearing levels.

2.7.2.1 Indicators of hearing disabilities

Students with hearing disabilities can be identified through interactions or reference to institutional records (Wray, 2011). Nevertheless, most affected students avoid disclosure of their hidden disabilities for fear of labelling and stigmatisation (Tai et al., 2022; Jameel, 2011). However, Nwadinobi (2019) concur with LCZT (2016) that educators can still detect hearing disabilities when a student shows inattentiveness, day dreaming or signs of being unaware of being spoken to. Others repeatedly request repetition of a question, statement or instructions before responding, while some often withdrawn from the learning situations although they might seem to be listening (Okeke, 2001; LCZT, 2016). At times, one turns an ear towards the speaker or focus on the presenter's face to facilitate lip reading (Nwadinobi, 2019; Pacey, 2011). Compromised hearing often reduces one's self-esteem, triggers feelings of inadequacy and society usually labels those affected less capable in learning contexts (Wray, 2011). As a result, affected students often become lethargic, because they are forced to exert more effort than colleagues to master learning presentations and instructions. They are also prone to real or imagined rejection, which dampens their desire to engage in learning tasks (Nwadinobi, 2019; LCZT, 2016; Laabidi et al., 2014).

2.7.2.2 Responding to challenges posed by hearing disabilities in learning engagements

Educators often seek to accommodate students with hearing disabilities through the adoption of varied teaching and learning engagements (Mayer, 2008; Nwadinobi, 2019). These include amplifying sound in either oral or techno-aided presentations through the use of speakers. Others pitch their voices highly or use electronic devices that are synchronised to speakers for enhanced sound output. Further options include use of sign language, gestures and body language to enhance interactions with affected students (Kavcic, 2005). Such strategies provide alternative communication modes that suit students with hearing disabilities.

2.7.3 Physical disabilities

Physical (orthopaedic) disabilities present as malformations on body limbs and mobility problems, which makes those affected easy to detect (Laabidi et al., 2014). Most definitions of disability have been influenced by physical impairments, which similarly influenced most legislation on disability (WHO, 2011). LCZT (2016) submits that physical disabilities result from neurological and muscular-skeletal impairment. Neurological impairments are caused by disorders or damage in the brain or nervous system, whilst the muscular-skeletal entail limb malformation characterised by distorted posture and mobility challenges (LCZT, 2016). Those induced by neurologically factors include cerebral palsy and spina bifida, whilst the muscular - skeletal comprise dystrophy, amputees, limb deficiencies, scoliosis and dwarfism, among others (Jameel, 2011). An outline of physical disabilities that are common among pre-service teachers is given below.

2.7.3.1 Cerebral palsy

Cerebral palsy is a non-progressive loco-motor dysfunction triggered by a defect or lesion in the brain (LCZT, 2016). According to Hawkrigge, Vincent and Hales (2019), cerebral palsy makes muscles excessively tight, which results in loco-motor, vision or speech challenges. It can lead to mental retardation, seizures, as well as drooling (Pacey, 2011; Careerforce, 2017). Cerebral palsy-related disabilities do not usually inhibit studies in teacher education. However, those affected require appropriate responsive strategies as they may have shorter attention span or get easily distracted by unnecessary sounds or movements that occur within the learning environment (LCZT, 2016).

2.7.3.2 Orthogenesis imperfecta (brittle bone disease)

This is a genetic bone disorder characterised by deformities, dwarfism or brittle bones of the lower or upper body limbs caused by connective tissues that are defective from birth (LCZT, 2016). Those with mild cases often engage in processes of learning like teacher education.

2.7.3.3 Scoliosis

Scoliosis presents as forward or backward structural body curvature, caused by spinal deformities triggered by conditions like cerebral palsy, poliomyelitis, spinal muscular atrophy or dystrophy (Hawkrigde, Vincent & Hales, 2019). Curvature on the limbs restricts flexibility and one can also have tumours on the rib cage or pelvic deformities that are accompanied by respiratory disorders (LCZT, 2016).

2.7.3.4 Limb deficiencies or amputations

Amputations usually result from accidents or infections that cause partial or total loss of body parts to create a condition called dysmelia (LCZT, 2016). Deformity or absence of particular limbs is identified by specific terms. Phocomelia is when a limb is reduced to a stump, while paraplegia is when either an arm or leg is affected and if both are affected it is called quadriplegia (LCZT, 2016).

Total absence of either an arm or leg is called *Amelia*, while absence of one or both feet is called transverse terminal hemimelia (LCZT, 2016). Partial or complete absence of a hand is called *acheiria* and these conditions are nowadays common among students, where educators facilitate the use of technologies to plug resultant deficiencies in learning processes. They also adapt learning environments through the use of technologies in complementing the functions of defective or missing body limbs (Arrigo, 2005). Special technologies like adapted laptops and voice recorders are often used to assist students with missing hands in capturing notes, whilst creation of space facilitate freer movement for those impeded by certain disabilities (LCZT, 2016; Kavcic, 2005). Learning obstructions that relate to physical disabilities can therefore be reduced through the use of appropriate technologies (LCZT, 2016).

2.7.3.5 Spina bifida

Spina bifida is triggered by a neural tube that fails to close in early foetal development, which can paralyse the lower body limb, particularly, in females (LCZT, 2016). It presents as a dimple caused by an opening on the spinal cord or a tumour that contains spinal fluid and nerve tissue (LCZT, 2016; Careerforce, 2017). Spina bifida may be accompanied by

hydrocephalus caused by accumulation of excess cerebral fluid in the brain (LCZT, 2016; Careerforce, 2017). Those affected by spina bifida usually have emotional disorders and mobility challenges.

2.7.3.6 Poliomyelitis

Poliomyelitis is a viral infection that inflames nerve cells in the spinal cord, which then creates a gap in the central nervous system, including other peripheral nerves, resulting in paralysis (WHO, 2011; LCZT, 2016). It affects the spinal cord, the upper or lower body limbs, which results in muscle imbalances. Poliomyelitis induces deformities due to excessive pull from stronger group of muscles, which worsens with age, as the limbs shrink in girth and become shorter. Poliomyelitis leads to limb paralysis, tilted pelvis, deformities in the wrist, forearm and elbows or flexed hips (LCZT, *ibid*).

2.7.3.7 Muscular dystrophy

Muscular dystrophy is often hereditary, and it often weakens muscles that facilitate body movement (LCZT, 2016; Careerforce, 2017). This condition presents as curvature on the spine and back accompanied by poor balance, drooping eyelids and respiratory difficulties. Muscular dystrophy causes degenerative weakening or total destruction of muscle cells. This results in multi-system disorders, whose severity ranges from mild to profound (Careerforce, 2017; LCZT, 2016). Gradual weakening of muscles leads to mobility challenges, which does not, however, impede enrolment for teacher education (Careerforce, 2017).

2.7.3.8 Concluding note on disabilities that affect pre-service teachers

Diversity of disabilities among students in higher education has increased due to global demographic population changes, which in turn created multiple challenges for inclusivity (Cochran-Smith & Villegas, 2016;). Nevertheless, educators have implemented various responses by embracing ethical and well-reasoned pedagogical strategies (United States, Census Bureau, 2008). Walimbwa and Mayende (2014) assert that using technologies is fundamental in plugging deficiencies that emanate from students' disabilities. Although families and guardians are obliged to support learning endeavours for students with disabilities, the social model views it as an obligation for all stakeholders (Otsimo, 2018, Rudhumbu, 2021). Miles (2011) attributes most impediments encountered in learning processes, by students with disabilities to the society. Nevertheless, advancement in technologies has availed standard and adapted technologies that match students with specific

disabilities (Reynolds & Ruedel, 2015). The next section examines standard and adapted technologies that support learning by curtailing inhibitions induced by disabilities.

2.8 Technologies supporting Learning for Students with Disabilities

Literature often uses the term ‘assistive technology’ when referring to gadgets that support individuals with disabilities to function in academic and other interactional set ups (Otsimo 2018). The International Organisation for Standardisation (ISO) adds that such technologies support and substitute functions of impaired limbs, which promotes effective participation and efficient execution of learning tasks (ISO, 2011). This study uses the term ‘technologies’ to embrace standard products and software that support teaching and learning processes, particularly for pre-service teachers with disabilities. Laabidi et al. (2014) similarly, define technologies as gadgets used to make learning contexts more inclusive and adaptable to all students. Thus, adaptations enable students to ‘learn from and with technologies.’ While students with disabilities learn from and with the technologies, their colleagues get awareness on how these support learning, as they prepare for encounters with learners with similar disabilities in the schools (Gupta & Bostrom, 2008). Using these technologies makes execution of learning tasks possible and easier for students with impeding disabilities (Bryan, 2016).

Educators often use computer-based technologies to present learning content, explain concepts and give learning tasks to students, including to those with disabilities (Xu, 2018; Laabidi et al., 2014). Such usage is however, no preserve for educators because students also use these in learning tasks and in communicating with colleagues or the educator (Otsimo, 2018; TechMedInstru, 1997). This makes computer-aided teaching and learning a fundamental innovation that complements traditional instructional modes for the benefit of students with various disabilities (Laabidi et al., 2014; Christmann et al., 1997). Those affected by conditions like phocomelia, acheiria and amelia often have challenges in using the standard computer mouse, due to missing fingers or hands, hence, they need adapted technologies like the mouse and special software (Seale & Cooper, 2010). Some of the technologies are operated through a mono-switch mechanism that facilitates application of pressure on the mouse to achieve a click on the computer cursor (TeachThought Staff, 2023; Sharp, 2002; Hasselbring & Glaser, 2000).

2.8.1 Technologies supporting learning for pre-service with physical disabilities

Physical (orthopaedic) disabilities often impede mobility or functions of body limbs (Mishra, Sharma & Tripathi, 2010). While these are diverse, technology has also availed a plethora of matching technologies to augment learning for those affected (O'Connell et al., 2010). Use of the technologies support execution of academic tasks, which gives reprieve to the students in both academic and interactional social set ups (Tait, 2018). The next section examines technologies that support students with physical disabilities in learning contexts.

2.8.1.1 Alternative mouse devices

Kavcic (2005) recommends use of the pointing device as an alternative to using the mouse to input information into the computer. The mouse keys are at times integrated within keyboard functions to facilitate control of the cursor on the computer screen and allow iterative switching from mouse input to text input (Rivera & Smith, 1997). This exemplifies customised technologies that match students' specific disabilities (Sharp, 2002).

2.8.1.2 Camera computer mouse

Some computers have an inbuilt camera that is connected by USB link, so that it functions with the standard computer webcam (Hasselbring & Glaser, 2000). The operational functions are synced to preferred part on the user's face, such that moving that part shifts the cursor around (Science Scope, 2003; Laabidi et al., 2014). If the cursor is maintained at one position on the computer screen a click gets activated to initiate desired processes (Sharp, 2002). This mouse enables students with disabilities like quadriplegia or muscular dystrophy disabilities that restrict movement to input text into the computer in conjunction with the on- screen keyboard.

2.8.1.3 Onscreen or virtual keyboard

This provision is ideal for students with physical disabilities that impede movement or motor control. For instance, hands or fingers those are too weak to operate the standard keyboard (Salminen, Ryan & Petrie, 2004). The virtual or onscreen keyboard pops up on the computer screen and remains visible, like other programmes and students then access the keyboard with a pointing device to input information into the computer ((Kent-Walsh & Light, 2003).

2.8.1.4 Eye tracking system/eye gaze

The eye tracking is ideal for students with physical impairments that hinder use of the standard computer mouse and keyboard, who then input information and control computer

processes by eye movement (Science Scope, 2003). The system functions with a camera attached to the computer monitor and an external unit that captures eye movement to transmit commands onto the screen. (Laabidi et al., 2014; ALSO, 2022).

2.8.1.5 Switches

Technology provides alternatives for the standard keyboard and the joystick, where special single and multiple button switches or a sensory plate are used (Hawkridge, Vincent & Hales, 2019; ALSO, 2022). These may have touch-free motion sensor functions or a sip-and-puff mechanism that enable one to control devices that support independent computer operations, like insertion and removal of external storage devices, copying files and using the keyboard (Science Scope, 2003). These switches can be activated by a preferred body part, which then controls several technologies that are within one's reach. Such provision suits those affected by muscular dystrophy, multiple sclerosis, cerebral palsy, spinal cord or head injuries that cause mobility challenges or obstruct physical interface with some of these electronic devices (LCZT, 2016). These switches facilitate independent manoeuvres like operating the radio or other technologies that support communication with colleagues or accessing essential academic information (Science Scope, 2003; Johnson et al., 2016). Such provisions provide an alternative for the standard keyboard to enable effective use of computers by students with physical disabilities (Leung, Yates, Duez & Chau, 2010).

2.8.1.6 Word prediction software

Word prediction prompts a list of words that begin with the letter punched on the keyboard to pop up on the screen, so that a student can select and insert the desired word in the text (Hardaway & Scamell, 2005). Words that pop up depend on the sequence of letters entered and words frequently used on that computer (Hasselbring & Glaser, 2000). This software is used on a programmed computer, and facilitates reading out of the words aloud, which enables students with compromised fine motor skills or communication challenges to also articulate their ideas through vocabulary that links closely to their thinking (ALSO, 2022; Handley-More et al., 2003). Therefore, keystrokes needed to input information into the word processor are reduced and it assists with spelling, grammar or punctuation checks, as well (Otsimo, 2018; Handley-More et al., 2003). Such technology-aided strategies promote effective communication and better exchange of ideas in collaborative knowledge construction (Jameel, 2011). These computer allied technologies also extend learning

environments beyond the lecture room by facilitating access to multi-varied information sources (Hardaway & Scamell, 2005; Vesisenaho & Dillon, 2013; TechMedInstru, 1997).

2.8.1.7 Hyperlinks and hypertexts

These provide access to electronically linked sources that have related information by just clicking on the computer mouse (Hardaway & Scamell, 2005). Hyperlinks enable students to navigate multiple information texts in a non-sequential manner, while hypertexts are like an encyclopaedia or web constituted by inter-dependent electronic units that allow iterative comparison of information with minimal effort (Von Davier et al., 2017). This provision saves the student's time and effort of browsing multiple texts by sifting through the bibliography sections or searching related book sources in the library (Hasselbring & Glaser, 2000). This gives students more time to reflect and deepen understanding, rather spending it on searching for information (Partnership for 21st Century Skills, 2014).

2.8.1.8 Multimedia environments

These extend the hypertext concept, where different media are then electronically linked to enhance students' conceptual understanding (Hasselbring & Glaser, 2000). Multimedia environments often incorporate images and sound effect to improve conceptualisation by students affected by some of the disabilities or those with little background in a study discipline (Mayer, 2008; Williams et al., 2000). Therefore, students that have disabilities which impede effective writing can illustrate their thoughts and demonstrate evidence of what they have learnt using this provision (Collins, Hawkins & Carver, 1991). These provisions also avail students with physical disabilities with options to demonstrate unique abilities and talents that are often concealed, when traditional presentation methods are used (Hasselbring & Glaser, 2000). Multi-media environments stimulate origination of products, where students use technologies like videotapes and other storage devices to share their work with others. They may also share their innovative artefacts or resources by uploading on institutional web pages or displaying in libraries, as evidence of competencies that compare well with colleagues.

2.8.2 Technologies supporting learning for students with visual disabilities

Severity of visual disabilities ranges from low vision to total blindness (Mishra, Sharma & Tripathi, 2010). While educators often lack expertise to precisely establish students' visual acuity, they should however, take cognisance that those affected require specific provisions, such as technologies that enhance their learning. Students with mild visual impairment can

use large print text, magnification lenses or electronically enlarged text, to augment their functioning and promote independent learning (TeachThought Staff, 2023; Mathews, 2005). The next segment examines technologies that support more efficient functioning of students with visual disabilities in learning processes.

2.8.2.1 Larger keyboard keys

Instead of using standard computer keyboard students with visual impairment can alternatively use an adapted keyboard with larger keys that are easier to locate (WHO, 2011).

2.8.2.2 Voice recognition systems

The voice recognition system facilitates the use of voice to input information into technologies like the computer (TeachThought Staff, 2023; Adebisi, Liman & Longpoe, 2015). Text is then dictated, which the computer captures or is alternatively fed through some application commands and is then saved in the computer for use by students that are blind (Rivera & Smith, 1997).

2.8.2.3 Screen reader and talking browsers

A screen reader exemplifies voice output technologies, where special software converts text displayed on the computer screen into a synthesized voice output through keystrokes entered into the keyboard (ALSO, 2022; Laabidi et al., 2014; Christmann, Badgett & Lucking, 1997). This text-to speech application analyses letters, words or phrases and translates them into digital speech and it functions with software packages like word processing, educational mathematics, reading and spelling programs (TechTrek, 2003). The voice output is either male or female, whose reading speed and volume are adjustable to match particular individuals (TeachThought staff, 2023; Christmann, Badgett & Lucking, 1997). This technology incorporates voice-based browsers that facilitate use of internet, where provisions like the screen reader software are integrated (LCZT, 2016).

2.8.2.4 Speech synthesizer

Speech synthesizer output device functions with an optical character recognition software program that incorporates screen reader or speech output software loaded in the computer's multi-sound card (TeachThought, 2023; Rivera & Smith, 1997). This allows listening to a CD or participating in audio and video discussions (Adebisi, Liman & Longpoe, 2015). The speech synthesizer is available in digital or synthetic speech formats that enhance participation in learning engagements for students with visual impairments or communication

disorders. The speech synthesizer uses text-to-speech or screen reader application for on-screen text display that is then read aloud so that students with compromised sight can iteratively read and edit the text (Otsimo, 2018).

2.8.2.5 Job access with sound (JAWS) software

When installed in a computer this software programme enables students with impaired vision to read text through synthesized speech (Mishra, Sharma and Tripathi, 2010). It functions in conjunction with various commands that support use of other programs in; editing documents and reading web pages (<http://www.freedomscientific.com/jaws-hq>; Adebisi, Liman, & Longpoe, 2015). JAWS can be used in conjunction with a refreshable braille display, which produces braille format, instead of speech output (Mishra, Sharma & Tripathi, *ibid.*).

2.8.2.6 Closed-circuit television (CCTV) magnification

The closed-circuit television (CCTV) magnification system enlarges text and graphic material through a small video camera that has zoom lens and is connected to a display monitor (Freeman et al., 2007; TechTrek, 2003). The displayed text or graphic material is put on a sliding stand below the camera lens, which then projects these images onto the monitor (Hasselbring & Glaser, 2000). The CCTV has provision for adjusting size, contrast, brightness and focus, including change of display background to black, white or colour (TechTrek, 2003). This equipment is obtainable in large and portable version for use by many people or individuals, respectively.

2.8.2.7 Computer screen magnification

Software that supports ‘on screen’ image or text magnification is often loaded into the computer, where a portion on the text is then enlarged to more than 15 times of the original size (Adebisi et al., 2014; Hasselbring & Glaser, 2000; Mishra, Sharma & Tripathi, 2010). Although only a small part of the image or text is enlarged at a time, this however, enables students with visual impairments to use the computer in ways that match colleagues.

2.8.2.8 Optical character recognition (OCR)

Optical character recognition technology is fundamental for students with profound visual impairment. It uses synthetic or digital speech to interpret and read out print materials like books placed on a scanner (ALSO, 2022; Rivera & Smith, 1997). Large versions of OCR devices are usually found in libraries, while individuals can use more convenient and user

friendly smaller portable versions (Balmeo et al., 2014). The OCR can be attached to an independent computer or scanner (Hasselbring & Glaser, 2000).

2.8.2.9 The Braille note taker

The Braille note taker is a portable device that stores information in braille format (Mishra, Sharma & Tripathi, 2010; Laabidi et al., 2014). This device functions with six keys, like the standard braille writer and functions with software that converts braille characters to text format, which is then listened to through an integrated speech function (TechTrek, 2003). The Braille note taker can be synchronised to a standard printer or braille printer to produce hard copies of text or braille paper output, respectively (Hasselbring & Glaser, 2000). Combining the Braille note taker functions and computer technology makes learning more efficient and effective for students with visual challenges.

2.8.2.10 Descriptive video services (DVS)

Descriptive video services (DVS) technology integrates oral descriptions of visual physical features such as facial expression of human characters in a presentation and narration on these is provided at interval pauses during an electronic presentation (Hasselbring & Glaser, 2000). The DVS is incorporated in a television set or recorder with an integrated ‘Second Audio Program’ (SAP), which can be switched- on to access the automatic descriptive video (TechTrek, 2003). This technology facilitates access to information and enables students to be actively engaged in discussions that relate to viewed programs like videos. This gives the students the opportunity to interact and collaborate in knowledge construction in mainstream education contexts (Hasselbring & Glaser, 2000).

2.8.3 Technologies supporting pre-service teachers with hearing disabilities in learning engagements

Hearing impairment ranges from mild to total deafness, and affected students often rely on visual cues for communication (Mishra, Sharma & Tripathi, 2010). Loss of hearing can affect processing of linguistic information through auditory channels. However, there are technologies that augment the residual hearing, where students use senses of sight and touch as alternatives (Hasselbring & Glaser, 2000).

2.8.3.1 The cochlear implant

This device is surgically inserted beneath the skin to bypass defective parts in the inner ear and stimulate nerves to allow continuous reception of signals from sounds that are within earshot of a person with profound hearing impairment (TeachThought, 2023; TechTrek,

2003; Hasselbring & Glaser, 2000). The student can then hear sounds that were not discernible without the implant.

2.8.3.2 Hearing aids

Hearing aids act like a mini public address system, as these amplify sounds for the user (Hasselbring & Glaser, 2000; TeachThought Staff, 2023). For optimum efficiency, learning contexts must have low noise obstructions and the user has to be closer to the presenter. While hearing aids function equally well when worn on any part of the body, students often prefer to have them behind the ear (TechTrek, 2003; Hasselbring & Glaser, 2000).

2.8.3.3 Frequency-modulated (FM) amplification system

The FM amplification system directly links the educator's microphone with the student using hearing aids, which prevents interference from background noise (Hasselbring & Glaser, 2000). It is versatile for in and outdoor use, because shifting of position by both the educator and students does not interfere with functional efficiency (TeachThought Staff, 2023; TechTrek, 2003; Hasselbring & Glaser, 2000).

2.8.3.4 Audio loop

This is modified version of the frequency modulation device, where sound is amplified and channelled from the source directly to synchronized hearing aids of students (Hasselbring & Glaser, 2000). The Audio loop can also transmit radio waves from the presenter to students through wire connection that uses speakers whose volume is adjustable for general use or to match specific learning environments (Christmann, Badgett & Lucking, 1997). This device can be integrated into the walls or confined to a section to benefit specific students (TechTrek, 2003).

2.8.3.5 The infra-red system

This device transmits sound to a student with impaired hearing, without the notice of colleagues since it does not use wires or cords for transmission. The functional efficiency of this piece of technology is not affected by radio signals from other external sources (TechTrek, 2003; Hasselbring & Glaser, 2000). However, the recommended distance between the emitter and transceiver must be maintained for optimal efficiency.

2.8.3.6 Telecommunication device for the deaf (TDD)

The telecommunication device for the deaf resembles a mini keyboard with a screen attached on the telephone to display in and outgoing messages (Hasselbring & Glaser, 2000). It further

enables students with compromised hearing to make and receive telephone calls with ease. The messages typed on the keyboard are automatically converted into tones that are transmitted to another TDD which converts it into text for the receiver; hence, both sender and receiver require similar devices at both ends (TechTrek, 2003). It can have provision for paper printout which captures conversations for future reference. While the TDD may not be used in lessons, it enables interactive discussions outside the lecture room (Hasselbring & Glaser, 2000).

2.8.3.7 Captioned television

Captioning entails augmenting visual screen display, where spoken words are displayed as text. This provision can be integrated in the in-built decoder of a television to assist students with impaired hearing to access television programs and videos for educational or recreational purposes (Hasselbring & Glaser, 2000). The open captioning version can be turned off, unlike the closed one which cannot be turned off from the television screen (TechTrek, 2003).

2.8.3.8 Live speech captioning

Live speech captioning facilitates access to words as they are spoken by students with hearing impairment. This technology functions like steno keyboards used in recording court proceedings, where the stenographer feeds information as the educator talks, which is then displayed on a computer screen. Live speech captioning enables students with hearing impairment to benefit in mass lectures (Hasselbring & Glaser, 2000).

2.9 Chapter Summary

Literature reviewed in this chapter has revealed how technologies support teaching and learning, for pre-service teachers with various disabilities (Schrok, 2018; Bekteshi, 2015; Adebisi, Liman, & Longpoe, 2015). Nevertheless, use of technologies is often impeded by the lack of apposite guiding frameworks, among other factors. This scenario results in disjointed structuring on how technologies are acquired, used and monitored. Cochran-Smith and Villegas (2016) argue that provision of education is a complex multi-faceted activity influenced by ideas from various quotas of the society. Literature however, indicates that these multiple ideas require guidance of a general framework that then informs assessment or determines their value and relevance. These frameworks can be buttressed by philosophies like the universal design for learning (UDL) and the substitution augmentation modification and redefinition (SAMR). This chapter has explained UDL and SAMR, which are the

theoretical and conceptual frameworks for this study. Besides examining UDL and SAMR, the chapter also looked at literature related to integration of technologies in contexts of teaching and learning. The chapter further interrogated the principles of Multiple Representation, Expression and Engagement, which helped justify adoption of UDL as the theoretical framework. The reviewed literature provided evidence on how UDL deepens understanding of how effective integration of technologies support teacher education processes and the significance of using the SAMR model to project extent to which technologies are integrated in pedagogic processes, including evaluating their effectiveness. The chapter also looked at disabilities that affect students and technologies that could be used to reduce their effects on teaching and learning processes.

The reviewed literature indicates that Western countries like the UK, Sweden and others are like pace setters on enrolment and use of technologies to support learning for students with disabilities. However, developing nations like Zimbabwe seem to have low documentation on such practices, which strengthened the resolve to carry out this study. Literature also revealed that, regardless of whether disabilities are congenital or adventitious, they all affect learning, which necessitates using technologies to support learning processes. However, more novel standard and adapted technologies continue to be designed, which reduces social inequalities in education, especially for students with disabilities. The reviewed literature has paved way for research methodologies for this study that are presented in the next chapter.

CHAPTER 3: RESEARCH DESIGN AND METHODOLOGY

3.1 Introduction

In this chapter, the methodology used in this study is described. Creswell (2014) posits that methodology encompasses processes and tools that conform to projected research outcomes, and these are often influenced by the preferred research design. Van Rensburg and Smith (2004) assert that research methodology comprises data gathering instruments and processes, whose choice is determined by the research design. The data collection methods used in a study are usually in sync with the ontological and epistemological persuasions of the researcher. Invariably, choice of instruments and processes for gathering data are informed and guided by an apposite research methodology. This chapter provides description of the methodology and design that shaped the structure of this study, as well as the procedures for gathering data. The chapter also explains the research paradigm, study population, sampling procedures, which includes the techniques used. The chapter also provides justification for tools used in gathering data that helped to address the study's aim and objectives. Also elaborated are ethical considerations, trustworthiness of data and plan for its analysis.

3.2 Ontology and Epistemological Considerations

3.2.1 Ontology

In the entire engagements of this study, personal ontological persuasion swayed me to view education as everyone's basic right regardless of abilities, disabilities, gender or other social predispositions (Xu, 2019; UN-CRPD, 2012). My conviction was premised on that nothing could impede engagement in teacher education processes, particularly, if one has disabilities that are clear of profound levels and environments are adequately conducive to learning. This might sound as personalised ontological claims; hence, the subsequent section seeks to substantiate it.

I believe the nature of pedagogic experiences encountered by students with disabilities, which includes the extent of interactions with colleagues, educators and instructions, influences their acquisition of knowledge and skills for teaching. This is confirmed through the social constructivist lens, a paradigm constantly referred to in the processes of this inquiry. To comprehend phenomena, people often rely on personal experiences and observations in contexts of daily living or employment (Creswell, 2014). Implications are that the People's understanding of the world is influenced by their personal experiences and the social context in which they live. This perception symbolises a relativist ontology, which underpins social

constructivism, a paradigm chosen to anchor this qualitative research (Klenke, 2016). Although findings from this study could infer broader prevalence in like contexts, I maintain that findings primarily depict extant status at the site of study. This standpoint is influenced by the chosen social constructivist paradigm, which restricts focus to specific contexts to facilitate comprehension of social and cultural settings of the target group (Creswell, 2015). This is further supported by my experience of over twenty years in teacher education, where I witnessed gradual increase in enrolment of pre-service teachers with disabilities. I nevertheless, noted that such students often experienced peripheral attention, as evidenced by lack of essential provisions and accommodations. In Zimbabwe, contextual settings for teacher education have multiple and dynamic realities, hence, mono reality does not necessarily prevail in the institutions. In view of that, the study focused on one institution, in its individualistic context as a unit, which was meant to yield deeper understanding of the study phenomena (Creswell, 2014). Specific individuals were selected to inform this study, who then relied on their experiences at the institution to develop and portray subjective meanings of phenomena related to this study. Their experiences were considered as proof of constant contact or interactions with the study phenomena. Participants in this study were drawn from pre-service teachers, teacher educators and institutional administrators.

3.2.2 Epistemology

I used multiple data sources and tools to unravel and construct deeper understandings of factors influencing strategies for technology mediated teaching and learning in the preparation of pre-service teachers with disabilities (Creswell & Creswell, 2018). I further took cognisance that effective understanding could only emerge from meanings ascribed by others regarding a phenomenon, which often assists in generating newer knowledge claims on the issue under study (Creswell, 2014; Tracy, 2013). Pursuant to that, I considered involvement of multi-varied study participants as a critical index in yielding socially constructed understandings and narratives grounded on an assemblage of context specific institutional interpretations and experiences (Klenke, 2016).

I furthermore, banked on the daily practices and experiences of teacher educators, administrators and pre-service teachers in an effort to elaborate on technology mediated approaches at the institution (Denscombe, 2014). I captured these through interactional processes that comprised interviews with teacher educators and the principal, session observations and focus group discussions with pre-service teachers (Creswell, 2014). These strategies helped reveal relationships and practical realities of technology mediated processes,

as experienced by the target population, which allowed the study situation to speak for itself. I could, therefore, discern reality of meanings ascribed by study participants to their life situations (Klenke, 2016). I then used objective analysis and interpretation of the data to build newer knowledge claims on the use of technologies for pre-service teachers with disabilities.

Burke and Christenson (2014) argue that knowledge construction mainly materialises through people's viewpoints based on their experiences from situations in the social environment. In concurrence, Salman (2007) opines that people's perceptions are dependent on sensory stimuli gained through seeing, feeling and hearing. In view of that, I had to embrace varied communicative modes in oral interviews and focus group discussions, as well as observing behaviours or actions portrayed in live lecture sessions. I then inductively integrated and refined participants' individualised perceptions to construct knowledge claims that yielded pragmatic recommendations for this study (Burke & Christenson, 2014). Although information provided by participants often showed subjectivities, this was ultimately reconciled to yield objective institutional data that reminisced of holistic findings from a singular case unit (Denscombe, 2014). Thus, I used individual and group perceptions, explanations or beliefs to yield collaborative knowledge gains, which illustrates social constructivism (Patton, 2002). I had to scan for complexities in participants' views, rather than narrowing resultant meanings to few categories and ideas, as I felt meanings could be multi-varied (Creswell, 2014).

Since students with disabilities are often relegated to peripheral margins of critical pedagogical engagements, I viewed use of technologies as a possible respite for them (WHO, 2011). However, effectiveness of these could only be ascertained through experiences narrated by teacher educators and pre-service teachers themselves. Mattingly and Ratisifandrihamanana (2016) noted how issues of disabilities were often marginalised in discussions regarding general education curricular. Deliberations like on technology designs and state of the learning environments often focus on the so-called 'average student' who has no disabilities (Mattingly & Ratisifandrihamanana, *ibid.*). In cognisance of the foregoing, I engaged in focus group discussions with the affected pre-service teachers so that they could speak for themselves, which also provided an opportunity to observe interactional dynamics among them (Creswell, 201). This subscribes to epistemological persuasions of qualitative study, where individual and group perceptions inform knowledge construction (Cook & Campbell, 2002).

According to Gronlund et al. (2010) and WHO (2017), lack of relevant policy frameworks often results in educators and institutional authorities accord second fiddle status to the learning of students with disabilities. In view of that, I adopted the case study design, which then exposed me to the actuality of technology mediation practices, so that I could ‘*verstehen*’ or understand lived experiences and perspectives of those affected (Neuman, 2011). This helped me to gain empathetic comprehension of technology mediated teaching and learning through exposure to participants’ personal viewpoints (Weber, 1968). I was, therefore, assisted to deduce perceptions on the significance attached to using technologies to support learning for pre-service teachers with disabilities. These students often get weighed down by multiple factors, like succumbing to the whims of self-fulfilling prophecy of ‘I am a second-class student’, which often compels them to conform to those capabilities conceived and apportioned by society (Tracy, 2013; Goffman, 1959). I therefore, sought to explore and proffer strategies that could prop these pre-service teachers to swing above and beyond such obnoxious societal constructs. I perceived use of technologies as an astute intervention that boosts confidence and plugs discrepancies in the learning for pre-service teachers with disabilities. These were ontological and epistemological conceptions that guided processes of this study and also helped me to gather information, integrate perceptions, present and explicate how the use of technologies influenced teacher preparation. These study processes further helped me to challenge generalisations and stereotypes in learning engagements for pre-service teachers with disabilities.

By foregrounding interactions between the researcher and researched, I envisaged transformation in both parties, as well as in other stakeholders. As a researcher, hope was on increased knowledge claims, whilst the researched derived improved practices in teacher education processes and other stakeholders would draw better understanding on the use of technologies for pre-service teachers with disabilities (Creswell, 2012). Thus, I sought to penetrate the participants’ ‘inner world’ of experiences for deeper understanding of benefits in using technologies from multi-varied viewpoints. This was buttressed through sampling participants from a broader spectrum of practitioners in teacher education and pre-service teachers. I was conscious to avoid haste judgemental conceptions, through avoidance of prematurely clumping responses that readily appeared analogous and converging. I had to scan for subtle meanings from the data to facilitate critical analysis, interpretation and reflections that would yield credible findings and conclusions for the study.

This study focused on students rendered vulnerable by disabilities, which influenced use of established canons of research. These informed sampling of participants with significant role in teacher preparation and their choice was backed by personal ontological and epistemological beliefs. I had to make prudent reflection on standard research principles, which influenced the research paradigm, approach, design and other methodological aspects related to qualitative research.

3.3 Research Paradigm

Hammersley (2013) views a paradigm as an approach chosen to facilitate comprehension of targeted study phenomena. This often represents foundational beliefs and principles representing an individual's 'world view' or perceptions (Lincoln & Guba, 2005; Jilcha, 2019; Neuman, 2014). A paradigm, therefore, comprises established philosophies, traditions, approaches of orientation that facilitate observation and comprehension of complexity in reality or phenomena (Collis & Hussey, 2009; Creswell, 2007; Plant, 2005; Babbie, 2011). From the various paradigms, social constructivism was seen as 'fit for purpose' in this study (Creswell, 2013).

3.3.1 Social constructivism

Reality is socially constructed or remodelled through communicative interactions and practices. Lapan et al. (2012) advance that study participants and the researcher can collaboratively construct understanding of particular study phenomena. Thus, social constructivism was chosen for its capacity to facilitate knowledge reconstruction through use of naturalistic qualitative methods, which foregrounded the participants' narratives and interpretations (Cohen et al., 2018). This paradigm deters researchers from influencing any restructure or interpretation of existing circumstances in study contexts, unlike in other intrusive paradigms. I therefore avoided any interference with integrity of settings at the research site. Data was then gathered from interactions conducted in the usual pedagogic contexts, as natural settings. In conformity to the inductive nature of social constructivism, I sought to derive meanings from interactions, behaviours and actions, as observed or experienced in the specific study contexts (Tracy, 2013). Thus, understanding emerged from multiple constructions on participants' perception of reality in conformity to social constructivism. This paradigm is ideal for studies conducted in learning contexts like this one (Cohen et al., 2018). Social constructivism foregrounds interactional learning, which stimulated focus on how technologies can enhance participation in learning engagements by

pre-service teachers with disabilities. According to Tracy (2013), perspectives of study participants usually assist researchers in analysing social actions related to the study. This made it fundamental to explore the influence of technology mediated teaching and learning through the lens of sampled teacher educators, college authorities and pre-service teachers with disabilities. This shows knowledge construction through collaborative discourse analysis with participants as proof of social constructions and dispositions that influence preparation of pre-service teachers with disabilities (Cohen et al., 2018).

3.4 Research Approach

Research approach comprises tools and processes that conform to projected research outcomes, as informed by the researcher's ontological persuasion, which also influences choice of the research design (Van Rensburg & Smith, 2004). Social research like this one could be either quantitative or qualitative, but I opted for the latter. That choice was influenced by social constructivism, which foregrounds interactions with and among study participants to yield effective knowledge gain. Since this study sought to examine practices and experiences in the use of technologies by pre-service teachers with disabilities, adoption of a qualitative methodology was obligatory, as the marginalised pre-service teachers told their story as data.

3.4.1 Qualitative research

A qualitative methodology facilitates deeper understanding of study phenomena as learnings are based on the study participants' experiences, social circumstances, and viewpoints (Cohen et al., 2018). In cognisance that social settings are often dynamic, unique and complex, adoption of a qualitative approach provided an opportunity to derive sense from specific contexts of teaching and learning (Tracy, 2013). This created an opportunity to build sturdy knowledge claims on influences of technology mediated approaches in teacher education, in view of the fact that qualitative research is interpretive and seeks to establish meanings attached to phenomena by people in their social world (Ritchie & Lewis, 2009). I got immersed in targeted teaching and learning contexts of the study participants to observe their daily interactions as they unfolded (Creswell & Creswell, 2018; Tracy, 2013). Qualitative research explores attitudes, behaviours and lived experiences of individuals that are directly involved with phenomena under study (Dawson, 2002; Chapman, 2003). In this study, I examined existent social contexts through gathering, structuring, interpreting and analysing data that yielded findings on the issue under study (Cohen et al., 2018; Adelman,

1980). Tracy (2013) similarly argues that qualitative research creates pathways for social transformation, which in this case focused on strategies that could reconfigure learning trajectories for students with disabilities.

Qualitative methodology enabled me to wade into the frequently sheltered domain of teaching and learning for students with disabilities, besides professional enrichment through exposure to practices of other teacher educators (Neuman, 2014). This strengthened hybridization of ideas and approaches to improve personal practice, as an educator. Qualitative research influenced processes which cultivated closer and more trusting relationships with study participants, which coerced them to release information for this study unreservedly (Tracy, 2013; Maxwell, 2008). They further provided critical insights into the teaching and learning processes of these vulnerable pre-service teachers.

Besides provision of opportunities to experience sayings or doings of teacher educators and pre-service teachers in academic processes, engagements in the study afforded me exposure to participants' lived experiences in their specific contexts (Creswell & Creswell, 2018). In support of the foregoing perception, Adelman (1980) lauds qualitative research for enabling researchers to peek into interpersonal relationships of study participants. As evidence, I managed to examine interactional relationships among pre-service teachers and with their teacher educators.

Although this methodology restricted the study to fewer participants, it nevertheless, enabled deeper exploration of technology use in contexts of teaching and learning, where verbal rather than statistical data was largely used (Bryman, 2008). Participants' verbatim expressive voices were retained as rich data in the report, which provides thick descriptions. A qualitative approach facilitated access to critical information, which participants could have concealed behind their observable actions and behaviours (Cohen et al., 2018; Geertz, 1973).

Data from qualitative research is largely unstructured as participants provide subjective individualistic submissions that may corroborate or diverge (Hammersley, 2013). This cajoled me to avoid sole focus on converging perceptions and accommodate perceptual diversity to obtain views with contextual truthfulness. Thus, I strived to remain a primary tool for gathering data and analysis, which illustrates responsiveness and adaptability (Nisbet & Watt, 1984; Merriam, 2009).

As expected in qualitative research, I sought to uphold ‘one to one’ interaction with participants by gathering data through interviews, focus group discussions and observations. This made the study more relational through researcher - participant exchanges (Tracy, 2013). Creswell and Creswell (2018) applaud the qualitative approach for exploiting multiple methods in gathering data. However, the qualitative approach is often perceived as overly demanding on time for researching and it often yields lengthy reports. On the contrary, I appreciated this approach for enabling production of an elaborate and comprehensive report (Denzin & Lincoln, 2011). The outlined features of qualitative research, justify my choice of social constructivism, as a befitting and robust paradigm to anchor this study.

3.5 Research Design

The research design influences structure of the study which comprises plans for gathering and analysing data to answer the research questions (Yazan, 2015). It also influences how the study is organised, research procedures and also provides basis to critique, adapt or replicating the methodology in other studies (Neuman, 2014). According to Kumar (2011), the research design influences manner in which personal ontological persuasions of the researcher are exploited in the selection of study participants, instruments and procedures for data analysis. In this study, I adopted the case study design.

3.5.1 Case study design

Decisions on the research design are influenced by nature of evidence required to convincingly address the research questions and objectives. Thus, entire research processes depend on the research design, which helps sustain cohesion and consistency in significant study phases (Denscombe, 2014). According to Pring (2015), a case study may focus on an individual, institution or a community. Focus on one definitive unit characterises a single case study, whilst more units yield a multiple case study (Creswell & Creswell, 2018).

Adoption of the case study design in this study influenced use of multiple sources to gather in-depth data that was then structured into themes that helped in examining the research case (Lichtman, 2010). Hitchcock and Hughes (1987) acknowledge that a case for study can be situated in a non-permanent geographical or institutional context, whose confines are defined by group physiognomies or roles often determined by institutional or societal arrangements. Although the case study design focuses on specific instances, its structure often illustrates broader norms or the state of affairs in similar settings (Ryazan, 2015). This design facilitates exposure to significant or unique instances of real live events and situations that help

establish factors acting upon research phenomena in specific contexts (Yin, 2009). In view of the foregoing, the case study design helped to obtain descriptions and explanations that illuminated the influence of using technologies in teacher education processes for pre-service teachers with disabilities (Yin, *ibid*). In consistent with features of the chosen study design, multiple tools and methods that comprised focus group discussions, interviews and observation protocols were used to gather data (Punch, 2005). Multiplicity of these enabled the capture of wide-ranging factors that support or militate against use of technologies in teaching and learning engagements (Cohen et al., 2018).

Case study design helped in obtaining deeper and broader understanding on the use of technologies in teaching and learning practices based on participants' lived experiences (Neuman, 2014; Nisbet & Watt, 1984). Pre-service teachers expressed their perceptions, views and experiences during FGDs, whilst teacher educators narrated theirs in one-on-one interviews. Further insights were obtained from observed lecture sessions. Wellington (2015) asserts that case studies often yield study reports that are easy to disseminate and capture attention of the readers. Similarly, Wellington (2015) concurs with Creswell and Creswell (2018) that findings and insights from case studies can be interpreted and implemented easily by the target beneficiaries. Tenets of this design helped to boost my professional and academic development, as a teacher educator and student researcher (Denzin & Lincoln, 2011; Adelman et al., 1980).

According to Nisbet and Watt (1984), the case study design provides room for a single researcher, which helped me to allow events on the use of technologies to 'speak' for themselves without having to consult anyone. I also spent a considerable period in the field, to achieve data saturation, because I had prerogative on when to exit the research field (Whittier, 2013). However, literature acknowledges weaknesses in the case study design, which I had to contain. For instance, Cohen et al. (2018) are concerned with the selection of aspects for study, which can be biased, more personal and subjective. Choice of aspects to be examined and the study participants rested on me, and I strived to broaden selection parameters to embrace diverse forms and severity of student disabilities. Focus was on those with physical, visual and hearing disabilities, but considered variation in severity of the disabilities, as well.

Other apprehensions on case studies relate to the researcher's control over events during data gathering, where concern is on possible manipulation of behaviours or actions of study

participants (Hitchcock & Hughes, 1995). In efforts to skirt personal biases and prejudices, I maintained strict human research instrument status, where my role was to gather data. As mentioned earlier, this was a single case study at one institution. Features of a single case study, as used in this inquiry, are examined in the next segment.

3.5.1.1 Single case study design

According to Gilbert (2008), a single case study focuses on a specific component that is then studied extensively to yield thorough and holistic in-depth information. It resembles a bounded unit considered as an entity with potential to provide insight into events and conditions obtaining among the target population (Kumar, 2011). This study had one teacher education institution as the case, from which study participants were strategically selected (Creswell & Creswell, 2018; Tracy, 2013; Adelman et al., 1980). Adoption of the single case study design facilitated in-depth inquiry into technology mediated teaching and learning in specific contexts and timelines, in view of the fact that contexts can be unique and dynamic (Yin, 2014; Hitchcock & Hughes, 1995). Thus, a string of interrelated events were examined within demarcated study boundaries and over a specified time, which confirms this as a single study or case unit (Denzin & Lincoln, 2011).

However, Tracy (2013) posits that findings from research confined to a specific institution may not be generalised to other contexts. Nevertheless, I am convinced that recommendations from this study can be adapted in similar institutions and contexts. Adelman (1980) argues that case study recommendations can be accepted and implemented, as influenced by the value discerned by researchers and readers. This gives room for transferability of findings from case studies.

3.6 The Research Site

The site for this study was an institution in Harare, the capital city of Zimbabwe. This institution is located in a residential suburb, where residents subsist on proceeds from entrepreneurial business ventures, employment in various facets of the economy and in government departments. The institution had an enrolment of about two thousand and five hundred, including pre-service teachers with disabilities. The staff comprised 128 teacher educators and 103 ancillary staff members. Financial support was from fees and levies, besides support from the central government. Pre-service teachers were accommodated in hostels, although others commuted from surrounding residential suburbs. I purposively selected this institution, as it was one of the largest teacher education institutions in terms of

enrolment and infrastructure (Institution's Strategic Plan, 2019). Some teacher educators at the institution had received basic training in sign language facilitated by the ministry, while others had observable physical and mild visual disabilities themselves, which provided capacity to deal with and appreciate students with disabilities. Ramps had been constructed at some strategic places, as proof of effort to accommodate pre-service teachers with disabilities. These factors provided high probability of accessing significant number of pre-service teachers with disabilities for the study. The institution was established in the early 1980s, which was soon after the country's political independence (Research institution's Strategic Plan, 2019). I envisioned the institution to have modern infrastructure and satisfactory contemporary technologies, hence, suitable for the focus of this study. Its urban geographical location was another index presumed to attract teacher educators with opulent experience in modern pedagogical processes; hence, the assumption was that majority educators were sufficiently proactive and responsive to use of technologies. The institution's name remains anonymous, in compliance with research ethics and cognisance that explicit permission for disclosure was not sought from the gatekeepers.

3.7 Gatekeepers

Personnel that superintend and regulate access into an establishment, including how and when one can engage the target population in research context are the gatekeepers (Creswell, 2012; Tracey, 2013; Hammersley & Atkinson, 1995). These are privy to confidential information for the specific sites, including information on prospective participants, which are critical indices for study data (Cohen, Manion & Morrison, 2018). The researcher should therefore, conform to official contextual site protocols, even if these are not documented (Leavy, 2017). This nurtures good relations with gatekeepers, which are critical for access to study participants, as major sources of research data (Cohen, Manion & Morrison, 2018). Requests for permission to carry out the study were submitted to the Permanent Secretary in the Ministry of Higher and Tertiary Education, Innovation, Science and Technology Development (MHTEISTD) and principal of the research site institution. These facilitated access to the institution, teacher educators, as well as pre-service teacher participants. Sampled study participants were also regarded as gatekeepers in a subtle way, for their individualistic monopoly over research data. Leavy (2017) acknowledges participants' gatekeeping role through reference to their choice to participate and depth of information they release to the researcher. Pursuant to authorisation by the principal, participants were

approached to seek their willingness and consent to give ideas, opinions and perceptions as research data, which they confirmed by signing consent forms.

3.8 Target Population

A group of individuals that appeals to the researcher's interest in a study constitutes the target population (Leavy, 2017). However, Flick (2014) expresses scepticism on feasibility to involve the entire target group in a study. Thus, study participants are carefully selected from the target population, and these must have potential of providing information that represents views and perceptions of the target population (Cohen et al., 2018).

In this case, the target population comprised twenty-three teacher educators from the professional studies department, two senior college authorities, who were the principal and vice principal, as well as about thirty pre-service teachers with visual, hearing and physical disabilities. The latter were sampled from different study programmes, serve for first years, whose exposure to use of technologies in teaching and learning was considered limited.

Exit qualification for all study programmes was a teaching diploma for secondary education, awarded by the University of Zimbabwe. Study programmes had varying duration which depended on entry qualifications. The two-year programme enrolled post Advanced or 'A' level holders, whilst the three-year programme was for those with post Ordinary or 'O' level qualifications. Similarly, the four-year programme enrolled post Ordinary or 'O' level qualification holders, whilst the eighteen months programme enrolled holders of diploma qualifications in technical subjects who just needed the teaching component to become qualified teachers. Sampling of participants was restricted to pre-service teachers with more than two terms at the institution, who were assumed to have sufficient exposure to technology mediated teaching and learning processes. Drawing participants from different study programmes and subject disciplines was meant to capture broader experiences of technology mediated teaching and learning. Dominant disabilities of pre-service teachers were; physical, visual and hearing, hence, these featured among the sampled participants.

3.9 The Sample and Sampling Procedures

Sampling entails selection of study participants from the larger target population, like the sixteen that were selected in this study (Booth, 2018; Neuman, 2014). The sampling targeted individuals perceived to have potential to provide clarity, insights and deeper understanding of teaching and learning processes for pre-service teachers with disabilities. I therefore

targeted individuals with specific characteristics, experiences, behaviours and responsibilities that positioned them to possess data on the research issue (Cohen et al., 2018; Creswell & Creswell, 2018). I used sampling techniques that would help to capture homogeneity traits like being a pre-service teacher with visual, hearing or physical disabilities, teacher educator in the professional studies department or senior college authority (Maxwell, 2008; Patton, 2015). I also strived to capture heterogeneous traits through sampling individuals with varied severity of targeted disabilities, whilst ensuring gender representation (Maxwell, *ibid.*). From sampling methods that are consistent with qualitative research, I settled for the purposive, also known as judgemental, and the snowball techniques (Neuman, 2014; Cohen et al., 2018).

3.9.1 Purposive sampling

Purposive sampling is a non-random technique which facilitates selection of participants based on specific characteristics, particularly those related to the provision of relevant and plentiful study data (Dowling & Whiteman, 2020; Neuman, 2014; Creswell, 2012). This technique is guided by prescribed selection criteria, and it focuses on a limited number of participants (Ritchie & Lewis, 2003). Characteristics considered in the sampling include being a pre-service teacher with hearing, physical or visual disabilities, senior college authority or teacher educator (Creswell, 2012). These individuals were considered ‘information rich’ and having substantial knowledge or information on the issue under study (Creswell, 2012; Lodico et al., 2010).

3.9.1.1 Teacher educators

I sampled teacher educators that facilitated in Professional studies, a generic subject, which then positioned them to have higher chances of handling many pre-service teachers with disabilities in lecture sessions (Maxwell, 2008). The inclusion criterion was restricted to educators with more than five years’ experience in teacher education. The assumption was that these had sufficient practice with technology mediated teaching and learning approaches. I also took cognisance of gender balance in order to capture gender perspectives that supported or militated against use of technologies. Therefore, one female and two male teacher educators were sampled.

3.9.1.2 Institutional authorities

In this category, focus was on individuals whose responsibilities involved resource procurement and ensuring adherence to policy. The principal was therefore purposively

sampled, as she supervised and monitored procurement processes, as well as the teaching and learning processes (Merriam, 2009). She was therefore well positioned to assist in verifying support for and monitoring use of technologies, as well as provide insight into the procurement modalities.

3.9.1.3 Pre-service teachers

Twelve pre-service teachers were sampled by identifying four from each category of students with physical, visual and hearing disabilities. Among the four with physical disabilities, one did not have arms (Amelia), one had impaired legs (paraplegia) and the other one had impairments on both hands and legs (quadriplegia), whilst the fourth had part of the hand missing (phocomelia). These were purposively sampled to obtain perspectives from persons with varied severity of physical disabilities. Among those with visual disabilities, one had albinism, the second had profound sight challenges, with artificial lenses in both eyes, whilst one was short sighted and the fourth had his right eye seriously affected by a cataract. In the group of students with hearing disability, two were purposively sampled based on the fact that they had hearing aids, whilst the other two were identified through snowball sampling.

3.9.2 Snowball sampling

To circumvent glitches in identifying participants with hidden disabilities, snowball sampling was also used (Neuman, 2014). Participants that had already consented to involvement in this study, helped to identify colleagues with hearing disabilities (Creswell & Creswell, 2018; Cohen et al., 2018). Thus, networking and inter relationship were critical indices in sampling the last two participants, which illustrates respondent driven or networked sampling (Neuman, 2014).

3.9.3 Study programmes and year groups of sampled pre-service teachers

All the twelve pre-service teachers were in their final year of studies. Eight of them were in the three-year, post 'O' level programme, one in the four-year tech/vocational programme, two were in the two-year post 'A' level programme, with the last one being in the 18 months pedagogics programme. Thus, pre-service teachers comprised six female and six male.

The total number of participants was sixteen, comprised of three teacher educators, twelve pre-service teachers and one principal. This figure conforms to dictates of qualitative research, where the number of participants has potential to provide essential information

without over-saturation of participants or research data (Creswell & Creswell, 2018, Mathew, 2008).

3.10 Strategies Used in Gathering Data

Data for this study was gathered through semi-structured interviews, observations and focus group discussions (FGDs). How these strategies were used is outlined below.

3.10.1 Semi structured interviews

Two different protocols were used for semi-structured interviews, which comprised one for the principal and for the teacher educators (see appendix H and I on pages 253 and 256, respectively). Four interviews were then conducted and these enabled comparing and contrasting information from different interviewees (Dawson, 2002; Tracy, 2013). These protocols were structured to solicit responses for sub-questions 1, 2 and 3, where focus was on establishing inclusive practices of using technologies, as well as facilitation processes and experiences of pre-service teachers with disabilities. I interviewed the teacher educators as well as observed their live lecture sessions. Use of the two methods on each of the teacher educators enabled the triangulation of data (Cohen et al., 2018; Cohen & Crabtree, 2006; Ritchie & Lewis, 2003). To avoid disruption on participants' scheduled work responsibilities, I had to seek mutual agreement on timing for the interviews.

While interview protocols had pre-determined sequence, this was not strictly adhered to, especially when participants pre-empted responses to subsequent aspects. In instances where prompts and probes were used for clarity, this resulted in omission of some of the questions to avoid unnecessary repetitions and monotony (Creswell & Creswell, 2018). Each interview lasted approximately one hour, and these were audio-recorded to optimize capturing of detail (Maxwell, 2008). Non-verbal cues like frowns and smiles were captured by short hand as rich data (Schein, 2004). These were then converted to long hand, while the audio recordings were transcribed to word text timeously, since delaying could have resulted in distortions or loss of some critical information (Neuman, 2014; Maxwell, 2008).

3.10.2 Focus group discussions

Creswell and Creswell (2018) describe Focus Group Discussions (FGDs) as expressive dialogical engagements where 4 to 8 study participants examine an issue in contrived settings. Arksey and Knight (1999) similarly, assert that involvement of more than one participant in data gathering yields more robust findings.

Initial intention was to have two focus groups of six members each, as suggested by Fowler (2009). Such composition facilitates collaborative interactions and also provides a non-threatening atmosphere, where participants relate with 'similar others' with common characteristic like having disabilities (Yin, 2011; Lindlof & Taylor, 2011). However, the composition of groups was reduced to four members, in compliance with social distancing dictated by standard operation procedures to mitigate the spread of the Corona Virus Disease (COVID 19). This resulted in three FGDs and each session lasted one and half hours, as recommended by Tracy (2013). The time span for discussions was adequate and prevented exhaustion of the participants' zeal and energy to contribute. The discussions yielded multiple versions of encounters with technology mediated teaching and learning. This enabled cross-checking of complementarity and divergence in viewpoints, besides bolstering wholeness and credibility in the data (Cohen et al., 2018).

Dawson (2002) and Neuman (2014) concur that focus group discussions can be moderated or guided by the researcher or a designated moderator. This entails introducing discussion points, probing for detail and guarding against wandering or side tracking, which requires adequate coaching or induction for effectiveness (Newby, 2020; Lindlof & Taylor, 2011). In view of the foregoing, critical guidance and tutoring was obtained from study colleagues and the supervisor, which helped curtail dominance of more vocal participants and accorded participants equal chances to contribute (Neuman, 2014; Creswell & Creswell, 2018).

Self-moderation of FGDs helped me to keep participants relaxed and motivated, as an independent moderator would be viewed as another intrusive stranger. The created ambient atmosphere enticed participants to express opinions, ideas and perceptions unreservedly (Roediger, 2012). The foregoing scenarios also helped me to experience and maintain ownership of the research data (Newby, 2010).

The structure of the focus group discussion protocol targeted obtaining data to address sub-questions 1, 2 and 3 that focused on practices, facilitation and experiences of technology mediated teaching and learning (refer to appendix J, on page 260). This structure comprised the engagement, exploratory and exit phases in conducting focus group discussions (Bryman & Bell, 2011). The engagement phase focused on raising awareness on the topic, while the exploratory stage entailed investigative discussions and the exit phase ascertained coverage of all intended aspects, as well as solicit for additional information. The discussions were audio-recorded and further complemented with written notes or memos. Although

arrangements had been made for a computer installed with the Job Access with Sound (JAWS) software for participants with visual disabilities, it was later realised that none of them needed such provisions. Furthermore, I had made effort to perfect my basic sign language skills to facilitate interpretation of questions and discussion points, only to discover that these were not needed, because no one had verbal linguistic challenges that needed that.

Focus group discussions proved economical, fast and moderately less complicated to execute, as alluded to by Smithson (2000). They enabled obtaining rich data through participants' own varied perspectives, whose phraseology helped in developing instant deeper intuitions (Cohen et al., 2018). The ideas submitted in the discussions seemed inconceivable in one-on-one research methods like interviews, after noticing that participants could add on each other's contributions (Cohen et al., 2019; Gibbs, 2012). The data gathered enabled detection of support, influences, complementarities, agreements and disagreements on the use of technologies in learning engagements (Arksey & Knight, 1999). I also got an opportunity to engage participants in preliminary data analysis, as I frequently probed them for key aspects they felt were emerging from the discussions (Tracy, 2013). Furthermore, participants could make checks and balances on each other's contributions and further corroborate on truths in the data (Malvin et al., 2012). This scenario facilitated the identification and exposure of absurdity, factual errors and falsehoods, as well as reconciliation of contradictions in study data (Tracy, 2013; Arksey & Knight, 1999).

Cohen et al. (2019) expressed concern on the researcher's limited control over participants in focus group discussions when compared to other one-on-one methods like interviews and questionnaires. The diversity among participants can create challenges with congregating them for scheduled discussions. I circumvented this by tasking one participant to remind others a day prior to the scheduled date. Another concern relates to possible time wastage when discussions digress to issues with little relevance to the study, which was prevented by personally moderating the discussions. At times, participants may also withhold critical personal views, for fear of providing perspectives that are contrary to colleagues, which might then yield 'group thinks' (Leshem, 2012). This speaks to Arksey and Knight (1999), who assert that FGDs can yield 'public line' submissions, which are not necessarily truthful personalised perspectives. According to Cohen et al. (2018), participants can clandestinely connive to withhold information deemed sensitive or confidential, which might deprive studies of pertinent information. Furthermore, failure to reflect on projected techniques for

analysis at planning or during study processes can pose challenges in analysing data gathered through focus group discussions (Malvin et al., 2012).

Other authorities view the number of participants in focus group discussion as inadequate to represent or illuminate perceptions and ideas of the larger target population (Pring, 2015; Denscombe, 2014). Some of the cited shortcomings in FGDs were counteracted by sampling participants with varied disabilities drawn from different study programmes, which enhanced representativeness to the target population. At times focus group discussions accord the researcher unwarranted dominance in research decisions, which might sludge study data. According to Creswell (2014), the researcher might also exert undue influence on choice of the study's contextual settings, sampling of participants or how discussions are introduced, which could influence the data outcomes. Snowball sampling however helped to counteract some of these shortcomings, which reduced my influence on choice of participants, especially those with hidden disabilities (Wellington, 2015).

Initial plans to video record FGD proceedings were abandoned when four of the participants expressed discomfort just before the first session. Although I reassured them of confidentiality, they remained adamant as they felt recordings could be used for sinister purposes by other people besides me. One of them expressed concern that recordings of his deformities could be used for disability analysis in another forum. Audio recording and note-taking had to be used instead to capture the discussions. In addition, I later realised that video equipment was obtrusive, as participants could hold back on critical responses for fear of giving away audio and visual evidence. Others would perhaps feel uneasy or harbour imaginations that the equipment, would be for other clandestine purposes other than capturing the deliberations (Tracy, 2013).

Fowler (2009) asserts that involvement of few members in a FGD helps to uphold anonymity and confidentiality because information is shared in a micro 'public' gathering. I also discouraged sharing information discussed with other persons, as well as divulging information deemed too personal as there was no guarantee that members would maintain confidentiality thereafter (Tracy, 2013).

3.10.3 Observation

Observations involve systematic gathering data in study contexts through visual focus and noting down of the social engagement processes (Yin, 2011). Cohen, Manion and Morrison

(2007) assert that observation provides sturdy visual validity by revealing the participants' contextual first-hand information from mundane practices. Three observations were made in lecture sessions facilitated by the sampled teacher educators. The observations enabled me to capture live verbal and non-verbal occurrence of the study phenomena, which paved way for reality checks (Clark et al., 2009). I was also able to identify some claims by participants which were not reflected in their practice and experiences (Robson, 2002). Observations further helped in detecting aspects that participants would perhaps not divulge in contrived settings, like for interviews (Moyle, 2002).

Creswell (2012) asserts that data from observations is more authentic and valid than that from inferential methods like interviews and questionnaires. In this case, observation enabled gathering of information from live interactional settings as well as examining structure in learning environments and taking note of how the use of technologies influenced interactions and vice versa (Morrison, 1993). Observations are non-interventionist, which prevents the researcher from either manipulating existent study situations or interrogating study participants, except capturing the interactional events. They helped to establish trends and patterns on how technology mediated teaching and learning was practised (Adler & Adler, 1994). According to Marshall and Rossman (2016), observations can focus on practices or behaviours in engagement processes, but in this case attention was on processes of technology mediated teaching and learning that involved pre-service teachers with disabilities. Besides complementing data from interviews, observations broadened the understandings on the 'values-in-use,' accorded to technologies and the manner in which their integration subsisted with other learning engagements (Yin, 2011; Schein, 2004). They also enabled gathering of holistic data from natural social contexts, through the participants' behaviours and related occurrences 'in-situ' (Verschuren, 2003).

The projected observation points were loosely outlined in the observation protocol (appendix K, on page 265) and these comprised actions, behaviours and practices (Cohen et al., 2018). Also included was evidence of session preparation, setting-up of the learning environment and how pre-service teachers settled down in readiness for the lecture session. The protocol further sought to establish the nature of technologies and how these were used to benefit pre-service teachers with visual, hearing and physical disabilities. In addition, focus was on establishing the provision of technologies, whether this was sole responsibility for the institution or for both teacher educators and the pre-service teachers. The structure of items in

the observation protocol facilitated taking note of extent to which the use of technologies influenced students' interactions among themselves and with the teacher educators.

Structure in the observation protocol further left room to capture serendipitous aspects, not initially imagined (Denscombe, 2014). While the observations spanned the entire lecture processes, main focus remained on engagements that involved or targeted pre-service teachers with disabilities. Although focus was on the particular sampled pre-service teachers, there was room to capture instances where others with disabilities were involved, as data enrichment.

This section has provided description of how the three research methods were used to capture views, perceptions and practices related to use of technologies in teaching and learning processes. In all the processes, I remained a critical and inseparable research instrument, as expected in qualitative research (Tracy, 2013; Cohen et al., 2018).

3.11 My Role as the Researcher

I had pivotal responsibilities in this study, which involved interviewing four study participants, namely the principal and three teacher educators. I further observed three lecture sessions and moderated three focus group discussions for pre-service teachers, which substantiates my critical human instrument role in the study (Cohen et al., 2018; Eisner, 1991). I arranged convenient schedules for interviews with teacher educators and these were conducted after lecture observations. I avoided long time lapse between observation and interview for each educator to enable probing and interrelating, as well triangulation of data gathered through the two methods.

Interview with the principal was deferred until after gathering information from the other participants, to facilitate verification and triangulation of data. Triangulation was between research methods and different participants (Maxwell, 2008). Data gathering and analysis were like concurrent processes, as expected in qualitative research, which facilitated initial identification of common and contrasting trends in data (Coffey & Atkinson, 1996).

I maintained a non-participant status, by restricting my role to just capturing observed points without commenting or making any contributions (Creswell, 2012). Although the observed sessions spanned over two hours, I was able to endure these due to my experience of over twenty years as a teacher educator. This was bolstered by experience in supervising and

assessing students on teaching practice, which enabled capturing salient instances where technologies were used.

I divided pre-service teachers into three groups of four, where each group had at least one with visual, hearing and physical disabilities. I also moderated and recorded deliberations, which I complemented with notepad capturing. Although participants could have been grouped according to their disabilities to facilitate easier interactions, others resisted as they felt it was exclusionary. They preferred inclusionary discussions where perceptions, experiences and challenges would be shared among colleagues with different disabilities.

Creswell (2013) posits that background of the researcher can influence the study processes, as well as outcomes from qualitative research, when personal experiences or perspectives bring subjectivity and bias. Creswell and Creswell (2018) similarly advance that presence of the researcher in data gathering engagements may affect trustworthiness in data submissions. A case in point is the ‘Hawthorne effect’, where participants often stage manage behaviours or provide information perceived as required by the researcher, which distorts data (Best & Kahn, 2006; Plant, 2005). I therefore, subjected all data instruments to trial run, which served as a pilot study focused on weeding out biases in the data. This involved members other than the actual study participants.

3.12 Ethical Considerations

Ethics infer behaviour codes that guide conduct and practice of members in a particular occupation (Dowling & Whiteman, 2020). Compliance to these is obligatory whether they are explicitly written down or not. Ethics therefore inform practices that should be upheld or repulsed, which also applies to research studies (Neuman, 2014). I therefore sought precise guidance from mandatory research ethics in entire processes of this study.

As a student at University of the Free State (UFS), adherence to dictates of the Ethics Committee was mandatory, in addition to the general expectations in carrying out educational research (Creswell, 2012). Yin (2014) asserts that research processes require sanctioning by relevant committees on ethics. This study involved persons of vulnerable disposition, hence, strict compliance with standard research ethics was fundamental (Fouka & Mantzorou, 2011; Mills, 2001). According to Cohen, Manion and Morrison (2007), research ethics are premised on respect for humanity and observance of human rights of study participants and other individuals involved. Observance of ethics manifests in circumstances the researcher gives

recognition to the feelings and respect for members involved in a study (Creswell, 2012; Fouka & Mantzourou, 2011). The next segment focuses on how research ethics were imbedded in this study.

3.12.1 Permission to carry out study at the institution

As preliminary processes for data gathering, I sought registration with the Committee for Title Registration (CTR) at University of the Free State (UFS), as accentuated by Creswell and Creswell (2018). The foregoing authors underscore need for academic establishments to designate committees that sanction the research of affiliate members. Pursuant to title registration, I sought clearance from the UFS-General Human Research Ethics Committee (GHREC). Cohen et al. (2018) underscore the significance on who gives consent for a study on behalf of whom and for what purposes. The GHREC, therefore, had mandate to ensure that projected processes of the study conform to sound and acceptable standards in social research.

After obtaining clearance from the ethics committee, I trailed essential channels, protocols, and processes needed to access study participants. This involved request letters for access to the research site and study participants that were submitted to the Ministry of Higher and Tertiary Education, Innovation, Science and Technology Development (MHTEISTD) and the principal, as gate keepers (Cohen, Manion & Morrison, 2018). I only embarked on data gathering after obtaining written permission from the duo authorities.

3.12.2 Participant consent

Yin (2014) views fundamental ethics as comprising protection of the dignity, rights, confidentiality and anonymity of study participants. This compels researchers to unreservedly apprise participants about the purpose of the study to cushion them against emotional risks that could emerge from involvement in the study.

The sixteen study participants signed consent forms prior to involvement in any of the research processes, which provided option to take part or not (Cohen & Manion, 2011). Signing of consent forms confirmed voluntary commitment and approval to have photos taken where necessary, which was premised on full comprehension of the study focus and allied processes. Campbell (2002) asserts lack of reciprocal trust between the researcher and study participants as a factor that compromises dialogical engagements and often yields flawed trustworthiness in studies. I therefore sought to uphold openness and respect to earn

the trust of study participants, which paved way for sincere dialogical interactions. I also assured liberty to withdraw from research processes without risk of penalty or obligation to disclose the reason (Cohen et al., 2018; Creswell & Creswell, 2018).

In cognisance of the obtrusive observation method, it was prudent to protect pre-service teachers not directly targeted by study engagements from possible discomfort (Creswell & Creswell, 2018). I once more sought consent from all students in the groups by explaining nature and purpose of the study. I also assured personal and group freedom to decline approval, should anyone envisage infringement on their rights in the contexts of learning. Since the groups had large numbers, I realised that non-return of consent forms by even one would delay data gathering. I then adopted passive consent, where non-return of the consent form indicated consent. Anyone non-consenting would slip the form into the Dean's office or express reservations with the Student Representative Council (Ellickson & Hawes, 1989; Severson & Ary, 1983).

3.12.3 Anonymity and confidentiality

Confidentiality entails non-disclosure of information provided by study participants in ways that expose their identity or make them traceable during or after the study (Cohen et al., 2011; Hochschild, 2012). Bell (2005) argues that researchers should not present the identities of either study participants or the research site in identifiable form, as this breaches confidentiality. Pseudonyms were therefore adopted in place of actual names that remained anonymous and confidential in data records and the report (Creswell, 2012). Data analysis was done in a manner that avoided pre-disposing study participants, stakeholders and authorities to embarrassment, like physical, psychological or slander of reputation and status (Bogdan & Biklen, 1992). Raw data was never shared with anyone without direct involvement in this study, to sustain confidentiality (Hammersley, 2012; Leedy & Ormrod, 2013).

Interviews were also conducted in environments that provided privacy, which prevented obstructions and chances of eavesdropping by third parties. Gathered data was kept securely and confidentially in a locked cupboard and laptop secured by a password, including a memory disk that I had sole access to.

The measures outlined above provided reasonable anonymity and confidentiality, which allayed fears of possible victimizations of study participants. I also committed myself to upholding or shouldering moral and ethical responsibilities that would safeguard participants

from possible distress or humiliation associated with involvement in the processes of this study (Yin, 2014; Hammersley & Traianou, 2012). This was my critical ethical responsibility to protect study participants as the researcher. Hochschild (2012) argues that participants rarely initiate research; hence, their protection was within purview of the researcher.

3.12.4 Honesty and truthfulness in reporting

Truthfulness remained a fundamental precept as I strictly guarded against falsification and distortions by avoiding any fabrication or misrepresentation of study data (Cohen et al., 2018; Creswell, 2013). I ensured holistic and accurate documentation of findings, in view that the study report would be accessible in the public domain (Gallaher, 2009). The reporting was honest and avoided accusatory connotations for either participants or other stakeholders, which sustained mutual trust with the participants (Bogdan & Biklen, 1992). This illustrates that carrying out this study was not for fault finding but facilitate mutual learning with the researched and contribute to the existing body of knowledge.

3.13 Trustworthiness of Findings

Lincoln and Guba (1985) assert that extent of credibility, dependability, confirmability and transferability as critical elements for trustworthiness in a study. Cope (2014) further acknowledges these as fundamental determinants of usefulness and integrity of study findings. Trustworthiness determines the extent of confidence accorded to study data, its interpretation and research methods used, which ensures that it satisfies expected quality standards (Polit & Beck, 2014). Additional indices factored in to strengthen trustworthiness were rigour, member-checking, prolonged engagements, piloting of research instruments, counteracting researcher biases, rich descriptions and negative analysis (Lincoln & Guba, *ibid.*). These bolstered one or more determinants of trustworthiness, like credibility, dependability, confirmability and transferability (Connelly, 2016). Polit and Beck (2014) equate trustworthiness to rigour, since the latter should permeate entire study processes to guarantee sufficient trustworthiness (Polit & Beck, 2014; Cope, 2014).

Literature reports that qualitative approach is mired by intense debate regarding reliability and validity of resultant findings. For instance, Wellington (2015) argues that events and processes that involve human interactions may not be replicated to yield similar results, which can be verified and validated like in quantitative research. However, Ponelis (2015) notes that qualitative researchers circumvent such controversies by avoiding terms like

reliability and validity in their reports. Likewise, I adopted terms like credibility, dependability, confirmability and transferability to embody trustworthiness in the findings.

3.13.1 Credibility

Credibility is an alternate to validity, a term commonly used in quantitative study. Whilst the validity index provides some form of guarantee that a study truly appraises what it set out to measure, credibility measures congruence between research findings and actual occurrences on the ground. Polit and Beck (2014) affirm credibility as the mainstay criterion for trustworthiness in a study. Likewise, Bloomberg and Volpe (2008) argue that credibility represents extent of corroboration between narratives in a study report and perceptions, attitudes, as well as practices shown by participants. However, Lodico, Spaulding and Voegtler (2006) argue that when variance emerges between findings and reality, this may not necessarily indicate lack of credibility, but the researcher needs to clarify the dissonance to sustain credibility in the findings. To strengthen credibility, I engaged in note taking, persistent observations, adopted a prolonged stay in the research settings and triangulated the data (Lincoln & Guba, 1985).

3.13.1.1 Credibility of the researcher

My credibility as researcher was equally critical since I was the major instrument in data and analysis. As the researcher, my credibility was premised on my thirty-seven years' experience in education, comprising sixteen years in secondary education and twenty-one years in teacher education. The experience had exposed me to research engagements and supervision of research activities by pre-service teachers. I therefore possessed fundamental awareness of how methodology influences vital research stages and resultant findings. This made me vigilant about personal dispositions and biases that could influence processes and findings of the study. Beltez (2015) and Hammersley and Traianou (2012) concur that the researcher's background such as cultural values, beliefs and other social persuasions often bring biases into the study. I therefore had to introspect on these aspects and also consciously guard against personal prejudices like a penchant for students in the margins, which could have coerced commenting on practices that seemed to infringe on the rights of students with disabilities. To avoid any influence on data submissions, I maintained a neutral researcher position where focus was just on capturing data. Best and Kahn (2006) admit that positionality of the researcher can weigh heavily on credibility of the study. I therefore

shredded any perceived or real sphere of influence on any of the participants through de-rolling and upholding researcher status in all engagements of his study.

3.13.1.2 Prolonged stay

Prolonged engagement is fundamental for credibility, especially in qualitative case studies (Connelly, 2016). In cognisance of that, I endured nine months in the research field, which added rigour and bolstered credibility of the study findings. Hamilton and Corbett-Whittier (2013) assert that spending substantial amount of time in contexts of the researched yields deeper insights in case studies and embeds rigour. While data gathering processes were not done on each day of the nine months, the time was used to nurture cordial and deeper relationships with study participants. Data gathering was also intermittent, due to effects of COVID-19, which forced staggered days for lecture sessions such that others would be away from the institution for days. The prolonged stay enabled me to engage in casual discussions with pre-service teacher participants; during break or lunch times and even after lecture sessions. This facilitated unstructured observations and interviews that helped build trust and allay participants' fear of divulging personal perceptions, beliefs and information deemed sensitive or confidential to a stranger. It also yielded additional information recorded in memos as field notes, including participants' biographies used to describe the study context in Chapter 4. Tracy (2013) admits that such techniques create favourable operating relationships between the researcher and the researched. The developed rapport enabled observation of practices, behaviours and factors that might have remained concealed, if hurried data gathering had been adopted (Lodico et al., 2006). Even exiting the research site was not in haste in view of the good relations developed with participants, which made severing of links brusquely inconceivable (Tracy, 2013; Bogdan & Biklen, 1992). To show respect for the participants, I had to acknowledge and express my appreciation to the study participants before exiting. This prevented unannounced and abrupt departure which would reduce participants to mere 'objects' that are exploited and discarded at will (Leavy, 2017). Upon informing participants on plans to proceed to data analysis, I gave room for continued communication, for additional information, checking on study progress or just casual conversation.

The prolonged stay familiarized me with contextual social networks and power relations that allowed me to penetrate and decipher social networks amongst students with varied disabilities and colleagues with no declared disabilities (Klenke, 2016). Lincoln and Guba (1985) assert that considerable stay in the field boosts trustworthiness in the findings.

3.13.1.3 Triangulation

Yin (1994) asserts that triangulation assists in the endorsement or disapproval of credibility in processes of a study. In this study, three research methods were used to examine similar phenomena, which paved way for triangulation of data credibility. Triangulation was based on research methods and data sources, which sought to enhance confidence in the findings (Ritchie & Lewis, 2003). Inter - method triangulation focused on data from interviews, focus group discussions and observations, which was then compared and contrasted. Clearly, interviews and focus group discussions overlapped, as they often solicited for data regarding similar aspects (Amankwa, 2016). The strengths of each method therefore pacified limitations in the others. Inter-data source triangulation entailed comparing and contrasting data from pre-service teachers, teacher educators and the principal (Ritchie & Lewis, 2003). This helped to verify congruence and diversity of viewpoints among key players in teacher education, which yielded an opulent picture of practices and experiences in technology mediated teaching and learning at the institution. Triangulation therefore strengthened credibility of data (Lincoln & Guba, 1985).

The use of multiple data sources strengthened data triangulation, which illustrates eclectic gathering of data. Furthermore, adoption of varied instruments yielded diverse, but mutually complementary perspectives and interpretations (Cohen et al., 2011). The assortment of methods and data sources ameliorated real and perceived short falls ingrained in the adopted research methods, which assisted in navigating broad and unique perceptions of the participants (Gay et al., 2011). These symbolise triangulation through multiple research methods, where data on a common research issue was gathered through four interviews, three focus group discussions and then complemented by three lecture session observations that helped to verify claims by participants. In some instances, analogous findings emerged from diverse sources, which bolstered credibility of findings. Besides diverse data instruments, study participants were drawn from more than one stratum, which comprised of educators, pre-service teachers and an administrator. Thus, diversity in research tools and participants facilitated robust data triangulation. Furthermore, the pre-service teachers were carefully sampled to involve those from different study programmes and year groups. In addition, gender equity was also considered, which augmented data triangulation, particularly, on influence of gender in the use of technologies.

The methods of gathering data adopted had undergone long usage in research, which exposed them to numerous critiques and further development. This positioned them well to address

related factual and or perceived inadequacies, which brought confidence in their collaborative capacity to screen inconsistencies in study data. As indicated earlier, some of the methods were overlapping to solicit for similar information, which strengthened triangulation. The research instruments were also structured to obtain information that addressed the study's first three guiding objectives, which enabled multi-focus on objectives, to verify data authenticity and accuracy. Comparing and contrasting data from the multiple instruments helped in detecting divergences and convergences in data, which exposed commonality and divergence in participants' opinions and perspectives, as an additional index for data triangulation.

3.13.1.4 Inclusive analysis

Inclusive analysis is another critical index for credibility that added trustworthiness by helping to explore alternative explanations to occurrences and perspectives in data (Creswell, 2012; Connelly, 2016). Although some patterns emerged and recurred in early stages of analysis, this did deter further examination of data as recommended by Silverman (2001). I had to exhaust all data cases before coining conclusive finding. Thus, homogenous data patterns that emerged at the outset of analysis were shrugged off to avoid hasty conclusions until after all related information had been analysed. For instance, early analysis of focus group discussions data inferred low use of technologies by teacher educators, but data from interviews and observations later revealed that they also allowed and facilitated use of personal technologies which supported pre-service teachers with disabilities. Thus, ready emerging commonality traits in data did not make me complacent, as even uncommon findings were not considered trivial or not worthy noting (Lodico, et al, 2006). I therefore continually explored any serendipitous findings in pursuant of negative analysis, particularly, on issues not initially imagined to be found in this study, which yielded additional insights. They also further enriched the findings and helped to uncover concealed factors that act upon the study phenomena to strengthen credibility of findings (Connelly.2016).

3.13.2 Dependability

Dependability seeks to ascertain the extent to which findings from a qualitative study convinces the reader of authenticity, in relation to practical occurrences on the ground (Cohen et al., 2011). In earlier paragraphs, I provided description of contexts in which this study was conducted, as well as the research design and how it was applied (Lichtman, 2010). I also explained the phases in data gathering, which strengthened the dependability index in this

study. Dependability enhances data stability, so that it can be sustained over a considerable period under similar conditions, In view of that, I boosted this through peer reviews and debriefings, among other measures.

3.13.2.1 Peer review

I sought independent checks on research processes by one work colleague and two fellow doctoral candidates, whose critical reviews and advice informed fundamental adjustments on methodological aspects (Merriam, 2009). Their feedback was written and at times verbal, depending on the issue being focused on. For instance, I had to reduce the length of some data instruments that could have put off other participants. Peer review also exposed emerging dissonances and similarities in research processes that compelled data re-examining and verification to bolster dependability.

3.13.2.2 Debriefing

Data gathering can be overwhelming; hence, it requires scholarly reviews and ideas from trusted colleagues (Lodico et al., 2006). I therefore, engaged in periodic peer de-briefings, besides continuous guidance from my study supervisor. I requested the services of a colleague pursuing doctoral studies, who provided critical reflections in entire study engagements and processes. These included discussions prior to and timeously after significant research engagements that yielded collaborative reflection on study progress (Cohen, Manion & Morrison, 2011). This also availed an additional set of eyes and intellectual prowess, which brought newer intuitions into processes of the study. We engaged in de-briefings at the piloting of instruments, transcription and analysis of data, as well as at discussion of findings. Second opinion was critical during data transcriptions, as it provided views that helped to curtail misrepresentations and loss of crucial perspectives (Lodico et al., 2006). Therefore, peer de-briefing complemented guidance on sound research practices obtained from my supervisor. I also kept an audit trail of all study processes like notes from peer debriefings, specific data gathering processes and persons involved, including any unanticipated issues that emerged. These served as an audit of activities and critical decisions made (Polit & Beck 2014).

3.13.2.3 Truthfulness in data

To ensure that data gathered was truthful, multiple types of instruments were used, which helped to uphold consistency and also buttress dependability (Cohen et al., 2011). Structure of the instruments captured well thought out aspects, which helped to encourage participants

to provide honest responses. These responses and interpretations have potential to be sustained in related studies that adopt similar frameworks (Polit & Beck, 2014). Therefore, interpretations from similar studies on similar phenomena are likely to converge with those yielded, if existing circumstances are not changed (Connelly, 2016).

3.13.3 Transferability

Transferability was another index of trustworthiness incorporated in this study. Connelly (2016) views transferability as extent to which findings are perceived as useful to the wider population and similar contexts. Lincoln and Guba (1985) similarly posit that it denotes the degree to which findings are applicable in contexts with like circumstances. This assists readers to reflect on applicability of the findings to their own circumstances or contexts (Polit & Beck, 2014). Transferability differs from ‘generalisation’ used in quantitative study, in that focus is on stories from study participants that are not inferred to everyone else, unlike the latter which is used to validate findings in other contextual settings based on statistical data gathered. However, due to prevailing social dynamics and uniqueness, findings from case studies cannot be easily externalised (Lincoln & Guba, 1985). Despite the foregoing perspective, I believe this case study bears likeness to the scenario in some institutions, which makes the findings transferrable to these (Cohen & Crabtree, 2006). This perspective enthused provision of clear elaboration on procedures of data gathering and lucid descriptions of study context and characteristics of the participants. The elaboration enables readers to deduce similarities or differences with own situations, as they determine extent of transferability. Furthermore, I gave clear explanations on methods and procedures in data gathering, coupled with explicit outline of time lines of study engagements.

3.13.3.1 Data gathering and analysis

Literature affirms use of appropriate sampling procedures as a factor that helps to obtain data with significant transferability to the target population and similar contexts (Adelman, 1980). Data obtained through the sampled pre-service teachers and educators seemed representative to others in similar circumstances, at this and perhaps other institutions in Zimbabwe (Adelman, 1980). Suitable one on one techniques have been used to gather and objectively analyse the study data (Adelman, *ibid*). This is evidenced by the similarity noted between the pilot study and main study data that was gathered from members from the same institution. This speaks to Cohen and Crabtree (2006), who assert that transferrable data should sync well with that gathered through similar methods. I frequently used memo recordings to question

and reflect on study data, including my personal conduct in study processes. This yielded a vivid informative picture for readers of this report, who can therefore, appraise or repeat similar methods and procedures in similar subsequent studies (Connelly, 2016; Amankwaa, 2016). Findings from this study illuminate successes and challenges in preparing pre-service teachers with disabilities at the institution, besides adding to the existing body of knowledge. Information gathered through interviews, observations and FGDs recordings were systematically transcribed to ensure easy compilation of data narratives. I also captured verbatim phrases from the participants, as rich and thick data, which provides vivid descriptions of settings for the study (Creswell, 2013). Quoting participants' voices curbed data misrepresentations, besides reducing any biases and subjectivities (Geertz, 1973). The analysis of data followed established trajectories for qualitative data, which circumvented any allure for short cuts. Thus, five analytic stages used comprised; compilation, disassembling, reassembling, interpreting and concluding, as explained later in this report (Yin, 2011).

3.13.4 Confirmability

Study participants and experts in the field related to phenomena under study are well positioned to authenticate the findings with objectivity (Creswell, 2012). Their appraisal helps to establish the extent of confirmability based on impartiality noted in study processes (Polit & Beck, 2014). In justifying approaches and methods adopted in this study, I also explained their weaknesses and the measures taken to counteract them (Gray et al., 2011; Cohen & Crabtree, 2006). In the presentation of findings, I largely focused on revealing ideas and experiences of participants, not personal inclinations, which braced confirmability. The participants' verbatim narrations were frequently used to capture their candid submissions, which prevented spurning of any detail that seemed trivial or unpalatable. These narrations were extracted from the study's audit trail records like transcriptions, field notes, memos and journals (Saini & Shlonsky, 2012). Such practice showed transparency in the processes of data gathering, such that anyone interested can examine these with ease. Evidently, the findings emerged from genuine data which can be examined for personal biases to prove my little or no influence on outcomes of the study.

3.13.4.1 Critical reader

One of the two peer reviewers also acted as the critical reader, who then trailed processes of generating themes from data, to ensure that processes were logical and credible. This helped to guard against sole focus on pre-conceived themes, which paved way for newer themes to

also emerge from the data (Cohen et al., 2011). This practice illustrates audit trail on methodological and analytical processes, where I captured and retained commentaries on research processes. These historical accounts of the study enable interested persons to easily search for prejudicial beliefs or pre-conceptual influences. The critical reader had access to periodic methodological memos and notes on major decisions concerning research processes, like records of activities regarding data gathering and its analysis. The critical reader helped to develop rival explanations to data and other related occurrences.

3.13.4.2 Relations with study participants

Confirmability in this study was further bolstered through adherence to research ethics, as guided by expectations of the UFS committee on research ethics. Cognisant that good relations would enable participants to volunteer comprehensive information, I nurtured harmonious relations with them. I therefore unreservedly disclosed all aspects of this study, so that participants would not be surprised when they encounter situations perceived as deceptive or exploitative, even in the study report. I also encouraged participants to use non-stigmatising language to prevent denting the morale of colleagues. This included avoiding commenting on a colleague's disabilities. This illustrates 'beneficence', where I strived to shield participants from adverse or harmful situations that could arise through the study engagements (Cohen et al., 2018; Lichtman, 2010).

3.13.4.3 Member checking

A few participants were asked to verify authenticity of data recordings and transcriptions against ideas and opinions they had expressed, which validated the findings against submitted perspectives (Creswell, 2013; Maieta, 2002). This included checking and re-checking of data accuracy, which enhanced rigour in this study (Yin, 2011; Cohen et al., 2018). Member-checking was done during data gathering, after analysis and compilation of the report. Creswell (2012) asserts that it is prerogative of the researcher to decide on frequency in member checking and participants involved, since all of participants cannot be given access to the manuscript.

Emerging major findings were frequently shared with participants involved in member checking and this helped to flush out distortions and misinterpretations (Creswell, 2012). Their feedback informed adjustments on noted perversions, which made the study report more reflective. Lincoln and Guba (1985) assert that study participants can accept, disown or recommend rephrasing of information in the study manuscript. In this case, they confirmed

authenticity of presented perspectives in both the manuscript and final report. There were only a few aspects that were perceived as too candidly stated and perhaps unpalatable to the administration. For instance, excerpts that implied meagre institutional support, which I had to rephrase.

A chance arose to present the study at a local research conference for teacher educators (TERC-Zim 2020), which gave opportunity for member-checking (Connelly, 2016). On submitting both abstract and preliminary research report, reviewers expressed interest and lauded findings, which illustrates confirmability of the study outcomes (Creswell & Maieta, 2002). However, more could have been gained from oral presentation, but the conference got deferred due to restrictions necessitated by the outbreak of Corona Virus Disease (COVID 19).

3.13.5 Pilot Study

I piloted data instruments through a trial run to eliminate ambiguities and subjectivities. Lodico et al. (2006) posit that capacity in research tools to gather truthful views on occurrences in specific study settings can be ascertained through a trial run. Thus, piloting of instruments helped to project credibility of data for the main study.

Leedy and Ormrod (2013) describe pilot study as preliminary investigative exploration undertaken to establish efficiency and effectiveness of instruments, research procedures and techniques, before gathering final data. Bless et al. (2006) further consider it as mini research carried out before the main one. The pilot study helped to ascertain suitability of the chosen methodology and its capacity to yield credible findings. This included sampling procedures, research instruments and projected techniques for data analysis. Piloting also verified the capacity of research instruments to convey intended meanings and obtain appropriate responses. Results of the pilot informed adjustments on procedures of gathering data, as well as rephrasing of instruments to remove ambiguities, inadequacies and biases (Yin, 2014). These results also projected on probable data for the main study.

In piloting of interview and observation protocols I involved two teacher educators and one head of department. These were a gentleman and lady with ten years' experience in teacher education, whilst the head of department had been in the post for five years and often acted as vice principal. Piloting the protocol for focus group discussions involved four pre-service teachers with visual, hearing and physical disabilities who were in final year of study. All

those involved in piloting were not participants for the main study. The pilot study helped me to reflect on initially conceived research procedures and enabled identification of probable themes and sub-themes, as insight on data analysis.

3.13.5.1 Report on the pilot study

Findings of the pilot study helped to condense the two initial interview protocols for teacher educators into one, after realisation that one session would suffice. I also removed the requirement for participants' age from the interview protocol, as I noted discomfort associated with it. Moreover, it gave no additional insight since experience in teacher education was more critical. I also reduced noting points in the observation protocol to weed out repetitiveness. Some of the observation points proved to be too specific and restrictive; hence, these were broadened to embrace wider aspects of technology use. I also removed aspects on students' discipline, after realising that it had little relevance to the use of technologies. These adjustments reduced the protocol's pages from nine to four. Reference to the universal design for learning (UDL) theory and the substitution augmentation modification redefinition (SAMR) framework was further embraced on aspects that examined inclusiveness and use of technologies at various session stages. From the pilot study results, I noted that UDL and SAMR were not familiar frameworks; hence, I resolved to avoid mentioning them explicitly in interactions with participants. I then used descriptors instead, although these frameworks were kept at the back of my mind. Such a response resonates with Plant (2005), who discourages use of terms that are unfamiliar to study participants during data gathering interactions. I also noted challenges in comprehending some statements on interview and focus group discussion protocols, which I then rephrased. In spite of the above cited observations, the findings affirmed the instruments as satisfactorily effective, considering that some data sub-themes were already emerging. Sub - themes like policy support, challenges and benefits of using technologies for students with disabilities emerged and these provided projections on approaches for data coding, as preliminary analysis of data.

3.13.6 Addressing personal biases

Patton (1990) argues that the researcher's biases often affect trustworthiness, credibility and dependability of findings, especially if the researcher somehow contributes to study data. I had to make conscious and honest introspection on personal prejudices that could compromise data gathering and analysis. For instance, I strived to suppress personal interest in issues concerning persons with disabilities, to purge subjective tendencies. Yin (2009)

proposes accrual of ‘a chain of evidence’ through the use multiple data sources, which reduces bias. Multiple research methods and diverse participants were then involved in data gathering. Research methods used include interviews, focus group discussions and observations, whilst data sources comprised pre-service teachers, teacher educators and the principal. During interviews and focus group discussions, I listened attentively and probed for additional information, only after participants had finished their narrations to prevent subjectivities and biases. I also kept reflecting on all research activities, as these unfolded.

3.14 Period for Gathering Data and Plan for Analysis

Gathering of data stretched from end of February to November 2020, which conforms to qualitative research. This approach accords great significance to considerable stay in the research field, to yield in-depth understanding of study phenomena and enhance trustworthiness of findings (Creswell, 2018; Cohen et al., 2018).

3.14.1 Procedures for data analysis

Data processing started as a concurrent engagement with its gathering (Maxwell, 2008). I adopted a thematic approach, where data was coded and categorized based on relatedness (Coffey & Atkinson, 1996). Coding enabled re-arranging of data into categories that supported easy understanding of practices and experiences of technology mediated teaching and learning (Bogdan & Biklen, 2006; Creswell, 2018). Coding helped to structure data in readiness for written interpretive discussions. This facilitated easy retrieval of excerpts needed during compilation of the report (Neuman, 2014; Miles, Huberman & Saldana, 2014).

Cognisance was taken that fragmenting data into themes could cause analytical oversight, where ideas not fitting in pre-determined themes are either lost or not further developed. This necessitated use of both organizational and substantive theme approaches, where organisational themes represented broad topical issues conceived even prior to data gathering, whilst the latter emerged from data (Maxwell, 2008). I obtained initial direction from the organisational themes and later used participants’ perceptions and beliefs to construct substantive themes, which curtailed suppression of their conceptions regarding influence of technology mediation (Maxwell, 2008, Creswell & Creswell, 2018; Corbin & Strauss, 2007).

I compared and contrasted data from interviews and focus group discussion, which I then complemented with observation data. This helped to quash apprehension that analysis of qualitative data can be subjective and biased. I also selected a few study participants to verify

and authenticate the transcription of data from interview and focus group discussion recordings. These were braced by reports of peer reviews, as well as the supervisor's expert feedback. As conformity to systematic analysis of qualitative data, I trailed five analytic phases as proposed by Yin (2011). These comprise data compiling, disassembling, reassembling, interpretation and concluding, which are explained in the next section.

3.14.1.1 Data compiling

This entailed structuring information gathered from the study field into a data base that would facilitate deeper and more rigorous analysis. This facilitated easy access to the field notes in later phases of analysis, especially when I needed to verify specific detail. It also reconnected and familiarized me with field notes captured in memos and other records, considering that multiple data sources and research tools had been used. Reading through the reports enabled me to reflect and link data with literature reviewed in chapter two. Similarly, I was able to revisit transcriptions of the interview and focus group discussion recordings. These were revisited, compared and cross checked to establish and complete any unfinished transcriptions or omissions. Considerable time was spent at this stage, which helped to maintain links between data, study objectives and other distinctive aspects like emerging serendipitous issues.

3.14.1.2 Data disassembling

This was the second analytic phase, which may be perceived as fracturing or reduction of data (Yin, 2011). Fracturing and reduction might sound as breaking down data in an undesirable manner (fracture) or mere condensing (reduction). However, this involved coding data, making it easy to manage. I used open coding to identify and tag related information (Auerbach & Silverstein, 2003). Disassembling assisted me to adjust some initial ideas to accommodate newer emerging conceptual perspectives. The resultant modifications were then captured in memos to facilitate retrieval that supported subsequent analysis. Analysis of data was iterative, as evidenced by frequent cross referencing and linking of emerging ideas with earlier ones (Saldana, 2009). Initial coding was based on the organisational technique, where I used categories conceived at study outset and from pilot study results, which was then later substantiated through substantive coding. Thus, behaviours, opinions, perceptions and explanations captured at the Compilation phase were integrated to yield sub-categories (Strauss & Corbin, 1998). Data gathered through the different instruments was therefore, sorted into similar and dissimilar groups.

3.14.1.3 Data reassembling

Coding and sorting of data at disassembling facilitated the identification of broad patterns that gave projections on the meanings of data that could be used to inform the topic and address the study's objectives. Disassembling provided clues on how data could be reassembled in the subsequent phase. In data reassembling, I further integrated the codes to conceive broad themes (Hahn, 2008). I then examined and sorted these to establish usefulness of study data in relation to earlier outlined ontological and epistemological persuasions. I then extracted concrete data from the data base, where I used similarities to organise and create fewer higher abstract groupings, as themes, which provided base for analysis and deducing interpretations.

3.14.1.4 Data interpretation

Interpretation was the fourth analytic phase which was informed by earlier conceived themes. This was the pinnacle of data analysis where meanings were deduced from data to facilitate conveyance of the study's value to the public. Focus was initially on interpreting individual themes that were later combined to yield comprehensive sturdy interpretations.

3.14.1.5 Concluding

Concluding was the final phase of data analysis, where implications and lessons derived from the study were captured. I adopted multiple conclusions that were then linked to the Interpretation phase and main findings of the study. These were complemented by broader ideas and overarching statements that elevated the conceptual level of the findings. This approach facilitated capturing of more pragmatic implications and helped to establish grey areas that could be targeted in future studies.

3.15 Chapter Summary

This chapter has provided descriptions of the research design and methodology as well as their connectedness in this study. The chapter affirmed choice of these to have been based on 'fitness for purpose' as evidenced by their effectiveness and efficiency in entire engagements of this study. It also elaborated on how social constructivism was embraced to reveal reality in the use of technologies by pre-service teachers with disabilities. The chapter also clarified how the qualitative approach assisted in fore-grounding participants' beliefs, attitudes and lived experience in examining contextual reality related to study phenomena. Thus, it helped

justify choice of the case study and how it influenced use of interactional study methods like observation, interview and focus group discussion.

The chapter also provided descriptions of the research population, sampling techniques, research site and study participants. Furthermore, techniques used to sustain rigour and trustworthiness in the study were elaborated through explanations given on; credibility, dependability, transferability and confirmability. It also outlined ethical considerations and the period in which data was gathered. Although data gathering stretched from February to November 2020, this chapter illuminated how intermittent it was due to restrictions related to the COVID 19 pandemic where other study participants would be away from the institution. The chapter further explained data analytic strategies, which provided basis for the analysis presented in the next chapter.

CHAPTER 4: DATA PRESENTATION AND ANALYSIS

4.1 Introduction

In this chapter, I analyse data gathered from twelve pre-service teachers, three teacher educators and one principal. Data was gathered through focus group discussions, interviews and observation of lecture sessions. The analysis captures verbatim narratives, which gives participants a ‘voice’ to authenticate their perceptions in the report. Analysis is guided by three main themes that are complemented by sub-themes which emerged from data captured in the reports from interviews, focus group discussions and observations. A concept summary of the main themes, sub themes and conceptual categories is presented in Table 4.3.

4.2 Context of the Study

This section gives an outline on study participants and examines frameworks that informed and guided use of technologies in pedagogic contexts to benefit pre-service teachers with disabilities.

4.2.1 The Participants

Participants in this study comprised teacher educators and pre-service teachers with disabilities and a principal from one teacher education institution. A clearer picture of these can be obtained from table 4.1 for the staff members and table 4.2 for pre-service teachers. The principal and teacher educators are identified by pseudonyms given in column one of table 4.1. Information in the table shows gender balance among them and all had more than five years’ experience in teacher education. They all had post graduate qualifications and were teaching subjects under the professional studies department that include health and life skills education, classroom management and educational media technology, except for the principal who was non-teaching. Chimbadi and Mbofayo were pursuing doctoral degrees in Education for Sustainable Development and Educational Leadership and management, respectively, at different universities.

Table 4.1: Biographical data and experience of the principal and teacher educators

Participant	Designation	Gender	Qualifications	Experience	Discipline taught
Mbofayo	Principal	F	PhD. Candidate	30 years	Non-teaching
Chimbadi	Lecturer	F	PhD. Candidate	26 years	Education for Sustainable Development, Health and Life

					Skills Education
Barakasi	Lecturer	M	M.ED	11 years	Classroom Management
Chibwe	Lecturer	M	M.ED	10 years	Educational Media Technology

Pre-service teachers are identified by codes and pseudonyms in columns 1 and 2 of Table 4.2. Their study programmes were a three year - post ordinary 'O' level; a two - year post Advanced 'A' level; a four -year technical /vocational and a sixteen months Pedagogics. The programmes enrolled holders of Ordinary and Advanced level passes respectively, whilst the pedagogics programme accommodated those with diplomas in technical subjects and the technical/vocational group enrolled holders of diplomas in technical subjects. This is proof that pre-service teachers were from different programmes, disciplines and levels of study.

Table 4.2: Biographical data, study programmes and study disciplines for the pre-service teachers

Code	Pseudonym & Nature of disabilities			Study area & level		
	Participant	Disability & Gender		Programme	Subject	Level
S12	Tsitsi	Physical: Amelia – <i>has no hands and uses toes for writing</i>	F	Pedagogics (1½yrs)	Computer Studies	2 nd yr.
S11	Gidza	Physical: Phocomelia – <i>left arm amputated, uses right hand only</i>	M	Post 'A' level (2yrs)	Mathematics	2 nd yr.
S3	Kesie	Physical – Quadriplegia – <i>hands and legs impaired</i>	M	Post 'O' level (3yrs)	Computer Science	3 rd yr.
S1	Jud	Physical: Quadriplegia- <i>upper & lower limbs impaired.</i>	F	Post 'O' level (3yrs)	Mathematics	3 rd yr.
S10	Richie	Hearing & Physical: <i>non-functional left ear & impaired left leg and uses a crutch</i>	M	Tec/Voc (4 yrs.)	Wood Technology	4 th yr.

S2	Jimmy	Physical and hearing: Left leg affected by Polio & uses a crutch.	M	Post level	'A'	Geography	2 nd yr.
S8	Phedie	Hearing: <i>Does not hear clearly, sounds that are 10 metres away.</i>	F	Post level (3yrs)	'O'	Technical Graphics	3 rd yr.
S5	Gemu	Hearing: <i>Can't hear distant sounds</i>	F	Post level	'O'	Physical Education & Sports	3 rd yr.
S9	Tinny	Visual: <i>Short sighted, difficulty seeing without spectacles.</i>	F	Post level (3yrs)	'O'	Physical Education & Sports	3 rd yr.
S4	Biala	Visual: <i>can't see distant objects, but has no spectacles.</i>	F	Post level	'O'	Physical Education & Sports	3 rd yr.
S6	Klerk	Visual- sight affected by Albinism:	M	Post level	'O'	Science	3 rd yr.
S7	Titie	Visual: <i>Has artificial lens in both eyes & can't see without them or when they have expired</i>	M	Post level (3yrs)	'O'	Mathematics	3 rd yr.

4.2.2 Global, ministry and institutional guiding frameworks on inclusive practices

Ideally, issues of inclusiveness and technology use in academic processes require explicit guiding frameworks. I therefore asked participants to cite frameworks that guided practices of Inclusive Education and use of technologies in the preparation of pre-service teachers with disabilities. A summary of their responses is presented in table 4.3.

Table 4.3: Frameworks that supported inclusive education and the use of technologies

Name of framework	Participant that cited it
Ministry of Higher Education Policy on Inclusive Education	Chimbadzi, Mbofayo, Barakasi,
Sustainable Development Goals (SDGs)	Barakasi
Millennium Development Goals	Barakasi
Constitution of Zimbabwe Amendment Act No. 20 of 2013	Barakasi, Chibwe
Convention on the Rights of Persons with Disabilities (CRPD)	Chibwe, Barakasi
Institutional Strategic Plan 2019-2023	Mbofayo

While commenting on frameworks that guided Inclusive Education and technology use for pre-service teachers with disabilities, Chimbadzi (a teacher educator) remarked, “I do not know of any, except that I have heard of a policy on Inclusive Education, which also incorporates disabilities.” It would seem Chimbadzi was operating without guidance from any framework on Inclusive Education and technology use. Similarly, Mbofayo (the principal) admitted, “There are policies at national level, but then, at institutional level, we just pick directly from the global and national frameworks.” The above narration indicates a lack of relevant home-grown policy at the institution, which left teacher educators relying on national policies and global conventions.

Barakasi (a teacher educator) cited the following as guiding frameworks: the Constitution of Zimbabwe section 20, of 2013, Millennium Development Goals (MDGs), Sustainable Development Goals (SDGs) and the Ministry of Higher and Tertiary Education’s policy on inclusive education.” Although he did not elaborate on what each framework entailed, he showed conviction that these frameworks had capacity to inform societal interactions and engagements that involve pre-service teachers with disabilities.

Chibwe (another teacher educator) remarked, “Everything concerning education for students with disabilities is drawn from the UN Convention on Education to the Constitution of Zimbabwe, government policies and college policies.” It appears he meant the United Nations Convention on Rights of Persons with Disabilities (UNCRPD). Although Chibwe could not identify the convention properly and also elaborate on what it espoused, he demonstrated awareness of its existence. Chances are that Barakasi and Chibwe referred to the cited frameworks for guidance in pedagogic interactions with the pre-service teachers. Mbofayo added the institution’s strategic plan for the period 2019 – 2024 and she provided a copy of it. On perusal, I noted subtle intent to promote inclusivity and the use of technologies. My attention was particularly, drawn to the Vision, Mission, and Core Values, as well as the strategic goals. The Vision was outlined as follows: ‘To be a centre of excellence in the production of patriotic and professional school teachers by 2020.’ By envisioning attainment of centre of excellence status, this indicates that the institution had projections on embracing contemporary methods like technology mediated teaching and learning as well. Implications appear to have been on incorporating technologies in moulding teachers, notwithstanding their disabilities.

The Mission statement was stated as, ‘To produce competent, innovative ... teachers.’ The statement seemed to suggest that competences could be developed through imparting teaching skills, regardless of one’s abilities or disabilities. It also encouraged inclusiveness and adoption of strategies that optimize learning. The mission was supported by core values on Professionalism and Innovation, which are cited below.

Core Value on Professionalism:

Every person at the college should be treated as being inherent worth. This implies that every student ... should be approached as a person capable of thinking and learning. Respect should be regardless of ...and outward appearance ... Honesty and fairness to one another should be exercised in the distribution of favours and burdens, in the handlingof students.

The core value on Innovation was phrased as, ‘The College aims to equip prospective teachers with necessary and sufficient competencies to design meaningful and authentic learning environments that are engaging for learners.’ Closer analysis reveals that the core value on ‘Professionalism’ highlighted equal treatment, which embraces pre-service teachers with disabilities, whilst that on Innovation infers creation of environments that support participation to enhance development of teaching skills. Both core values seem to focus on enhanced participation and curtailing hindrances that relate to disabilities.

Furthermore, overarching goals 1 and 2 in the strategic plan complemented the vision and mission in supporting inclusive practices. These were stated as: To achieve self-sufficiency in the context of Vision 2030 in human capacity building through use of Science and Technology under Goal 1, and to increase appropriate teaching and learning facilities by 10%, under Goal 2. I discovered that Vision 2030 was a government blue print designed to guide the national development trajectory (NDS1, 2020). These goals sounded supportive of inclusivity and technology use, as they projected provision of facilities that would capacitate both teacher educators and pre-service teachers. Although the goals seemed subtle on disability and inclusiveness, it however, sounded like inference was on catering for every student as sufficient evidence on supporting inclusiveness.

In his remarks on policies, Barakasi (a teacher educator) said “The Inclusive Education Policy in the Ministry of Higher Education was rushed and it side-lined contributions by stakeholders like lecturers, students and other relevant organizations.” While I initially appreciated his sentiments, I later realised that the policy was non-existent, which Barakasi later admitted, by saying, “The Inclusive Education policy in the Ministry of Higher and

Tertiary Education is said to be there, but efforts to get a copy have been futile.” In that context, Mbofayo (the principal) revealed, “Something (referring to policy on Inclusive Education) has been coined through the ministry, but still needs to be solidified.” This confirmed that the policy was still a draft. Lack of supportive policies seems to have affected the way pre-service teachers with disabilities were handled, as well as influenced subtle articulation on issues of disability in the institution’s mission and vision statements.

In her remarks on frameworks that informed inclusive education and the use of technologies, Tsitsi (a pre-service teacher) said, “I do not know of any.” Similarly, Klerk and Titie (other pre-service teachers) followed suit, which suggests little knowledge of policies they could use in lobbying for essential provisions and accommodations, as pre-service teachers with disabilities.

Although, pre-service teachers alleged existence of policies on Inclusive Education and the use of technologies, none of them could cite even one example. For instance, Phedie stated, “At this college, the use of information and communication technologies is encouraged, although I am not sure whether there is a policy, but at enrolment, students are instructed to bring a laptop and a cell phone.” Similarly, Gidza (a pre-service teacher), remarked, “I think there is a policy, because the government created a ministerial post that represents people with disabilities.” He added, “I do not know its name, but the policy is there.” Furthermore, Tinny (another pre-service teacher), said, “There is a government policy which encourages institutions to consider admission of students with disabilities, but I don’t know the chapter.” However, the above cited submissions seem to have been specious claims, as evidenced by participants’ failure to cite any of the national or institutional policies. It was clear that pre-service teachers lacked awareness on frameworks that supported Inclusive Education, unlike teacher educators who could cite some relevant global conventions and frameworks.

The data presented above reveals non-existence of specific frameworks to guide and support Inclusive Education and the use of technologies at the institution. Although related excerpts were noted in the strategic plan, these appeared inadequate, since teacher educators relied largely on global pronouncements for guidance on inclusive practices that also included the use of technologies for pre-service teachers with disabilities.

4.3 Concept Summary, Themes and Sub-Themes from Data

Analysis in this chapter focuses on themes related to sub-questions 1, 2 and 3, whilst sub-question 4 is addressed in Chapter 5. Whilst the themes were framed from the subsidiary questions, the categories emerged directly from the data, and these were grouped into sub-themes as presented in Table 4.3. The primary question for this inquiry is: How does technology-mediated teaching and learning influence preparation of pre-service teachers with disabilities? The three sub-questions covered in this chapter are:

- 1) What are the inclusive practices in the preparation of pre-service teachers with disabilities for the profession?
- 2) How do teacher educators facilitate technology - mediated teaching for pre-service teachers with disabilities?
- 3) How do pre-service teachers with disabilities experience technology - mediated teaching and learning?

To answer these questions, data is divided into these three themes: Practices of technology mediated teaching and learning; facilitation of technology mediated teaching and learning, and Experiences of technology mediated teaching and learning, as presented in table 4.4.

Table 4.4: Themes and sub-themes that emerged from data

Sub Questions	Themes	Sub Themes	Categories
Sub-question 1. What are the inclusive practices in the preparation of pre-service teachers with disabilities?	Theme 4.3.1 Inclusive practices in preparing pre-service teachers with disabilities	Sub-theme 4.3.1.1. Inclusion of pre-service teachers with disabilities in teacher preparation programmes	4.3.1.1.1.Enrolment of pre-services teachers with disabilities 4.3.1.1.2.Disabilities found among pre-service
		Sub-theme 4.3.1.2 Technology integration practices for pre- service teachers with various disabilities	4.3.1.2.1 Inclusive use of technologies to cater for pre- service teachers with disabilities 4.3.1.2..2 Use of appropriate language and equal treatment for pre-service teachers 4.3.1.2..3 Access to information on pre - service teachers with disabilities and its influence on universal design for learning
		Sub-theme 4.3.1.3 Access to technologies by teacher educators and pre-service	4.3.1.3.1 Technologies used to benefit pre-service teachers with specific disabilities 4.3.1.3.2 Awareness on

		teachers	technologies for pre-service teachers with disabilities 4.3.1.3.3 Accessibility and maintenance of technologies
Sub-question 2 How do teacher educators facilitate technology mediated teaching and learning for pre-service teachers with disabilities?	Theme 4.3.2 Facilitating technology mediated teaching and learning	Sub-theme 4.3.2.1 Support, Capacity Development, and Monitoring. Sub-theme 4.3.2.2 Conceptualizing use of technologies in teaching and learning engagements.	4.3.2.1.1 Ministry support in the use of technologies 4.3.2.1.2 Institutional authorities' support on infrastructure staff capacitation, acquisition of technology equipment and monitoring usage 4.3.2.2.1 Perceptions on the use of technologies 4.3.2.2.2 Attitudes towards use of technologies in teaching and learning processes 4.3.2.2.3 Competences of teacher educators and extent of using technologies to support UDL 4.3.2.2.4 Preparing lecture sessions That integrate use of technologies 4.3.2.2.5 Setting up technologies, their operation and the UDL philosophy 4.3.2.2.6 Allocation or choice of lecture venues in view of UDL principles 4.3.2.2.7 Seating arrangement for the pre-service teachers and UDL 4.3.2.2.8 Monitoring attendance of pre-service teachers 4.3.2.2.9 Managing progression of Sessions
Sub-question 3. How do pre-service teachers with disabilities experience technology mediated teaching and learning?	Theme 4.3.3 Experiences of technology mediated teaching and learning	Sub-theme 4.3.3.1 Use of technologies and inclusiveness in lecture sessions	4.3.3.1.1 Choice of technologies, involvement of pre-service teachers and the SAMR framework 4.3.3.1.2 Technologies commonly used 4.3.3.1.3 Other technologies anticipated for use

		Sub theme 4.3.3.2 Strategies in the use of technologies	4.3.3.2.1 Successes in the use of technologies at Substitution and Augmentation to support multiple representations, expressions and engagements 4.3.3.2.2 Challenging in the use of technologies 4.3.3.2.3 Strategies of using technologies as experienced by pre-service teachers 4.3.3.2.4 Strategies to enhance use of technologies
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4.3.1 Inclusive practices in the preparation of pre-service teachers with disabilities

This theme is subdivided into three sub-themes which are: inclusion of students with disabilities in teacher education; technology integration practices for pre- service teachers with various disabilities; and access to technologies by teacher educators and pre-service teachers.

4.3.1.1 Inclusive practices in the preparation of pre-service teachers with disabilities

Recent increased enrolment of students with disabilities compelled use of technologies to plug learning obstructions in their learning processes. The first intake at the institution was in 1982, which had 400 pre-service teachers (Strategic Plan 2015-2024). The principal confirmed gradual increase in enrolment which stood at 2500 pre-service teachers at the time of this study, and of these more than thirty-five had various disabilities. Such information perhaps facilitates conceptualization of the study. Analysis in this sub-theme embraces the following analytic categories: Enrolment of pre-service teachers with disabilities and disabilities found among pre-service teachers. This sub-theme consists of two categories, which are; enrolment of pre-services teachers with disabilities; and disabilities found among pre-service, as discussed below.

i) Enrolment of pre-service teachers with disabilities

Enrolment practices at the institution have shown inclusion of pre-service teachers with disabilities at the institution. In that context, I asked Barakasi (a teacher educator) about the initial enrolment of these and gender aggregation. His response was, “I recall it was in 2013 and it was with a few numbers. ... Uhm! [Trying to remember] off-hand, I can’t recall how many they were, but I think they were less than five and with more males.” Similarly, Chibwe (another teacher educator) reflected, “The first enrolment of students with disabilities

was in the year 2013, that's when we went to UCE [United College of Education - another teacher education institution in Zimbabwe] for a workshop on Inclusive Education." However, Chimbadzi (another teacher educator) gave a different version and said, "It was from the year 2000 and the students comprised one male and two females, and this was when the government enacted a policy on affirmative action, to increase enrolment of female students."

Barakasi and Chibwe concurred that pre-service teachers with disabilities were only enrolled well into the new millennium, while Chimbadzi insisted on early turn of the millennium. Nevertheless, indications are that the initial enrolment of pre-service teachers with disabilities comprised five or less, as opposed to over thirty-five at the time of this study. Gradual increased enrolment over the seven years (2000- 2020) perhaps enabled the teacher educators to develop or adopt suitable strategies in facilitating use of technologies to benefit students with varied disabilities.

Whereas Chibwe insisted that enrolment of pre-service teachers with disabilities was stimulated by the national workshop on inclusive education he had attended, Chimbadzi credited this to government policy on gender equity and equal access to education. In sync with the foregoing, I noted near balanced gender representation among pre-service teachers with disabilities at the institution. Similarly, Mbofayo (the principal) accorded the credit to national policy by saying, "The national policy implores institutions to prioritize enrolment of students with disability to reduce discrimination." Mbofayo added, "Even when we advertise for new students, we state that those with disabilities have special priority." I verified that practice with the institution's advertisement for applicants (see appendix L).

Although on the enrolment of pre-service teachers with disabilities was considered progressive, there were concerns among study participants. For instance, Barakasi said, "There was a rush by the ministry, as there was no preparedness and adequate planning." He added, "Ministry should have ensured existence of appropriate physical infrastructure and materials, including tutors trained for specific disabilities." It seems suitable infrastructure and equipment was deficient, which riled participants, even at the time of this study. Barakasi further remarked, "Infrastructural adjustments and improvising on facilities is needed, apart from staff capacitation, if enrolment of these students is to continue." Chimbadzi added, "I think enrolment of students with disabilities was done before

procurement of essential gadgets and even up to now, very little has been done, besides the acquisition of projectors.”

Despite concerns about inadequacy of essential provisions and suitable adaptations, the enrolment of pre-service teachers with disabilities was considered fundamental in bolstering inclusive education. For instance, Tsitsi (a pre-service teacher) remarked, “Enrolment of students with disabilities removes discrimination and it helps us to be viewed in the same manner with our colleagues.” She added, “It also reduces discrimination in schools, where learners with disabilities are treated differently.” Tsitsi sounds convinced that inclusive enrolment helped to transform the treatment given to learners with disabilities in schools where pre-service teachers with disabilities served upon completing teacher education. Tinny (another pre-service teacher) similarly, remarked, “Enrolment of students with disabilities reduces interactional challenges, promotes sharing of ideas and enhances their participation in learning engagements.” Such views were also affirmed by Chibwe (a teacher educator), who said, “Enrolment of students with disabilities is a progressive inclusive initiative, since we have moved from enrolling them in isolationist institutions.” Barakasi, similarly, commented, “Enrolment of students with disabilities is critical for inclusivity and is supported by our national constitution.” These excerpts reveal the significance accorded to the enrolment of pre-service teachers with disabilities, which participants considered critical in the elimination of discriminatory practices in teacher education.

Upon inquiring why the pre-service teachers had particularly sought enrolment at this institution, Tsitsi said, “I got attracted by services offered, like at the hostels and how students that used wheel chairs were being catered for during my initial visit to the college.” It appears Tsitsi and possibly others were enticed by perceived services offered at the institution. The cited provisions depict institutional efforts to create environments that support universal access, multiple representations and maybe multiple engagements, as well. Tsitsi added, “On the day I applied, I toured the college and was convinced that existing conditions were right, even my interactions with the principal and lecturers made me feel welcomed and well accepted.” Existent facilities and warm reception by staff members clearly impacted on Tsitsi’s commitment and attitude towards engaging in teacher education. Therefore, facilities and ambience at the institution bonded Tsitsi to the institution from the outset. Similarly, Jud (a pre-service teacher with multiple physical disabilities) revealed, “My enrolment at this college was inspired by the quest for self-reliance and its closeness to my

home.” Biala (with visual disabilities) also stated, “I was encouraged by my brothers and sisters who trained here, which made me leave colleges in Bulawayo [a city 650 kilometres from Harare] for this one, which was tagged as the best in producing good teachers in Southern Africa.” From the above excerpts, the institution was considered conveniently located, accommodative to students with disabilities and famed for churning out quality teachers. These factors seem to infer practices that conform to the UDL principle of multiple engagements, since the enrolment was voluntary and out of the prospective student’s personal interest. In my view, teachers educators just needed to capitalize on the students’ interest to sustain and promote effective learning.

The data presented in this segment has credited factors like; quest for self-reliance, proximity to participants’ homes, desire to fight discrimination and the institution’s famed reputation for enticing students with disabilities to enrol at the institution. Also highlighted was conformity to national and global frameworks that discouraged discriminatory practices. It appears guidance on mainstreaming pre-service teachers with disabilities was largely drawn from national and global conventions. These also helped to embed the Universal Design for learning philosophy, to ensure access and enrolment of deserving persons in teacher education, in spite of their disabilities. However, pre-service teacher participants seemed unaware of when initial enrolment of those with disabilities started at the institution and it appears their enrolment was done prematurely, when infrastructure and other essential provisions were still profoundly inadequate.

ii) Disabilities that pre-service teachers had

This section focuses on disabilities that the pre-service had, as evidence of inclusive enrolment at the institution. Although focus was on physical, visual and hearing disabilities, I also sought a holistic overview of all the disabilities.

a) Physical disabilities

Physical disabilities were more predominant, which Chibwe affirmed, by saying, “The students are mostly physically challenged.” Similarly, Chimbadzi reflected, “I have seen students with physical disabilities, either on the hands or legs.” I related these submissions to Tsitsi (a pre-service teacher with no hands-Amelia), Jud and Kesie (with disabilities in upper and lower limbs-quadruplegic), Jimmy and Richie (with disabilities in the lower limb - paraplegic) and Gidza, without the left arm - Phocomelia (LCDZT, 2016). In concurrence,

Barakasi (a teacher educator) remarked, “We have students with physical disabilities, without limbs, others that cannot walk or use wheel chairs.” In that context, “Tsitsi said, “My disability is difficulty in walking.” However, literature reviewed in Chapter Two designates her disability as ‘Amelia’ (LCDZT, 2016). If institutional records had captured Tsitsi’s disability the way she stated it, perhaps teacher educators would be misled on choice of technologies to support her learning. It appears Tsitsi’s disability necessitates the use technologies that address limitations on lack of hands, more than those related to mobility. Perhaps Tsitsi just wanted to highlight how the missing hands was affecting her movement, but it also illuminates the importance in raising awareness on correct identification of students’ disabilities.

b) Visual disabilities

Chimbadzi reflected on pre-service teachers with visual disabilities, by saying, “I have seen blind students ...ooh! [trying to remember] and albinism, probably those that have visible disabilities in this institution are up to ten.” It was clear that Klerk (with Albinism), Titie (with artificial lens in both eyes), Biala and Tinny (who were short sighted) were in that category. Barakasi added, “We have those with difficulties in seeing – the visually impaired.” Similar sentiments were echoed by Chibwe, who said, “Yes, we have students that have sight problems.” This view was also reinforced by Mbofayo (the principal), who revealed, “We have recruited students with visual disabilities who have already completed studies, although at some stage, some of these could not proceed because of our incapacity to provide needed provisions.” This statement was corroborated by Chimbadzi, who said, “There was a case of a blind student who could not proceed with studies in Mathematics, because the institution had failed to provide specialised gadgets and software that could assist him with mathematical calculations.” Barakasi also narrated the following experience, “I only became aware of the presence of a blind lady student after quoting a bible excerpt which says ‘the blind shall not lead the blind’, upon which other students responded negatively, until one of them alerted me.” Although, I did not encounter a blind student at the time of this study, the cited incidences confirm existence of these in previous intakes.

c) Hearing disabilities

Turning to students with hearing disabilities, Barakasi reflected, “A-a-ah! I recall one who had hearing aids; not that he was totally deaf but only had some difficulty in hearing.” He added, “That student used a hearing aid in one ear and also used a recording device that he

would listen to, later after sessions.” Barakasi went further to say, “In other instances, some students fail to repeat a point or what has been said in the session, and if you ask them, they repeatedly say I did not hear you properly.” This indicates impaired hearing.

While the above cited excerpts reveal existence of pre-service teachers with hearing disabilities, Jimmy (a pre-service teacher) claimed, “There are no students with hearing disabilities at this college.” This view was corroborated by Jud, Kesie and Klerk, including Mbofayo (the principal), who even declared, “We have never enrolled someone with hearing impairment, besides those with partial impairment, since we don’t have the capacity.” She then proceeded to say, “Perhaps some did not disclose, but I wonder how they proceeded, since we should have bought equipment for them.” Chimbadzi similarly, remarked, “I can’t say much about students with hearing impairments, because it may not be that obvious.” Chimbadzi seemed hesitant to confirm or deny existence of pre-service teachers with hearing disabilities at the institution, which could imply that others with impaired hearing were inadvertently neglected, unless they opened up or were noted by alert educators. I also noted doubts by some participants that Phedie and Gemu were part of those with disabilities from the way they looked and interacted with the two during discussions. Such reactions were perhaps triggered by the fact that these two had hearing disability which was not visible, unlike Jimmy and Richie who also had other observable disabilities, besides that of hearing.

d) Perceptual disabilities

To add another dimension, Chibwe said, “We have few students that take long to finish the course, fail to make constructive sentences in assignments or submit work in time, due to mental disabilities.” Chibwe appears to have interpreted deficiency in expressive eloquence as mental disability, although this could also indicate learning disabilities. Similarly, Phedie (a pre-service teacher) reminisced, “I remember a student who had mental disabilities and I doubt whether he completed the course.” It seems the institution had pre-service teachers with perceptual challenges, although none of these were sampled in this study.

Analysis in this segment has revealed that physical, visual and hearing disabilities were predominant among pre-service teachers, which provided an opportunity for this study to examine practices that support multiple representations, expressions and engagements to accommodate students with such disabilities, as inclusive practices. For instance, the students confessed having sought enrolment voluntarily, which demonstrates existence of universal

access, as multiple representations. Other students with disabilities were identified through use of personal technologies like hearing aids, which demonstrates commitment on propping own learning by supporting multiple engagements and expressions.

4.3.1.2 Technology integration for pre-service teachers with various disabilities

Under this sub-theme, the following categories are discussed in this section: Inclusive use of technologies to cater for pre-service teachers with disabilities, use of appropriate language and equal treatment for pre-service teachers; and access to information about pre-service teachers with disabilities and its influence on universal design for learning.

i) Inclusive use of technologies to cater for pre- service teachers with disabilities

Under this category, I will discuss findings on how technologies were used to accommodate students with different disabilities. The disabilities catered for were; visual disabilities, hearing disabilities and physical disabilities.

a) Inclusion of pre-service teachers with visual disabilities through the use of technologies

I noticed the following in Barakasi's session [Klerk, a pre-service teacher with Albinism struggled to read from the projector screen until he walked out unnoticed by the educator]. Such behaviour proves that although technologies were used in the session, these failed to fully support multiple representations for all students, as Klerk derived little benefit from their usage. The teacher educator was perhaps unaware of Klerk's visual challenges, which impeded provision of appropriate responses. On another note, Tinny remarked, "Although lecturers may know most of the students by name, some of them may not know even a single name of those with disabilities." Such a scenario can make students feel alienated, which affects their participation in learning engagements. Lack of information on students' disabilities impeded the teacher educators from appropriately adapting the learning environments. The teacher educators were also unable to adopt more suitable facilitation methods, like choice of matching technologies. To substantiate this view, Biala (a pre-service teacher with visual disabilities) said:

Lecturers may not know that I have sight problems, unless I am asked to read text from the screen, which then exposes my sight challenges. However, this has not happened to me in the past three years and no one knows about my disabilities.

Titie (a pre-service teacher with visual disability) also revealed, “Whenever, I disclosed my condition to lecturers, they either sought to accommodate me in their presentation methods or provided specialised treatment, whilst others would blame me for not taking a front seat or doing extra work alone.” It appears Titie was in a quandary, concerning disclosure or non-disclosure of his disabilities. He further remarked, “If I don’t inform educators about my disabilities, I may suffer in silence and then lag behind in learning processes.” Such perception was corroborated by Klerk (another pre-service teacher with visual disability), who said, “If you let lecturers know of your disability, they can assist in securing a front seat that provides better visuals and audio of the presentations.” Titie then reflected on the following incident:

I suffered in the first term of first year, through copying notes from friends’ books during lectures, which I later abandoned upon realising the discomfort it caused on colleagues. I then resorted to sitting quietly in sessions and copied the notes later.”

It appears pre-service teachers whose visual disabilities were not known to the teacher educators experienced numerous challenges in learning engagements, as they did not receive sufficient necessary support. For instance, teacher educators professed inability to adequately accommodate them, as they planned on technologies that would support suitable content presentations, like they did for those with known visual impairments. Data shows that pre-service teachers with visual disabilities known to the teacher educators obtained strategic seats for optimal visuals of screened presentations. It appears, the way teacher educators facilitated the use of technologies, largely benefitted pre-service teachers that had either disclosed or had visual impairments that could be detected easily. Thus, teacher educators were obstructed from adopting befitting means of content presentation and engagements by such unawareness.

b) Inclusion of pre-service teachers with hearing disabilities through the use of technologies

Tsitsi remarked, “Students with non-visible disabilities are not usually considered by lecturers, because they do not disclose their disabilities for fear of labelling and stigmatization.” The above excerpt infers that pre-service teachers with covert disabilities often got deprived of essential provisions and support, because teacher educators were not aware of their presence. In apparent response to the foregoing scenario, Barakasi lauded himself for using the following strategy, “I always inquire on size of the group and nature of students, before the lecture, as this varies with intakes, which assists me in making relevant plans for particular groups.” On further reflections on his practice, Barakasi explained, “One

of the previous groups had blind students that required electronic copies to convert into voice text, so that they would be able to also follow my presentations during the sessions.” The above quotes demonstrate strategies devised to cater for diverse pre-service teachers, where the teacher educator sought to use technologies that matched particular student groups. For instance, Barakasi clearly obtained information on the nature and severity of student disabilities through personal ingenuity and it helped him to appropriately structure the learning context.

In Chibwe’s session, the following was noted, [Although the room was spacious, which made mobility easy for pre-service teachers with physical disabilities, the acoustics were very poor, due to lack of sound proofing on the walls, which marred audibility, especially for those with compromised hearing. Worse still, no technologies were used to amplify the sounds]. I also noted the following, [Richie, Jimmy, Phedie and a few others were sitting at the edge of their chairs and leaned forward, whilst Richie repeatedly turned an ear towards the educator and visibly struggled to maintain focus on the educator’s face]. Further observations revealed, [Richie eventually receded into apathy and dosed off, as shown in Figure 4.1, which the teacher educator seemed oblivious of]. I also noticed the following, [Gemu and Phedie visibly struggled to hear his presentations, they shifted positions twice, until they eventually gave up and appeared distracted from the proceedings]. Implications are that pre-service teachers with undisclosed disabilities like hearing were not effectively catered for in the lecture session.

It would seem special accommodations were mainly focused on pre-service teachers with observable and disclosed disabilities, which illuminates how critical information on students’ disabilities is, for effective planning and use of technologies.



Figure 4.1: A pre-service teacher (Richie) struggling to hear presentations from the educator

c) Inclusion of pre-service teachers with physical disabilities through use of technologies

Tsitsi (a pre-service teacher with physical disabilities) remarked, “If lecturers are not informed, they may not prepare adequately for us, and they may also use a fast pace in dictating notes.” This quote exposes how physical disabilities can impede effective capturing of presented learning content. Such pre-service teachers often require accommodations like reduced pace of presentation or can be salvaged through the use of appropriate technologies. Tsitsi went further, to say, “The administration should inform lecturers of students with disabilities in staff meetings or even notify departments of particular students.” Tsitsi wished teacher educators could be informed timeously whenever anyone with disabilities was enrolled. The practice would perhaps assist teacher educators to adopt facilitation strategies that promote multiple representations and expressions. Similar concerns were raised by Biala, who said, “Informing lecturers on students with disabilities enables them to decide on suitable teaching strategies and technologies to use.” Experiential evidence of the foregoing was given by Tsitsi and Kesie (students with physical disabilities) who confirmed occasional

receipt of additional information and notes from teacher educators. Tsitsi even stated, “Lecturers often provide us with hard copies of the notes and at times prepare specific work for us.” I also noted the following [Barakasi invited six pre-service teachers that comprised Kesie, Gidza, Jud and three others with visible physical disabilities to collect hand-outs from his office after the lecture session]. When asked about the practice, Barakasi explained, “I always strive to prepare hand-outs, including abridged and large print formats for students that I know to have disabilities.” Such efforts demonstrate conformity to Multiple Representations in the UDL philosophy, since the format of hand-outs was customised to suit pre-service teachers known to have particular disabilities.

As Barakasi introduced his lecture session, he remarked, “This lecture room is not inclusive enough for some of us who have difficulties and challenges of diverse nature.” The above excerpt implies that the learning environment was not compliant with Universal Design for learning on access for the students with physical disabilities and teacher educators as well. Furthermore, entrance into that particular room, as well as access to the front stage was by steps, which created challenges for persons with physical disabilities, especially if they wanted to either operate or use technologies mounted on the stage. Besides that, the room did not have a designated screening surface for electronic presentations, which Barakasi circumvented by mounting a board on two chairs. The improvised screen could even be moved closer to viewers, unlike screening on the wall surface. On pre-service teachers with physical disabilities, Chibwe reflected, “I once got embarrassed to discover a lady writing with a pen supported between toes in the middle of my lecture.” This sounds like a ‘chance discovery’ of the student’s disabilities and Chibwe added, “I could not have made prior arrangements for this student, since I was not aware of the nature of her disability before the lecture.” Nevertheless, Chibwe acknowledged that the cited encounter had motivated him to strengthen multiple representation of content and explore alternative ways of helping students to demonstrate evidence of learning.

I also noted in Chibwe’s session that Tsitsi was operating the computer with her toes, as shown in Figure 4.2. Tsitsi used the laptop as an alternative means of expression to communicate and demonstrate evidence of having grasped concepts, which illustrates application of multiple means of expression in the UDL philosophy.



Figure 4.2: Tsitsi (student without arms) using toes to operate the laptop

ii) Appropriate language and equal treatment for pre-service teachers

I noted efforts by both staff members and other pre-service teachers to avoid using language that sounds derogatory or demeaning to students with disabilities. In my view, this practice illustrates strive towards inclusiveness. As proof, Barakasi remarked, “I encourage colleagues to use language that is neutral in all interactions with students that have disabilities.” I discovered that even senior authorities consciously used non-offensive language when addressing the pre-service teachers. For instance, I witnessed the vice principal referring to Klerk as, ‘that gentleman with Albinism’ and not labelling him an Albino. Similarly, Barakasi commented, “Life is not fair, as disability can set in on anyone at any time.” His statement encouraged me to inquire more on why he had such passion and deep concern for students with disabilities. I then discovered that he fell sick two years back, which left him with physical and visual disabilities. Such developments then motivated him to become like a resource person on inclusive practices, as evidenced by representing the institution in seminars on disability and Inclusive Education, as well as making efforts to use technologies like the projector that enhance learning for students with disabilities.

While reflecting on inclusive practices, Chimbadzi said, “Whenever I orient students to Education for Sustainable Development, I always stress on equal treatment to uphold human rights.” She added, “If one is aware of the other’s disabilities, he or she becomes appropriately sensitive during interactions.” Mbofayo similarly declared, “Looking at it nationally, we are required to interact positively with all persons, whether disabled or not.” These perspectives demonstrate determination on strengthening inclusiveness at the institution.

iii) Access to information on pre-service teachers with disabilities and its influence on Universal Design for learning

In this section, I examine access to information on students’ disabilities by the teacher educators, since this knowledge can influence decisions on essential accommodations and interactions with affected students.

In reflecting on how teacher educators got to know of her condition, Tsitsi said, “Some lecturers saw me on the day I applied, as well as on the day college reopened for the year.” She added, “Although the administration did not convey the information, lecturers eventually noticed my disabilities, since I always sought to take a front seat, during lecture sessions.” The strategy yielded multiple benefits for Tsitsi that include better view and audibility of presentations, besides alerting teacher educators on the nature and extent of her disabilities. She however, seemed unsure of the capturing and compilation of student disabilities, as she said, “I have no idea, as it appears details of my disabilities were not captured at all, although I provided these on the enrolment form.” Similar sentiments were echoed by Tinny (another pre-service teacher), who recounted, “On admission, we completed a registration form where we provided information on disabilities.” The two excerpts reveal efforts to capture information on disabilities, although it was not clear whether the efforts yielded a comprehensive institutional data base. In the same vein, Richie (a pre-service teacher with physical and hearing disabilities) gave the following version, “After students have registered, lecturers usually trail the records to establish the nature of disabilities that students have.” The practice probably enabled teacher educators to decide on how to implement multiple presentations of content, multiple engagements and expressions to suit particular individuals. It appears the cited arrangement could be more effective if the teacher educators tracked the information timeously, or else they would omit essential accommodations for other pre-

service teachers. Further clarification on the practice was given by Mbofayo (the principal), who said:

While the Lecturers in Charge might know, other lecturers may not and these have often expressed anger on noticing visually impaired students in their sessions when they are unprepared to handle them. This has often affected relations among lecturers, while other students with disabilities have also complained of being denied special accommodations in learning engagements.

In apparent corroboration with the above quote, Barakasi remarked, “Getting information on students’ disabilities is a raw deal and at times we spend the whole year unaware of some students that have disabilities, which hampers provision of essential specialised provisions.” Similarly, Chibwe lamented, “Although we should receive information on students with disabilities from members of the College Academic Board (CAB), we often discover these on our own during lectures.” Likewise, Barakasi lamented:

As lecturers we are never given information on students with disabilities, although the students’ affairs department run by the dean usually has it, this is rarely passed on to lecturers in the different subject areas.

Details on the students’ disabilities gathered through the dean’s office seem to have been inconsequential, as it was not relayed to teacher educators who needed it to facilitate essential accommodations, like adapting the learning environment and planning appropriately for the lecture sessions. The above quotes give possibility that some pre-service teachers with disabilities went unnoticed or only got discovered later into the year. This scenario was confirmed by Mbofayo (the principal), who said, “I have often received complaints about lack of information on student disabilities from lecturers during staff meetings.” In apparent effort to circumvent the cited deficiencies, Chibwe disclosed, “I often use observations to identify students with physical disabilities, whilst those with mental challenges are often detected through slurred speech during discussions.” Chibwe then narrated how he identified a pre-service teacher considered to have perceptual disabilities, by saying, “The student was repeating first year studies and was mentally challenged [which could have been learning difficulties], and she then explained her condition to me, because she wanted assistance.” Such observations probably influenced conception of suitable facilitation strategies and selection of technologies that support multiple representations and expressions to benefit the majority of pre-service teachers.

Phedie raised an additional perspective on awareness and support for pre-service teachers with disabilities, by saying, “The Student Representative Council (SRC) has a reserved post for students with disabilities.” Such provision was confirmed by Richie, who then added, “The representative gathers names and details on students with disabilities.” He then proceeded to confirm being privy to the cited roles and responsibilities after having occupied that position in the previous year. Richie did not however, make it clear whether the representative’s roles included informing teacher educators on colleagues with disabilities. Similarly, Gidza who had also occupied the same position at some point, added, “The College created a task team to represent and support students with disabilities.” Although the initiative sounded noble, Gidza could not shed light on its composition, as all he could say, was, “It is made up of e-eh ...” [meaning he was not sure]. From this reaction, I deduced that either the committee was dormant or non-existent at all. However, contrary to accounts given by other participants, Klerk shared the following experience:

Whilst on teaching practice, a lecturer I didn’t even know came to fetch me for the Paralympic sporting games. This was after the head had refused to release me when contacted by phone. Therefore, the college administration knew about me, perhaps from details supplied on the application and registration forms.

Besides the evidence provided by Klerk, data shows that information on the students’ disabilities captured during interviews and at registration did not feed into a comprehensive institutional data base. This seems to have profoundly hindered teacher educators from implementing UDL to benefit the pre-service teachers in learning engagements, as there were no explicit strategies to inform teacher educators on the students’ disabilities. The information gathered either by the dean’s office or the admissions office was just archived instead of being conveyed to the teacher educators, for use in deciding on instructional approaches and adapting learning contexts. Although data revealed myriad platforms through which details on students disabilities could be conveyed, these were not fully exploited, which the principal admitted and then expressed commitment to redress in future intakes.

4.3.1.3 Access to the technologies

This sub – theme presents data on access to the technologies, which unfolds under these categories: Technologies available and used to benefit pre-service teachers with specific disabilities; Awareness on technologies for specific disabilities, as well as accessibility and maintenance of the technologies.

i) Technologies used to benefit pre-service teachers with specific disabilities

Analysis in this segment examines the type of technologies used, which infers their availability, as presented in table 4.5.

Table 4.5: Technologies that were available and used at the institution

Type of technologies	Participants that cited them
Projectors/Beamers	Chimbadzi, Barakasi, Chibwe, Tsitsi, Tinny, Phedie, Richie, Clerk, Titie, Biala, Mbofayo
Lap tops	Chimbadzi, Barakasi, Chibwe, Tsitsi, Tinny, Phedie, Richie, Clerk, Titie, Mbofayo
Cell phones	Barakasi, Chibwe
Speakers	Barakasi, Chibwe, Clerk
Interactive boards	Barakasi, Chibwe, Titie, Mbofayo
Printing facilities	Barakasi,
Televisions	Tsitsi
Video players	Tsitsi
Microphone	Phedie, Clerk, Biala
JAWS software	Chimbadzi, Mbofayo, Barakasi

Technologies presented in table 4.5 do not specify those considered suitable for pre-service teachers with particular disabilities, as the participants skirted being specific. Their responses could imply ignorance on that or it was because pre-service teachers with disabilities were mainstreamed, which meant the technologies were used inclusively with the whole group.

a) Technologies used to benefit pre-service teachers with physical disabilities

It appears there were no technologies used specifically to benefit pre-service teachers with physical disabilities. To prove the foregoing, Chibwe stated, “At times I go to the lecture with a projector combined with the laptop and audios as well.” It appears, Chibwe bunched all technologies used and did not single out those used for pre-service teachers with specific disabilities. Similarly, Barakasi explained, “Due to inadequate resources, I only use the projector, laptop, printing facilities, speakers in the great hall (although dysfunctional) and the Interactive board.” Avoidance by both participants to explicitly cite technologies used for particular disabilities, suggests fear of exposing deficiencies in the manner they dealt with pre-service teachers with specific disabilities. In spite of the foregoing, Barakasi remarked, “Each sector of students with disabilities has particularized and specific gadgets...” He proceeded to say, “Every student with disabilities has specific requirements and needs

specialised technological-based gadgets, because using one type would disadvantage others.” In the same context, Tsitsi, Barakasi, Tinny and eight others cited the combination of projector and laptop, as technologies positioned to benefit pre-service teachers with physical disabilities. Tinny however, cited the projector, as technology frequently used to ameliorate learning challenges for students with physical disabilities, whilst Phedie alleged non-existence of exclusive arrangements for pre-service teachers with this disability. In addition, Richie and Gidza (pre-service teachers with physical disabilities) candidly denied existence of any considerations for them. Gidza added, “We are treated just like other students.”

b) Technologies used to benefit pre-service teachers with visual disabilities

With regards to technologies that assisted pre-service teachers with visual disabilities, Phedie, Tinny, Richie and Gidza (pre-service teachers) concurred that no provisions were in place for this group. Similarly, Chimbadzi reflected, “To tell the truth...the only gadgets I have used are the beamer and laptop, where I could increase font size for the benefit of students with compromised sight.” She further explained, “I haven’t made any isolationist activities for students with disabilities, as I treat everyone equally...” Although her practice sounds inclusive, it may also be grossly exclusive, particularly, for students with disabilities that necessitate specific technologies to enhance their learning.

c) Technologies used to benefit pre-service teachers with hearing disabilities

Phedie cited the microphone, which could perhaps amplify audio presentations for pre-service teachers with mild hearing, as none had reportedly declared profound hearing. I also noted a microphone mounted in the room used by Chimbadzi, although I did not witness its usage. I noticed that very few participants cited gadgets used for pre-service teachers with hearing disabilities. This was probably influenced by the covert nature of that disability and limited disclosures by the students, which then affected access to matching accommodations.

Data revealed a fair number of technologies at the institution; although very few were specific to pre-service teachers with particular disabilities. Nevertheless, using these technologies with the entire groups, to some extent, also benefitted those with disabilities. This scenario seems to have affected preparation of those with other disabilities, who had to contend with a ‘one size fit all’ mode of content delivery and conveyance of instructions.

ii) Awareness on technologies for pre-service teachers with specific disabilities

I also inquired on participants' awareness on technologies that could prop teaching and learning for pre-service teachers with physical, visual and hearing disabilities, even if these were not available at the institution. These are presented in tables 4.6, 4.7 and 4.8.

a) Vital technologies for pre-service teacher with physical disabilities

Technologies that participants deemed essential in assisting the learning of students with physical disabilities are presented in table 4.6.

Table 4.6: Essential technologies for pre-service teachers with physical disabilities

Technologies cited	Participants that cited them
Projector	Barakasi, Chimbadzi, Tsitsi, Tinny
Laptops/computers	Chimbadzi, Chibwe, Barakasi, Klerk
Computers that are custom made	Barakasi, Klerk
Speakers for sound amplifications	Barakasi
Smart/ cell phones	Chibwe, Phedie
Video players and video recordings	Tsitsi,
Recording gadgets	Chimbadzi
Print materials and hand-outs	Barakasi
Interactive boards	Barakasi,
Electronic textbooks	Gemu

Barakasi, Chimbadzi, Tsitsi and Tinny considered the projector as befitting for pre-service teachers with physical disabilities. They perhaps appreciated it for the functions and ease of operation, which Chimbadzi confirmed. Barakasi even bragged, "In all my lectures, I use the projector for power point presentations." On another note, Chimbadzi, Chibwe, Clerk and Barakasi cited the computer and laptop as essential technologies for students with physical disabilities. Such appreciation was probably premised on the capacity of these technologies to be synchronized for power point presentations. Furthermore, the computer can be adapted for use by students with missing or deformed limbs.

Barakasi further remarked, "Students have been bringing own gadgets like computers for use in writing notes, examinations etc." As I observed the three lecture sessions, I noted pre-

service teachers with physical disabilities capturing notes in laptops, whilst teacher educators also used theirs to aid their presentations. This could have enthused Barakasi to explicitly say, “Computers that are custom made.” I also noted pre-service teachers like Gidza who was using one hand to operate the computer, while others like Tsitsi used their toes. As proof of awareness on the foregoing scenarios, Phedie reflected, “Like the student who has no hands and uses toes to type her work, which enables her to produce something, although she has a comparably slower pace.” Mbofayo (the principal) even expressed anticipation for software that could assist students with physical disabilities by saying, “like the lady who uses toes to operate the computer, I wish there is software that enables her to do those things faster.” Mbofayo sounded hopeful of finding suitable software or adaptations that would reduce challenges faced by students with impairments that hinder typing or writing notes.

Chibwe and Phedie mentioned the cell phone as essential for pre-service teachers with physical disabilities. I noted that cell phone-use, was a readily available innovative technology that almost every pre-service teacher used. Jimmy (a pre-service teacher with physical disabilities) commented, “Use of the cell phone helps me to capture and store notes.” Similarly, Chibwe remarked, “Together with my students we use cell-phone technology to exchange information through platforms like the ‘WhatsApp’. This practice seems to have enabled students to contribute ideas without shying away because of compromised expressive language. I then noted use of smartphones, tablets and even laptops to capture notes, taking photo shots of the notes and navigating Google search for additional information. Figure 4.3 illustrates a pre-service teacher using a smartphone in the session.



Figure.4.3: A pre-service teacher (Gidza with one hand) using a smart phone during a lecture session

Tsitsi (a pre-service teacher without hands) concurred with Chimbadzi (a teacher educator) that the video player, recording equipment and video recordings were essential for students with physical disabilities. They seem to have considered these technologies' capacity to illustrate events and processes that could have been inaccessible to the pre-service teachers because of physical disabilities. Chimbadzi also recounted the following incident, "On a field trip, I was not aware of a student with physical disabilities, who unfortunately had to endure walking the long distance, of which I could have..." She went further to justify, "It is helpful to have recording gadgets to enable students that cannot follow through the practical processes to view or listen to the recordings later at their own pace." In what appears as reinforcement to the foregoing perspective, Tinny (a pre-service teacher) remarked, "Video pictures enable us to comprehend the illustrations, step by step." This view evidences strong appreciation on observing sequential processes, as presented through recordings, especially if a student has physical disabilities that impede practical involvement.

Barakasi added that print material and hand-outs were also essential, by saying:

I always inquire on disabilities of the students before the session, which assists me in making make relevant plans. For instance, if the group is large and I then prepare hand-outs that include those in abridged format.

The practice alluded in the above excerpt infers use of the printer and allied accessories, although these were not cited by him or any other participant.

Chibwe and Barakasi concurred that the Interactive board was fundamental in the learning of pre-service teachers with physical disabilities. Barakasi even said, “Authorities have installed Interactive boards in lecture rooms across subject sections.” As proof, I noted one installed in the room used by Chibwe and in other four rooms, however, I did not witness these being used in any of the observed lecture sessions. On availability of Interactive Boards, Titie remarked, “There is only one Interactive board in the Mathematics department, which is rarely used and some lecturers cannot even use it or they just don’t like it.” The above excerpt implies that inadequacy and deficient operational skills stifled efforts to use the Interactive boards, which seemed exacerbated by lack of staff induction on how to use them. This view was confirmed by Mbofayo (the principal), who said, “Lecturers lack knowledge in using these technologies, for instance, most of them rarely use the Interactive boards installed in the lecture rooms.” Nevertheless, the Interactive board was considered essential, perhaps for enabling students with impaired hands to also make illustrations during lecture sessions.

b) Vital technologies for pre-service teachers with hearing disabilities

Table 4.7: Essential technologies for pre-service teachers with hearing disabilities

Type of technologies cited	Participants that cited them
Computers that convert word text to voice	Chibwe, Barakasi, Klerk, Biala
Personal hearing aids/sound amplifiers, speakers	Chimbadzi, Barakasi, Gidza, Gemu, Klerk
Microphone	Phedie, Klerk
Cell phone	Phedie, Jimmy
Video player, Video recordings	Tsitsi, Chimbadzi, Tsitsi, Klerk
Audios, videos, Audio-visual equipment	Chimbadzi, Tsitsi, Phedie
Interactive Board	Barakasi, Chibwe, Jimmy
Projector	Kesie, Klerk,
Electronic books, Radio with localised frequency	Gemu

Table 4.7 shows responses on essential technologies for pre-service teachers with hearing disabilities. A computer that converts word text to voice was cited, and Chibwe elaborated,

“Those with hearing challenges can use computers that convert word text to voice.” By this, Chibwe showed his appreciation of computer adaptations that support use by pre-service teachers with compromised hearing. Barakasi also added, “I also use speakers for voice amplification.” This excerpt depicts appreciation in the amplification of sound output of presentations through the use of speakers, which then provided better audibility for pre-service teachers with compromised hearing. Barakasi, however, remarked, “There are no special accommodations for students with hearing impairment and no one in the college has been trained to use related specialised equipment.” This view was in sync with the principal’s stance (Mbofayo), who declared, “I think we have never taken someone with hearing impairment.” She, nevertheless, added, “There could be those that did not disclose, who I wonder how they proceeded without us knowing, since we needed to procure assistive technologies for them.” This quote indicates that few or no technologies were in place for students with hearing disabilities, which Mbofayo also blamed on financial constraints by saying, “We have tried to address what we could, but realised that the technologies were very expensive.” Nevertheless, Chimbadzi noted, “Students with hearing disabilities usually provide their own hearing aids.” This seems to have rescued some of the pre-service teachers. Furthermore, Chibwe revealed, “If a student say I don’t hear properly, I ask him or her to come and sit in front or sit close to the board.”

Phedie suggested the microphone and in that context, I noted one attached to a sound system in the lecture room used by Chimbadzi. Also cited was the cell phone, whose choice was perhaps based on capacity to capture audios and visuals which students used as reference after lecture sessions.

Video recordings and the video player were mentioned as well, maybe because they enabled observance of step-by-step sequence of processes. In corroboration, Tinny remarked, “If one doesn’t hear, one can see the coaching points, particularly, in Physical Education and Sport [a subject offered at the institution].” Also cited was the Interactive Board, although its use is not often exclusive to students with hearing disabilities, but used with the whole group, revealing inclusive use of technologies.

Gemu and Titie went further, to suggest electronic books and localised frequency radios, respectively. Gemu added that electronic books could be accessed through the computer. Titie added, “The localised radio frequency has provision for volume adjustment to match

severity of one’s impairment.” Therefore, educators can use the localised frequency radio to transmit their presentations to students through special receivers.

c) Vital technologies for pre-service teachers with visual disabilities

Technologies considered beneficial to those with visual disabilities are given in table 4.8.

Table 4.8: Technologies that benefit pre-service teachers with visual disabilities

Type of technologies cited	Participants that cited them
JAWS software	Chimbadzi, Barakasi, Mbofayo
Braille printers	Barakasi, Chimbadzi, Jud
Audios	Chimbadzi, Chibwe, Barakasi, Tsitsi, Tinny, Biala
Adapted laptop, Adapted key pad	Barakasi, Klerk, Chimbadzi,
Electronic textbooks	Gemu
Computers that transmit signals to students’ tablets	Titie

The Job Access with sound software (JAWS) was cited by Chimbadzi, Barakasi and Mbofayo as essential for pre-service teachers with visual disabilities. In that context, Chimbadzi remarked, “...special or specialised gadgets for hearing impairment, like what I have heard about JAWS and Braille are critical.” Barakasi, similarly, commented, “Students with visual challenges can use the Braille, which is part of provisions that support inclusion and assist in preparing the affected students effectively for the profession.” He proceeded to say, “We still request the institution to acquire specified technologies like the braille, braille computer, and braille printers... to support students with visual impairment.” In another reflection, Barakasi recounted, “We had blind students that needed electronic copies, which they converted to voice with the aid of special software installed in their computers. I therefore, provided the presentations before sessions so that they could follow presentations in sessions.” Evidently, these students used adapted laptops with software that suited their specific requirements.

The participants also cited technologies under the umbrella term ‘audios’, which embrace audio-based devices with capacity to counteract effects of compromised vision through provision of audio voice output as an alternative. Also mentioned were laptops with adapted features on the keyboard, which then enabled students with visual impairment to also use standard technologies used in learning engagements by colleagues.

Data presented above shows satisfactory awareness on basic technologies that support learning for pre-service teachers with physical, hearing and visual disabilities. This evidences that teacher educators could use these for multiple representations that suit majority of the pre-service teachers, as an inclusive practice. However, very few contemporary technologies were cited, which depicts little awareness on related modern technologies. Such a scenario somehow impeded effective preparation of the pre-service teachers to levels that match current global trends. Although other teacher educators had received induction on Inclusive Education practices, it appears they had not cascaded the knowledge and skills gained to colleagues. Such discrepancy exacerbated knowledge deficiency and hampered use of matching technologies to support learning for pre-service teachers affected by particular disabilities. Furthermore, procurement of essential technologies at the institution was allegedly spasmodic.

iii) Accessibility and maintenance of the technologies

Analysis in this section examines data on access to the technologies by both teacher educators and pre-service teachers, including how these were kept functional.

a) Access to technologies provided at the institution

On access to technologies, Barakasi said, “Although authorities have provided Interactive boards, they should acquire and install more in other lecture rooms.” Installing the Interactive boards permanently made these accessible to pre-service teachers and teacher educators that used the particular rooms. I noted one installed in a lecture room, as shown in figure 4.4.

Barakasi went further, to say, “Most of the technologies can be transferred easily from one room to another.” Besides the permanently fixed Interactive boards, the other technologies could be moved to different learning environments, which facilitated their use even in non-specialist rooms. Information given by Barakasi and Mbofayo revealed that each subject department had its quota of technologies, which increased accessibility by the members. Barakasi, however, expressed the following concern, “The Professional Studies department does not have a projector, such that we rely on borrowing from other departments.



Figure: 4.4 An Interactive Board installed in one of the lecture rooms

Nevertheless, Jud proposed the following, as a strategy of increasing access to the technologies, “We need a resource centre, like at Mutare Teachers’ College [another institution in Zimbabwe], which has one for students with disabilities.” She added, “This is different with us at this college, since we also use the computer laboratory, where we usually find computers already taken by colleagues with no disabilities.” In support of the suggestion, Tsitsi said, “The setting up of our own resource room would enable us to use the computers without having to compete with colleagues that have no disabilities.” I gathered that students could access the computer laboratory during break time and after lectures, until about 1700hours, whilst computers in the library could be accessed up to 2000hours. However, the pre-service teachers cried foul on access to technologies in both facilities, as they were often outpaced by colleagues. The suggestion from Jud was further supported by Chibwe, who said, “A designated resource centre would enable students with disabilities to use the technologies at their own spare time, since their grasping of concepts is usually slow, hence, they need more time to research.” In apparent concurrence, Barakasi added, “The institution must acquire and reserve technology gadgets where they are safe and accessible to everyone.” Besides the proposed designated resource centre, Barakasi suggested centralized storage and issuing of technologies from a central place, to facilitate access to diverse technologies without others having to borrow.

b) Improvisation and other initiatives to promote the use of technologies

Data reveals efforts on addressing the inadequacy of technologies and making learning facilities more conducive for technology integration. For instance, Barakasi said, “I sometimes cover the wall with cloth to serve as screen and also facilitate use of laptops in place of desk top computers, where internet is accessed through Wi-Fi connection.” There is evidence that technologies at the institution were largely portable, hence, they could be used in any of the lecture rooms and not restricted to designated rooms. Barakasi adopted alternatives to facilitate the use of non-movable technologies like desk top computers, adopted alternatives for internet connection and also improvised for the screen, as presented above. In that context, Chibwe added, “Besides the equipment provided by the institution, I often present with my own laptop and encourage students to also use theirs.” The foregoing arrangement was confirmed by Barakasi, who said, “Students provide own laptops and smart phones, whilst as lecturers, we often use our laptops, as well.” These were strategies used to plug gaps created by the institution’s failure to provide other essential technologies.

Barakasi went further to say, “Parents and guardians have been providing technologies and other resources to their dependents (students), more than what the government does.” Such practice demonstrates effort to collaboratively enhance access to vital technologies that assist pre-service teachers with specific disabilities learn better. I also noticed how Barakasi created a makeshift screen after pre-service teachers tasked had failed to locate a proper one. As these pre-service teachers entered the lecture, Barakasi inquired, “*Machiwana here chamanga muchitsvaga* (did you find the equipment?). He proceeded to explain to the group, “They have been looking for a screen to use with the beamer, *vachishaiwa* (they could not find it).” From this scenario, I felt storage of the technologies in a central resource room would have ensured ready access.

c) Maintenance and repair of technologies at the institution

On maintenance of the technologies, Barakasi remarked, “Authorities...should facilitate the repair of speakers in the great hall and acquire more for the other lecture rooms.” I noted the dysfunctional speakers in the room used by Barakasi, which perhaps impeded use of a sound system that was in the room. Similarly, Chibwe said, “Cables in the lecture theatre are worn out and they do not function properly and are also risky.” The cited cables were for transmitting power to wall sockets where students plugged their technologies. I then noted that power sockets in some of the lecture rooms were vandalized as illustrated in figure 4.5.



Figure 4.5: Vandalized power outlet in one of the lecture rooms

It appears that either no one had mandate to maintain and repair the technologies or the person lacked supervision, which resulted in dereliction of duties. I also discovered that access to the technologies was better for teacher educators than the pre-service teachers, although the former seemed non-committed to the repair and maintenance of the equipment. The institution clearly lacked precise modalities and schedules for the maintenance of technologies, which seemed exacerbated by the lack of explicit institutional and ministry frameworks on the use of technologies for pre-service teachers with disabilities to promote inclusiveness. Sadly, the related excerpts noted in the strategic plans seemed insufficient to address that aspect.

On factors that inspired enrolment at the institution, pre-service teachers cited; desire for self-reliance, proximity to one's home, desire to fight discrimination and the institution's famed reputation. Similarly, the principal and teacher educators cited compliance with national and global calls for non-discriminatory practices in the provision of social services, like education. Data further revealed that inclusive practices, such as the use of technologies were largely informed by global pronouncements. Although teacher educators could cite some conventions that supported universal access to higher education and spurred integration of students with disabilities, the pre-service teachers clearly showed unfamiliarity with these. Data narratives provided suggest that enrolment of students with disabilities was a premature initiative, implemented when infrastructure was less suitable and essential technologies profoundly inadequate.

Data revealed that teacher educators were inadequately informed on pre-service teachers with disabilities, which negatively affected their efforts in creating conducive learning contexts and choice of appropriate instructional approaches. As a result, the teacher educators had challenges in the adoption of suitable modes of presenting learning content to pre-service teachers with particular disabilities. Furthermore, the institution did not have comprehensive records on pre-service teachers with disabilities, although data revealed that pre-service teachers provided such detail during selection interviews and at registration. As a result, some teacher educators had to rely on personal ingenuity in detecting students with disabilities, except for those that disclosed voluntarily. For pre-service teachers that disclosed their disabilities, teacher educators were frequently able to provide vital assistance in the learning processes. However, the principal (Mbofayo) vowed to facilitate better capturing of information on students' disabilities for subsequent intakes.

4.3.2 Facilitating technology-mediated teaching and learning

This theme examines how the use of technologies was facilitated for pre-service teachers with visual, hearing and physical disabilities in mainstreamed contexts. The analysis covers these sub-themes: support, capacity development and monitoring as well as, perceptions and attitudes on the use of technologies in teaching and learning contexts.

4.3.2.1 Support, capacity development and monitoring

Analysis in this sub-theme focuses at support for the use of technologies, capacitation of teacher educators and monitoring. These are examined under the following analytic categories: ministry support, institutional support on infrastructure, staff capacitation, acquisition of technologies and monitoring the use.

i) Ministry support in the use of technologies

The institution is under the Ministry of Higher and Tertiary Education, Innovation Science and Technology Development, which provides policy direction and monitored conformity to global standards on teacher education. In that context, Chibwe remarked, "Everything on Inclusive Education is drawn from the UN Convention on Education, to the Constitution of Zimbabwe, government policies and then college policies." This quote affirms the role of the ministry in informing and guiding institutional initiatives, as support. Chibwe further reflected, "In 2013, the five of us from this college went to the United College of Education

[another teacher education institution in Zimbabwe] for a workshop on Inclusive Education.” He intimated that the workshop was organized by the ministry in collaboration with VVOB (a non-governmental organization).

While commenting on ministry support, Barakasi remarked, “There is a ministry policy on Inclusive Education that was incepted five years ago.” He went further to reveal the following, “I sit on several boards that focus on Inclusive Education and these often invite college principals and ministry directors for capacity building workshops.” It appears involvement in the cited workshops kept Barakasi abreast with developments on Inclusive Education, which demonstrates the importance of ministry support. However, Tsitsi (a pre-service teacher) professed ignorance on any ministry support and just managed to say, “Lecturers need capacitation through training and the college must be given adequate resources.” The ministry evidently provided support in the form of implicit policy direction, mounting national workshops for teacher educators and creating opportunities for staff capacitation.

ii) Institutional authorities’ support on infrastructure, staff capacitation, acquisition of technologies and monitoring usage

In appraising the facilities, Barakasi remarked, “The institution must develop infrastructure that is appropriate for students with various disabilities.” However, Chibwe acknowledged existent efforts by saying, “Authorities at this college have done a lot since 2013, like erecting ramps around the college.” Ramps were noted at strategic places and entrances into specific learning environments, as shown in figure 4.6a and 4.6b.



Figure 4.6a: A ramp at the entrance of a lecture room **Figure 4.6b: A ramp with side rails**

The ramps evidences the administration’s efforts on supporting majority pre-service teachers to access learning environments, in line with the UDL philosophy. To reinforce the

foregoing, Mbofayo (the principal) remarked, “We have tried to avoid disadvantaging students with disabilities by setting up ramps around the college.” It was further noted that some of the ramps had side rails, as illustrated in figure 4.6b and these provided extra support to those with physical disabilities, as they accessed particular lecture rooms.

Chimbadzi added that:

Support from the institutional authorities has been limited, and I feel enrolment of students with disabilities was done prematurely and even now, they have not done much, except on construction of ramps.

The above quote implies that authorities exerted efforts on one aspect, while neglecting other critical areas that also needed support.

a) Capacity development for teacher educators

On staff capacitation, Chimbadzi revealed, “The administration has organized workshops, where they invited experts on different disabilities to share with us.” Mbofayo (the principal) confirmed the cited initiative, and added, “We have mounted one or two workshops, in which knowledgeable people were outsourced to enhance lecturers’ skills in handling students with disabilities.” However, Chimbadzi reflected on the workshops by saying, “There has not been any particular session which focused on empowering us in the use of technology gadgets, besides the encouragement we received from the Information Communication Technology (ICT) lecturers, in seminars mounted once in a while.” In that context, Chibwe revealed, “I participated in a workshop on Inclusive Education outside the college last year but one.” The workshop seems to have empowered Chibwe, which could explain why he rated personal use of technologies in the following manner, “I would give it 60%.” Chibwe then proceeded to rate his colleagues by saying, “A-a-ah! [For emphasis] use of technologies by other lecturers is below 30%... because they never attended any workshops on these challenged students.” Chibwe was evidently appreciative of his participation in the workshop, which seem to have greatly influenced him to integrate technologies in teaching pre-service teachers with disabilities, unlike his other colleagues. On the contrary, Barakasi alleged, “There has not been much administrative support, due to their negative attitudes, college principals and ministry directors attend national workshops, but they do not organize workshops to cascade the information to the college staff.” Barakasi further remarked, “I have potential to do more, if given induction and training in newer technologies.” He added, “As lecturers, we need self-initiation and continued capacitation on such issues.” This excerpt indicates need for continuous capacity development on inclusive practices like use of technologies. However,

Mbofayo disclosed, “We linked with organizations like Leonard Cheshire that show cased equipment for students with disabilities.” I also witnessed demonstration of technologies by Gross Care Pvt. Ltd as shown in Figure 4.7.



Figure 4.7: A display of technologies mounted by a visiting organisation

Figure 4.8a shows demonstration on the use a Braille tablet, whilst Figure 4.8b shows Tinny (a pre-service teacher) being assisted to produce a braille text version with an Embosser. Such use exemplifies Modification in the SAMR framework, where technologies assisted in customising material to accessible format for the students.



Figure 4.8a: Demonstration on the Braille Tablet Figure 4.8b: Student assisted to use The Embosser

b) Acquisition of the technologies and monitoring their use

On acquisition of technologies, Tsitsi just said, “The College must have adequate resources.” From this quote, Tsitsi appears non-conversant with procurement modalities at the institution.

In my view, consulting her and the other pre-service teachers would enable the authorities to acquire technologies that suit individuals with specific disabilities. Similar sentiments were echoed by Barakasi, who said, “Forms of disabilities are diverse and require specific equipment.” This excerpt implies that use of technologies facilitates embracing of Universal Design for learning through access to appropriate essential provisions by majority of the pre-service teachers. Barakasi further disclosed, “We often find it difficult to access funds for purchasing technology equipment, as this is not a priority for the authorities.” He went on to say, “The acquisition of technological resources needs improvement, which should be supported by a bigger financial budget allocation.” He added, “Organizations like, Jairos Jiri Association, Education Coalition Zimbabwe, Female Students Network, Forum for African Women Educators in Zimbabwe, the Catholic Church and the Ministry of Higher Education itself can assist with ideas and material support.” However, when probed further, the participants, including Barakasi failed to cite any technologies already acquired through assistance from the cited organizations. Perhaps the institution was still to explore such opportunities or information on donated equipment was exclusively privy to the administration.

In response to the inquiry on the procurement of technologies, Mbofayo explained, “We at times share equipment like software with the University of Zimbabwe and also borrow here and there.” However, Chibwe remarked, “The College needs a policy on reserving funds for assisting students made vulnerable by disability.” Such response might perhaps enhance acquisition of essential equipment to support learning for pre-service teachers with disabilities. In elaborating the purchasing procedures, Mbofayo (the principal) said, “Normal procurement procedures often apply, where lecturers identify equipment and inform their lecturer in charge who then forwards it to the head of department for actioning by the procurement committee.” She further clarified, “If the equipment is needed urgently, a lecturer can come straight to us (the principal), which makes it incumbent upon those directly involved to identify what they need.” Although plausible, this provision seemed unknown to the participants, as none of them hinted on it.

Turning to monitoring, Tinny (a pre-service teacher) commented, “The administration does not support at all, as they never make follow ups to establish needed equipment.” Similarly, Gidza added, “There is little support from the administration, because they never follow up

on how the technology gadgets are used in lectures.” These excerpts imply that monitoring use of technologies in pedagogic engagements by authorities was inadequate.

Analysis in this section revealed lack of explicit ministry policies that support use of technologies for pre-service teachers with disabilities to buttress inclusiveness. Nevertheless, data shows ministry involvement in co-organizing and supporting participation of members of staff in related national workshops. Noteworthy, is the apprehension expressed by participants on inadequate support from authorities. However, data has revealed infrastructural adaptations, college-based capacitation of teacher educators through the involvement of expert personnel invited from different organizations. The institution also developed links with other relevant organizations, procured technologies and in some instances borrowed resources needed to support learning for identified pre-service teachers.

4.3.2.2 Conceptualising use of technologies in teaching and learning processes

This sub-theme explores how use of technologies is conceptualized in contexts of teaching and learning, which is done under these categories: Perceptions on the use of technologies; attitudes towards the use of technologies; competences of teacher educators in relation to the use technologies to support UDL; preparing lecture sessions that integrate the use of technologies; setting up the technologies, their operation and the UDL philosophy; allocation or choice of lecture venues in view of UDL principles; seating arrangement for pre-service teachers and UDL; monitoring the attendance of pre-service teachers and managing progression of lecture sessions.

i) Perceptions on the use of technologies

Perceptions usually manifest through inter alia, one’s expression and narratives on particular phenomena, hence, what participants said in discussions was noted to extract their perceptions on the use of technologies. Perceptions are often triggered by the individual’s interpretations, impressions and beliefs about an issue. For instance, the use of technologies, which then influences the individual’s understanding of information derived through sight, sound and touch. Perceptions therefore, assist in the comprehension of contextual practices and occurrences, which influences how one experiences, acts or not act. I scanned for perceptions on the use of technologies from participants’ narratives, which culminated in analytic perceptive presented below.

a) Technologies facilitate clearer visuals presentations

Tsitsi (a pre-service teacher) remarked “The use of technologies is critical for us students with disabilities. For instance, presentations screened through the projector enable us to see these clearly.” Klerk (a pre-service teacher with sight challenges), similarly, said, “The projector gives better view of presentations, even if one is at the back, as it beams light as well.” Phedie (another pre-service teacher), likewise commented, “Screening presentation through a projector, enables one to see these clearly and also capture the notes well.” The excerpts cited above indicate perceptions that are appreciative of clarity in technology-aided presentations.

b) Technologies make teaching, learning and execution of academic tasks much easier

To illustrate the value attached to the use of technologies, Tsitsi (a pre-service teacher without hands) confessed, “When I eventually got access to a laptop, the compilation of assignments became much easier.” This is clear testimony that she used technologies at the Substitution level in SAMR, where she substituted use of the pen by using the laptop. Its use evidently ameliorated effects of disabilities on the student’s learning and made it more enjoyable and attainable. Klerk (with Albinism) also remarked:

Use of technology gadgets is very good, I love it. For example, the projector made power point presentations which make my learning easier, unlike when notes are dictated from a hard copy that I may not get hold of, because everyone often jostles to get the same copy.

By using the phrase ‘I love it,’ Klerk demonstrates profound appreciation in the use of the technologies, which illustrates his positive perception. In a similar manner, Phedie remarked, “Use of the computer helps me to Google or research, which makes compilation of assignments easier.” Phedie sounds indebted to computer functions, which infers positive perception on the use of technologies. Closer analysis of this scenario reveals that use of these technologies was at the Augmentation level in the SAMR framework, which enhanced Phedie’s capacity to execute academic tasks. Likewise, Tsitsi remarked, “The use of projector reduces the need for lecturers to always dictate notes.” Barakasi then vouched, “All my lectures are anchored on the use of technologies, where I use the computer and projector for power point presentations and the Interactive board in making illustrations.” From his submissions, it is clear that Barakasi frequently used technologies, which indicates positive perceptions on their efficacy in boosting learning for the pre-service teachers.

c) Use of technologies enhances concept acquisition

Chibwe (a teacher educator) commented, “Use of technology gadgets helps students with disabilities, as they are often slow in grasping concepts, which helps them to understand better.” The above excerpt indicates appreciation in the capacity of technologies to buttress learning, especially if disability is an albatross. Similarly, Jud (a pre-service teacher with physical disabilities) stated, “*Zvinotibatsira ku understander* (it helps us to understand) and grasp the concepts.” Tinny also added, “The use of technology equipment facilitates faster and more efficient grasp of content and concepts.” In apparent affirmation, Phedie (a pre-service teacher with hearing challenges) confessed, “The use of technologies has made my learning easier and more motivating.” The excerpts cited above demonstrate conviction that use of technologies boosts concept and skill acquisition, which portrays the participants’ positive perceptions on their use.

d) Use of technologies provides alternatives on teaching methods and techniques

Another perception that emerged is that technologies provided opportunities for alternative methods and techniques in teaching and learning. In that context, Tinny remarked, “Technology equipment reduces burden in carrying out educational tasks.” She went further to say, “If one has challenges in using eyes for reading, the Braille becomes a befitting alternative, whilst students that are deaf tend to understand better when pictures and videos complement the sense of hearing.” This excerpt hints on the use of technologies at Augmentation level of SAMR, where these bolster the usual ways of teaching and learning. Nevertheless, Barakasi (a teacher educator) remarked, “I need training in using newer and diverse gadgets.” While the earlier presented excerpts revealed Barakasi’s appreciation of technologies already available, the latter reveals his wish for the institution to acquire and expose him to more novel technologies. It sounds like; Barakasi’s desire was to use technologies that matched pre-service teachers of diverse dispositions, which proves positive perceptions on the use of the technologies.

Analysis in this section has revealed positive perceptions on the use of technologies, as participants appreciated their capacity to provide clearer visuals, easy execution of academic tasks, enhance concept acquisition and avail alternative strategies in the teaching and learning engagements.

ii) Attitudes towards the use of technologies in teaching and learning processes

How an individual appraises an issue like the use of technologies often denotes one's positive or negative attitude. This can influence the extent to which he or she uses these, because attitudes can manifest through actions and behaviours. From narratives of the study participants, I noted statements that infer attitudes on the use of technologies, as analysed below.

a) Interest and inspiration to use technologies in teaching and learning engagements

Tsitsi remarked, "Some students with disabilities are either afraid or shy to even look at the computer." It appears avoidance of proximity to or operating the technologies was indicative of depressed interest or support from educators. Such behaviours might also illustrate negative attitudes towards the use of technologies. Worth noting is Tsitsi's reflection on personal experiences, in which she made the following confession, "I did not have much knowledge in using the computer and projector, which I only learnt during teaching practice, as these were critical in my functioning in the classroom." Tsitsi did not however, disclose the reasons for this lack of skills, although she was pursuing Computer Studies and had been at the institution for a year before teaching practice. Basing on this, one would expect Tsitsi to have requisite skills to use such technologies, unless she did not receive adequate support from the educators who probably had negative attitudes. Nevertheless, experience during teaching practice transformed Tsitsi's attitude on use of the technologies, after realising how critical these were in the teaching and learning processes.

On the lack of skills to operate technologies like the projector, Barakasi commented, "Some lecturers do not have interest to learn how to use the available technology equipment." Based on the above excerpt, it is likely that students' depressed exposure to technologies resulted from negative attitudes of educators who did not facilitate integration of these in lecture sessions. Barakasi affirmed the foregoing view, by saying, "Most lecturers are not motivated to use such technologies and they never make effort to prepare specialised curricular instructions for students with disabilities." Richie also added, "Although lecturers may be knowledgeable in using technology gadgets, they lack motivation and make little effort to use them." It appears the depressed use of technologies was also exacerbated by negative attitudes.

In affirming the negative attitudes, Chibwe relived the following episode:

While on teaching practice supervision, we got to a school with a pre-service teacher who was known for writing with the pen supported between toes, who my colleagues unanimously agreed could only be supervised by me. This made me question whether they were ever sincere on implementing inclusivity.

The excerpt cited above exposes dissonance between the attitude of Chibwe and his colleagues, as evidence shows that exposure and conscientisation are critical determinants of one's attitude. On another note, Barakasi remarked, "The administration has negative attitudes towards the use of technologies, as evidenced by reluctance to readily avail funds to purchase these." He added, "Students with disabilities often bring and use their own gadgets like computers." The above quote demonstrates the pre-service teachers' efforts on counteracting the effects of scarcity of institutional resources by collaborating with teacher educators in the provision of technologies. As I observed Chibwe's lecture session, I noted, [He provided the presentation in soft copy to Kesie, a student with physical disabilities, who then saved it in his laptop and later printed a copy with his own printer, as illustrated in figure 4.9]. Although other students claimed use of similar equipment, this could not be verified as they used these at their hostels.

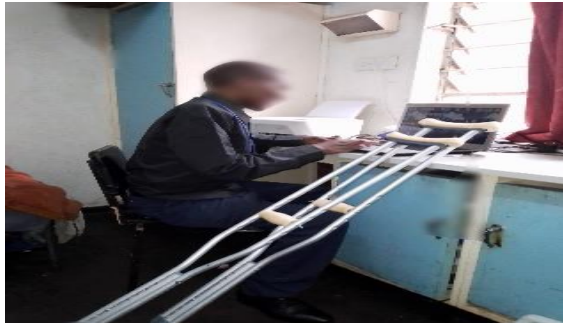


Figure 4.9: Kesie producing a hard copy of notes using his printer

b) Use of technologies is an innovative way of teaching and learning

Chibwe (a teacher educator) asserted, "The use of technology equipment is a new way of learning and it motivates students." Similarly, Chimbadzi (another teacher educator) remarked, "Use of technology equipment makes my practice more humanistic and gives me confidence to assist students with disabilities." The above sentiments were also supported by Biala (a pre-service teacher), who stated, "Since teaching and learning is now based on

technologies, everyone wants to use these.” These excerpts reveal the participants’ positive attitudes towards the use of technologies in teaching and learning engagements.

c) Use of technologies may consume much time than is necessary

Other participants seemed apprehensive on the use of technologies, which somehow inferred negative attitudes. For, instance, Tinny (a pre-service teacher) remarked, “The use of technology gadgets consumes a lot of time, especially in lesson preparation.” Gidza (a pre-service teacher) similarly, complained, “Much time is used up in setting up technology gadgets, which usually delays the onset of lessons.” These extracts insinuate that technologies may be used in ways that create negative attitudes among students. Chimbadzi (a teacher educator) further explained, “The use of technology gadgets becomes time wasting, if equipment is inadequate, since we may spend much time hunting for gadgets that are not in use.” She also confessed, “For gadgets that seem complicated to operate, I often ask technicians to help set them up, which makes preparation for lecture longer than otherwise.” In my view, the cited scenario demonstrates deficient planning on strategies for using the technologies, which wastes precious time and also affects the attitude.

Data has indicated that exposure and access to the technologies are significant indices in shaping perceptions and attitudes on their use. In addition, an individual’s attitudes may also depend on how one appreciates benefits accrued from the use of the particular technologies. In this study, it has been noted that indifferent attitudes portrayed by some institutional authorities and teacher educators affected the extent to which technologies were used. However, pre-service teachers generally showed positive perceptions on the efficacy associated with the use of technologies, although they acknowledged the influence of particular educators’ facilitations skills.

iii) Teacher educators’ skills and the use of technologies

This section focuses on the competences of teacher educators in relation to the use of technologies. In that context, Gidza (a pre-service teacher with physical disability) remarked [with a chuckle, which I considered contemptuous], “Most lecturers lack capacity and sufficient knowledge to operate the gadgets.” This sounds austere and contemptuous, especially when he did not provide reasons for the anomaly. One would expect teacher educators to have satisfactory capacity, since in Zimbabwe; one often obtains considerable experience in the primary or secondary school system before joining teacher education.

Phedie similarly, alleged, “Lecturers do not have the capacity to use technologies effectively, as they seem to have been affected by transformation in the education system, hence, they still need time to adjust to using newer technologies.” Likewise, Klerk (a pre-service teacher) remarked, “It appears some of the technologies are out of the lecturers’ generation.” These excerpts infer that developments in the education trajectories impacted negatively on the teacher educators, who were perhaps slow in adapting to the fast-paced developments on technologies. This scenario was probably exacerbated by the influence of novel trends like Inclusive Education and the advent of newer technologies, which then required teacher educators to have corresponding capacitation to sustain effective relevance in the system. Contrary to excerpts presented earlier, Tsitsi remarked, “Lecturers are capable, but lack interest to learn how to use the technologies, whilst others are afraid of using these” Tsitsi seems to blame lack of interest and ‘techno-phobia’ for impeding teacher educators from using the technologies. The teacher educators perhaps refrained from using technologies due to wary of exposing deficient skills or fear of damaging the technologies. They evidently needed functional capacity to operate the technologies and also transform their personal conviction on the efficacy associated with the use of technologies. However, Barakasi was not deterred by his lack of operational skills, as he tasked techno-savvy students to operate the technologies in his observed lecture. Besides, operating, I witnessed students attending to technologies that malfunctioned in Barakasi’s lecture, as shown in figure 4.10.



Figure 4.10: A student attending to technologies that malfunctioned during a lecture

On his capacity to use technologies, Barakasi declared, “It is fair, but I can do more, if I get further induction and training in the use of newer gadgets.” Chimbadzi (another teacher educator) similarly said, “It depends on the gadgets, but as for the computer and beaming, my capacity is quite high. It may however, be low on the use of specialised gadgets like JAWS

(Job Access with Sound) and Braille, for which I need further training, which leaves my capacity at 50%.” The quotes presented above indicate that both Chimbadzi and Barakasi had confidence in their skills to operate the technologies, although they wished for capacitation in using less familiar or newer technologies. To that end, Chimbadzi remarked, “I don’t mind being trained in other technology gadgets, to acquire more confidence in assisting students with disabilities.” This sounds like admission of inadequate skills in the use of diverse technologies, which was perhaps due to the advent of modern and more complex technologies. In appraising his capacity to use technologies, Chibwe said, “I put it at above 60%, since I am trying my best with the available meagre resources.” While Chibwe acknowledged high capacity in the use of technologies, he seemed concerned about inadequacy and non-availability of diverse gadgets which frustrated his efforts.

When I asked Barakasi to evaluate the capacity of fellow teacher educators, he said, “Other lecturers may have knowledge, but the majority lack motivation to use the technologies and have shown little effort to use them.” The above excerpt affirms low motivation and self-initiation as factors that influenced extent to which technologies were used. According to the excerpt, even educators that had functional skills to operate the technologies still needed self-drive to integrate these in teaching and learning engagements. Chimbadzi (a teacher educator) similarly, remarked, “Colleagues have very low capacity, although I have seen a number of them with smart phones, they cannot even set up a projector, which reduces the extent to which they use the technologies.” She then proceeded to say, “This leaves colleague lecturers’ capacity to use the technologies at an average of between 10 and 20%.” In the same context, Chibwe (another teacher educator) commented, “The capacity of most lecturers to use technologies is below 30%, because some of them cannot even select appropriate gadgets to use. Majority of colleagues did not take part in the workshops on challenged students.” Such data depicts low use of technologies by teacher educators, which was blamed on insufficient capacitation and lack of exposure to contemporary inclusive practices. Nevertheless, educators like Chibwe that had attended workshops on Inclusive Education, seemed appreciative of the knowledge and skills gained. On the frequency to which teacher educators used technologies with them, Tsitsi said, “On the average lecturers use technology gadgets with us at least once a month.” This was corroborated by Klerk, who remarked, “Teacher educators use gadgets, like the projector with us, once a month or not at all.” He continued, to say, “In my subject area, Mr [Name supplied] has only used the projector with us twice since our first year, of which the second time was last week.” In the same context,

Tinny stated, “We usually have technologies used with us after a month or so, depending on the topic.” She added, “It is mainly in Physical Education and Sports, where the projector is used, while there is little usage of this equipment in Theory of Education and Professional Studies.” This excerpt infers sporadic use of technologies in specific subject areas, which excluded Professional Studies. Nevertheless, the use of technologies once per month seemed inadequate, considering the number of lecture sessions scheduled for each group per month and diversity in the students’ disabilities.

On a different note, Klerk [a pre-service teacher with visual disabilities] commented, “When lecturers use technologies, their objective is usually not to benefit us, but as an alternative mode of presentation.” He elaborated that view by saying, “One of our lecturers once confessed failure to print a test question paper, which forced him to screen it with a projector.” While this denotes Substitution in SAMR, it also helped to save paper for printing, although use of the technologies seems to have been a default initiative. However, the technologies evidently enabled alternative presentation, following the emergence of unforeseen circumstances that obstructed use of the preferred presentation method.

Richie [a student with hearing and physical disabilities] then alleged, “Use of these technology gadgets only happens when a concerned student raises alarm, as most lecturers rarely consider students with disabilities in lesson delivery.” This excerpt indicates how pre-service teachers tried to influence the use of technologies to support their learning. Although the cited initiative might sound demeaning to the authority of educators, it nevertheless, depicts the pre-service teachers’ confidence in the capacity of technologies to transform their learning. Another pre-service teacher, Phedie added, “Some lecturers lack skills in operating the gadgets, hence, they often get assistance from students or technicians from the ICT department.” She went further to say, “Although lecturers might have personal laptops, the challenge is on mounting the projector and the screen, which results in time wastage, as they seek assistance of technicians from the ICT department.” Gidza (another pre-service teacher) added, “The use of technology gadgets wastes time, especially on preparation before the lesson, which forces some lecturers to avoid using them.” It appears the amount of time used in setting up technologies frustrated other teacher educators, who eventually refrain from integrating technologies in their lectures. Related to this, I noted the following in Barakasi’s session [The lap top and projector were only set up when students were already seated and ready for the lesson, which could have been done much earlier]. In this instance, Barakasi preferred tasking pre-service teachers to set up the technologies, although Phedie affirmed

existence of technicians who could do that. The only time I noticed assistance from technicians was when a gentleman switched on power in the lecture room used by Chimbadzi.

On the little use of technologies to benefit pre-service teachers with disabilities, Tinny remarked, “Technology equipment at this college is insufficient, as you might find only two projectors for use by the many student groups.” This quote implies that technologies were acutely inadequate for the more than 2 500 pre-service teachers and about 130 teacher educators. Similarly, Barakasi expressed concern with lack of a projector in the Professional Studies department, such that members relied on borrowing from other departments. In Chibwe’s lecture session, the following was noted [Students used personal gadgets like laptops, tablets, cell phones and smart phones to capture notes], as illustrated in figure 4.11a and figure 4.11b. In figure 4.11a, Gidza (a pre-service teacher without the left hand) had set his laptop to recording mode, but still proceeded to input notes into it by using the right hand, whilst in figure 4.11b, Tinny (pre-service teacher with visual disabilities) concentrates on capturing notes into her smart phone and seems unbothered to even look at the educator facilitating. Allowing the use of personal gadgets by pre-service teachers clearly enhanced the use of technologies. However, the use was largely at the Substitution level of SAMR, as this was mainly in note capturing.



Figure 4.11a: Jimmy using Figure. 4.11b Biala using own cell phone in a lecture session own laptop in a lecture

However, of concern was the little attention that teacher educators gave to how some pre-service teachers used their personally owned technologies during lecture sessions. I also noted that some of the pre-service teachers frequently reacted to alerts on their smart phones with unwarranted smiles, which showed engagement in private conversations on social media platforms. Others tapped on their smart phones that were positioned on laps under the desk

tops. Such actions were a ploy to evade detection by Chibwe, whenever he came close by, although they were not deterred by me noticing it. There were over 500 students in Chibwe's lecture session, which made it difficult to detect misuse of the personal technologies. To affirm this perspective, Barakasi, lamented, "The groups are too big and difficult to; manage, identify and monitor those with disabilities, particularly, when we are not informed about them." This excerpt makes it clear that large group sizes posed challenges for teacher educators to ensure that students used personal technologies for tasks related to the sessions, as their focus could not be on everyone at all times.

On another note, Barakasi reflected, "Stunny [not real name, an ex-student who was blind used a computer that none of us could operate, which impeded us from giving him much assistance." The above quote sounds like an admission on being unfamiliar with some of the computer functions, which impeded teacher educators from providing effective assistance to some of the students with disabilities. The cited scenario reveals adverse effects of personally owned technologies on collaborative use by pre-service teachers and teacher educators, when educators had little knowledge on functions of the technologies.

Although teacher educators could seek assistance from technicians in setting up and operating the technologies, this provision was rarely used, as they preferred to do it themselves or task pre-service teachers. Furthermore, the teacher educators' motivation to use technologies depended on personal perceptions and attitudes on their efficacy, which influenced low the average use of these in teaching and learning processes. While teacher educators had functional skills to operate the technologies, some of them were allegedly less keen to use newer technologies, which reduced the exposure to befitting technologies for pre-service teachers with certain disabilities. Analysis has revealed that pre-service teachers often used their own gadgets to enhance the use of technologies, although this posed challenges for teacher educators to effectively monitor how these were used in the large groups.

iv) Preparation of lecture sessions which integrated use of technologies

With regards to preparation of lecture sessions that integrate use of technologies, Chibwe remarked, "When planning lecture sessions, I always choose technologies that I can operate and are appropriate." This excerpt highlights significance of operational competence of educators and appropriateness of choosing technologies that are then used, at lecture the planning stage. Such practice assists educators in making projections on multiple

presentations of content that benefit the majority of students. In apparent concurrence, Barakasi remarked, “One needs to inquire on the nature of disabilities that students have before the session, so that appropriate facilitation strategies are adopted.” The above quote highlights the importance for teacher educators to know the nature of pre-service teachers that constitute a particular group, since this influences decisions on strategies that accommodate diversity. Such awareness also informs decisions on nature of learning engagements, which facilitates projections on possible multiple learning engagements for the pre-service teachers. Chibwe added, “I always vary methodologies based on the topic and content, hence, thorough preparation is critical.” This excerpt highlights thoughtfulness in session planning, as it enables educators to accommodate students’ diversities. On examining the objectives targeted in Barakasi’s lecture, the following was noted [He sought to embrace inclusiveness, particularly, in the objective stated as, ‘to assist students realise and appreciate the importance of leadership and management roles in education].The cited objective synced well with the lecture topic, which focused on Leadership and Management in Education. Barakasi clearly sought to promote inclusiveness through efforts to groom all the pre-service teachers for leadership and management roles, regardless of personal disabilities. He reinforced his efforts through the use of projector and laptop to further clarify concepts.

It was also noted that teacher educators saved their presentations in memory sticks, although they had hard copies of these. Such practice demonstrates careful planning and preparation, where back up is accorded due consideration. In Barakasi’s session, I noted the following [As part of the introduction, eight pre-service teachers narrated their special leadership roles at the institution to colleagues]. This practice illustrates use of realia, as students shared their experiential stories. Barakasi also used the strategy to give pre-service teachers that were setting up the technologies time to finish up.

As reported earlier, Barakasi had tasked some pre-service teachers to locate a portable screen, which exemplifies student involvement in session preparation. Similarly, Chibwe remarked, “Students have to assist in ensuring that essential technology gadgets are in place and ready for use before the session.” The two excerpts demonstrate desire to involve pre-service teachers in pre-session activities. In what appeared as support to the foregoing perspective, Barakasi remarked, “Students with disabilities must be given special attention... so that they feel to be part of the group, which then stimulates eagerness to demonstrate their knowledge.” He added, “Although the lecturer determines what is relevant, it is also important that

students with disabilities get the opportunity to choose or recommend appropriate technologies for their condition.” Chimbadzi, similarly, remarked, “Effective session preparation should start with getting to know the nature of disabilities that students have.” She added, “However, resource constraints often make us spend considerable time on efforts to locate technology gadgets that are available and free for use, which should be determined by the students’ disabilities.” This quote illuminates the importance of awareness on students’ disabilities before the session and how it influences fundamental accommodations.

Data presented in this section has shown that choice of technologies depended on factors like; gadgets that teacher educators could operate, the topic, content and disabilities of the students. In view of the latter factor, teacher educators often sought to establish the nature of students’ disabilities before sessions, which facilitated necessary accommodations. There was also concurrence among participants that involvement of pre-service teachers with disabilities in pre-session activities like choice of technologies that match their disabilities is important. Similarly, devices like the flash disc were valued for providing vital back up for presentations made through technologies like the computer. However, it was evident that pre-service teachers with disabilities had very little input in pre-session preparatory activities, although study participants highlighted need for their involvement.

v) Setting up and operation of technologies in view of the UDL philosophy

On setting up of the technologies, Chibwe disclosed, “I am usually assisted by the stores person (an individual responsible for safeguarding and issuing technology equipment in the department).” He added, “During setting up of the technologies, I often ask students to verify the clarity of presentations, particularly, for those occupying back seats.” This indicates compliance with multiple representations in UDL, where effort is to ensure that all students derive optimal benefit from technologies used. Such practice may also be viewed as collaborative setting up of technologies, although the pre-service teachers seem to have been passive recipients, who just verified clarity on visual presentations. Tsitsi (a pre-service teacher) confirmed her passivity by saying, “I am never involved in setting up technology gadgets.” From the above excerpt, it is evident that pre-service teachers with disabilities were not involved in such processes, yet, this was supposed to be part of their learning. To confirm the foregoing view, Barakasi remarked, “Professional Studies is a subject where students are inducted on the use of various technology gadgets.” It therefore, means the setting up and operation of technologies were course components for all students, but those with disabilities

were being side lined. Ideally, lecture rooms should have standard technologies in place that are always ready for use. However, this was not the case at the institution, since the technologies were usually set up just before sessions.

Non-exposure to technologies was condemned by Tsitsi, who lamented, “I went for teaching practice without knowledge and skills to operate the projector, yet, these were critical for me to function in the classroom.” She added, “I only gained these at the school where I did teaching practice.” Non exposure to technologies like the projector before teaching practice obstructed Tsitsi’s practice, since she did not have hands and needed the equipment to support in making illustrations. The cited scenario reveals the intransigence of teacher educators, who seem to have disregarded the need to use the technologies in facilitating multiple engagements and expressions, as well as induct students on using these before teaching practice. Such practice seems to have deprived Tsitsi and perhaps others of the opportunity to practice using these technologies before teaching practice. Tsitsi then said, “Lecturers must involve students with disabilities in setting up technology gadgets, in preparation for teaching practice and the world of work.”

In Barakasi’s lecture, I noticed [none of the pre-service teachers involved in setting up the projector, laptop and the make shift screen had visible disabilities]. This observation substantiates Gidza’s claim, who said, “Only students with knowledge and skills to operate the technology gadgets are asked to help in setting them up.” It appears the mounting of technologies was a prerogative for teacher educators and those students with no disabilities, which was perhaps meant to save on time. To confirm the foregoing views, Gidza said, “The process of setting up technology equipment wastes time and is usually confined to a few selected individuals.” Contrary to the foregoing, Klerk (a pre-service teacher with albinism) remarked, “Some lecturers involve us in setting up technology gadgets. He added, “In our main subject, the lecturer only asks me to set up the projector.” Such practice is contrary to the practice of Chimbadzi (a teacher educator), who revealed, “After selecting technology equipment, I always encourage students, including those with disabilities to take turns in setting up.” This strategy sounds more inclusionary, unlike relying on one student, as alluded to by Klerk. Biala (a pre-service teacher) supported Chimbadzi’s approach, by saying, “Some lecturers just bring the technology equipment and request us (students) to assist in setting them up.” What I liked was the ‘us’ aspect, which infers inclusion of pre-service with disabilities in the line-up for setting up technologies. Mbofayo (the principal) similarly,

added, “Some students know a lot and if given the chance, lecturers can learn a lot from them on operating these technologies, all they need is just initial exposure.” The above excerpt infers that pre-service teachers can even have better skills to operate newer technologies than their teacher educators. Therefore, involving them in setting up or operating the technologies can enhance efficiency in their use. Apart from her efforts to involve pre-service teachers, Chimbadzi confessed, “When a gadget seems complicated for me, I often seek assistance from the technicians.”

Analysis in this section has shown that efforts to involve pre-service teachers in setting up or operating the technologies mostly focused on those without disabilities. As a result, those with disabilities were disadvantaged and were often found wanting when required using these, especially, during teaching practice. Furthermore, there was frequent disregard for the principles of Universal Design for learning, as opportunities to mount and operate technologies were only given to teacher educators, technicians and selected pre-service teachers, leaving out the majority. Such practice dispossessed pre-service teachers of optimum benefit, as expected through multiple representation in UDL, as they could not demonstrate evidence of learning through operating the technologies, as well.

vi) Lecture venues used in relation to UDL principles

This segment focuses on the learning environments, as these influence how the use of technologies is facilitated. To substantiate the above notion, Chibwe said, “I have often planned to use technologies like the projector, only to find that there is no power or backup source.” The above excerpt highlights the need for power back up source in learning environments, which were allegedly missing. Barakasi, similarly commented, “Inclusive Education, like the use of technology gadgets is below expected levels, and it appears requisite material and appropriate physical infrastructure were not yet in place, when this initiative started.” Barakasi’s sentiments seem to infer that the ministry and institution introduced Inclusive Education on an ad-hoc basis, without proper planning and futuristic projections. Infrastructure and material resources were not commensurate with the diversity of student disabilities, which made the learning environments less conducive. Some of the learning environments were not easy to access for other students with disabilities, which illustrates non-compliance with the UDL philosophy on access by the majority. Mbofayo (the principal) confirmed this, by saying, “We still have a long way to meet global standards on Inclusive Education and the use of technologies.” Barakasi also added, to say, “We need to

make adjustment on the facilities and also improvise, as there are no special accommodations in place for students with disabilities at the moment.” His concerns resonate with Tsitsi, who lamented, “We are given general treatment just like other students.” Therefore, the existing provisions and accommodations were not sufficiently accommodative to pre-service teachers with disabilities, which is contrary to the philosophy of UDL.

In an apparent effort on adapting to the existent settings, Barakasi revealed, “I always inquire on the group size before the session, so that I can decide on facilitation strategies to use.” Such information seems to have also assisted Barakasi in re-organizing the learning environment into more conducive settings for students with various disabilities. The three observed lecture sessions were conducted in designated spacious rooms and teacher educators used the mass lecture approach with over four hundred pre-service teachers. I noted that the spacious rooms enabled easy movement for pre-service teachers with disabilities that impeded mobility. Whilst the rooms were allegedly reserved for these groups, teacher educators confirmed that they could still use any other preferred lecture room that would be free. The lecture room used by Barakasi and Chimbadzi accommodated the majority pre-service teachers in a lower area facing the stage, whilst Jud (with physical disabilities) had her seat on a platform near the entrance, as shown in figure 4.12. To prove awareness of the above cited arrangement, Klerk, said, “There is a reserved space in the lecture theatre for a lady with physical disabilities, who cannot go down the steps.” The sitting area for the majority pre-service teachers was accessed through steps that stretched from the entrance, which Jud could not pass through to be with the others. Jud therefore, had her seat on a platform which appeared to have been integral from initial construction of the building, before inception of Inclusive Education. Although the platform assisted Jud to have better view of presentations, it however, was no evidence of responsive infrastructural adaptations



Figure 4.12: Jud, a student with multiple physical disabilities occupying a secluded seat on a raised platform

Another adaptive response was noted on ramps that were put at the entrances of some lecture rooms, which made entry and exit easier for pre-service teachers using wheel chairs or crutches. This provision illustrates conformity to Universal Design for learning on accessibility. Efforts on providing sufficient lighting, were also noted in the lecture room used by Chibwe, which had additional lighting as contingent for cloudy days, as shown in figure 4.13



Figure 4.13: A lecture room with additional lighting

The following was also noted [expansiveness of the lecture rooms compromised audibility, because walls had no sound proofing]. I further noticed [Some pre-service teachers visibly struggled to capture audio presentations, until they became bored and apathetic. For example, Jimmy who was sitting at the back of the room eventually dosed off, as shown in figure 4.14].

Clearly, the set up in the room was non-compliant with UDL, since other students were not well positioned to obtain optimal audibility of the presentations.



Figure 4.14: Jimmy (with hearing impairment) struggling to hear presentations from the back of the room

Access to the front stages was only by steps, as shown in figure 4.15, which impeded students on wheel chair or with other physical disabilities from engaging in activities or operating technologies that were on the stage.



Figure 4.15: Steps used to access front stages in two of the lecture rooms

Data has shown that spacious lecture rooms facilitated easy mobility for pre-service teachers that had physical disabilities. Furthermore, the ramps erected at entrances of lecture rooms enabled easy entry for those with physical disabilities, whilst adequate lighting made learning environments more conducive to individuals with visual disabilities. However, access to some learning environments was restricted by the use of steps for access. Furthermore, lack of sound proofing in some lecture rooms made audibility poor, particularly, for pre-service teachers with compromised hearing. Some in-built features like the raised front stage also enhanced compliance to the UDL principle on visibility of presentations. However, further responsive infrastructural adaptations were still needed to cater for pre-service teachers with diverse disabilities.

vii) Seating arrangements in view of multiple representation in UDL

The sitting arrangement for the pre-service teachers in teaching and learning contexts that integrate use of technologies is critical for effective audibility and students' engagements with content. In the three observed lecture sessions, pre-service teachers had liberty to decide where to sit. However, Chibwe (a teacher educator) additionally, claimed, "For students that report challenges with hearing or seeing, I often facilitate front row seats for them or position them closer to the screen." I nevertheless, noted a paradox between the above claim and the practice of Chibwe and the three teacher educators, because none of them implemented that strategy in the observed lecture sessions. It appears Chibwe only wanted to portray an image of being accommodative or being aware of that strategy.

As I observed Chimbadzi and Barakasi' lecture sessions, I noticed [Most pre-service teachers sat in a lower space facing a raised stage, whilst Jud who had multiple physical disabilities sat on a raised platform at the back, as shown in Figure 4.12]. Although the platform enabled better viewing of screened presentations, Jud appeared 'marooned', which rendered the arrangement isolationist and a negation of inclusiveness. Educators therefore, needed caution in their efforts to uphold the UDL principles to avoid further disadvantaging the targeted beneficiaries.

Tsitsi also remarked, "At times as students, we take time to settle down in readiness for the lecture." To substantiate the above excerpt, the following was noted in sessions facilitated by Barakasi and Chimbadzi [Pre-service teachers spent much time trying to secure seats next to friends, which included Tinny, Titie and Biala (with visual disabilities), who then occupied back row seats with friends]. These pre-service teachers clearly prioritized sitting next to friends instead of positioning themselves for better view and audibility of the presentations. All the three teacher educators seemed oblivious of such manoeuvres, because none of them commented or tried to redress it. In Barakasi's session, I further noticed [Klerk a student with Albinism took a seat at the back and visibly strained his eyes to read text from the screen, which the educator did not notice, until Klerk left the session prematurely]. Follow up with Klerk established that he went out after efforts to read text displayed on the screen failed. This illustrates futile use of technologies for Klerk, as he got demotivated and missed learning from part of the lecture session. This incident confirms Phedie's remarks, who said, "Little attention is paid to students with disabilities, since lecturers deliver lessons without paying much attention to some of us who have disabilities."

Further observations exposed the following [Kesie, Jimmy, Richie and others that used wheel chairs and crutches always occupied back row seats in the three observed sessions. Although their objective was perhaps gaining faster entry and exit from the room, their sitting positions impeded effective hearing and viewing of screened presentations, in view of nature of their disabilities. Mbofayo, similarly added, “I have noticed that in the Great hall students with physical disabilities usually remain at the back, because they cannot go further into the room, as it accessed by the use of steps.

From data presented in this section, it is clear that while pre-service teachers with disabilities voluntarily chose unsuitable sitting positions, this anomaly was overlooked by the teacher educators, who did not take necessary interventions measures, like advising them to occupy more strategic seats, considering the students condition. Due to inappropriate choice of sitting positions, students with visual and hearing disabilities obtained poor visibility and audibility of presentations, even when technologies were used. From this scenario, it is clear that both ‘pre-service teachers and teacher educators were supposed to collaborate on ensuring that students occupied sitting positions where they get better visual and audio of the presentations. Such practice would then promote adoption of multiple representations that match majority of the pre-service teachers. There were however, instances where both teacher educators and pre-service teachers had limited options, especially, where the infrastructure needed adaptation, which could only the authorities could address.

viii) Monitoring attendance of pre-service teachers with disabilities

Checking attendance in pedagogic contexts is fundamental, particularly, for pre-service teachers with disabilities who might absent themselves for various reasons that include health challenges. I noted that the three teacher educators were not very keen to use physical registers to check on attendance. I was therefore; alert to identify alternative strategies used to verify students’ attendance, particularly those with disabilities. Tsitsi revealed, “Some lecturers often invite us to get notes in hard copy after sessions and at times they prepare work that is specific to us.” Such instances provided opportunities for teacher educators to check on attendance as students collected their hand-outs. As evidence, I noted the following [Upon concluding the lecture, Barakasi invited a group of pre-service teachers from a list, to his office where they were given hand-outs with the notes. All of them had either physical or visual disabilities]. Upon asking Barakasi to explain the incident, he said, “I adopt a relevant *modus operandi* and identify individuals with special needs, so that I can prepare for them

accordingly.” I noted that hand-outs distributed by Barakasi included abridged versions, like larger print, which evidences adoption of accessible formats. As he distributed the material, Barakasi also checked presence of particular individuals.

I took note of a concern from Barakasi, who lamented, “The large student groups make it difficult to track those with disabilities, worse still, the time tables are congested, which impedes one to one attention.” As evidence of credibility in the foregoing concern, I witnessed some pre-service teachers sneaking out of the lecture room, unnoticed by the educator. Barakasi proceeded to say, “Students with non - visible disabilities rarely receive special provisions.” The above excerpt infers that students with undetected mild hearing or visual disabilities were perhaps denied essential accommodations in the large groups. Nevertheless, Barakasi vowed:

I have interest in the affairs of students with disabilities, so I always strive to interact with them, so that I know the material to prepare for their individual needs and ensure that they feel accommodated. This gives them confidence to share personal successes and challenges.

From the above quote, Barakasi revealed his conviction that cordial relations with pre-service teachers would enable him to know the needs of particular individuals, which would also support detection of non-attendance. Such relations perhaps made students feel obliged to communicate on any pending absence, which made verifying attendance and notifying on absence collaborative. As Barakasi facilitated, I noted the following [He kept shifting positions, by presenting from the front, within students’ sitting space and at times from behind the back row seats]. Barakasi seems to have used the cited strategy to check on the presence and attentiveness of particular students, especially if these occupied specific sitting positions or were known to have disabilities. Chibwe similarly, alleged, “I always ask students with disabilities to occupy seats that are in front or close to the screen.” Such practice was also supported by Chimbadzi, who said, “I usually ask students who strain eyes to see screened presentations to take seats that are closer to the board or screen.” Such strategies seem to have facilitated constant checks on the students’ presence, particularly, for those that occupied front row seats, whose absence would be conspicuous.

From the analysis presented above, monitoring attendance in lecture sessions by pre-service teachers was like a default exercise, with no explicitly outlined strategies. This scenario hindered teacher educators from facilitating effective use of technologies in providing

multiple representations of content and supporting multiple pedagogic engagements, as other students absconded lecture sessions unnoticed. Furthermore, the large sizes of student groups obstructed monitoring of attendance, since teacher educators could not always establish that all of them were present. As a result, some pre-service teachers missed or abandoned sessions undetected, especially, if they considered the use of technologies to be exclusionary to them. Nevertheless, when teacher educators distributed hand outs and other information documents, they had opportunity to verify attendance, particularly, for students known to have disabilities. Some educators furthermore, sought good relations with those with disabilities, which enabled them to detect absentees.

ix) Managing progression of lecture sessions

With regards to managing the learning processes, Barakasi remarked, “At times lecturers spend the whole year without knowledge in the existence of some students with disabilities in their groups, which impedes provision of special provisions.” This excerpt reveals how the teacher educators’ lack of awareness on pre-service teachers’ disabilities affected their planning and management of learning processes. On the contrary, Chibwe declared, “I always try to choose technologies that suit circumstances and conditions of the day.” This quote evidences how Chibwe tried to plan on facilitating use of technologies that accommodate majority of the pre-service teachers, in spite of their abilities or disabilities. Barakasi similarly, reflected:

There was a lady who was sitting at the back, yet she was visibly struggling to hear my presentations. I then asked her to move to the front, which she initially resisted, only to comply after I insisted. She however, later acknowledged immense benefit from visuals and sounds from the laptop and speakers used in the session.

From the above quote, it appears alertness enabled Barakasi to make necessary accommodations, despite lack of official notification on the student’s disability from college authorities. Resistance by the cited pre-service teacher to shift was perhaps due to desire to conceal her disability or deny its effects on her learning. The reaction by Barakasi substantiates views expressed by Chibwe, who said, “Teaching is a calling and educators should serve the nation through the provision of equal treatment to students, including those with disabilities.” He added, “In delivering content and instructions, educators must take cognizance of the nature of students in the group, which should determine technologies used and the pace of presenting.” Chibwe then said, “For students that are in the final year of

studies, I only provide the topic or framework, which they then use to research and present findings to the whole group.” From this excerpt, it appears final year students had been groomed to use technologies at levels where only support and encouragement was needed for them to learn with and from the technologies. This practice exemplifies SAMR Modification and Redefinition levels, where students used technologies to research on assigned tasks and then devise strategies of presenting findings to their colleagues. Such practice seems to have equalized learning opportunities, as the students used technologies in seeking answers to given tasks and then conceived ways of presenting that would not be impeded by their particular disabilities. Barakasi added, “I prepare and teach students with disabilities just like the others.” This narration evidences a levelled learning landscape for the pre-service teachers, irrespective of their disabilities.

When observing lecture sessions facilitated by Chibwe and Barakasi, I noted the following [Their voices were frequently pitched highly as they explained concepts]. Such actions appeared as efforts to compensate for the non-use of sound amplifying system and dysfunctional speakers. In apparent appreciation of such strategies, Tsitsi remarked, “Lecturers often consider us, as students with disabilities in how they present, for instance, their voice projection, pace of presentation, as well as speed of dictating notes.” Adoption of such strategies seems to have provided satisfactory audibility for pre-service teachers like Tsitsi, which buttressed their learning.

In Barakasi’s lecture session, I also noted [Jud, a pre-service teacher with multiple physical disabilities sat alone at the back, but when she raised her hand on several occasions to contribute, this was only noticed towards the end of session]. A similar occurrence was noted in Chimbadzi’s lecture, which proves that sitting arrangements made for Jud were isolating and discriminatory. Also noted in the same lecture was, [Although pair and group work seem not to have been planned for, other students frequently engaged in consultative discussions, whilst the lonely Jud could not confer or compare notes with anyone. Even when she had challenges with reading from the screen, no colleague was close by to assist]. In Chibwe’s lecture session, I also observed, [In spite of full awareness of their visual disabilities, Klerk and Titie occupied back row seats, such that they visibly strained their eyes to read text from the screen]. These two pre-service teachers evidently obtained minimal benefit from the technologies used in that lecture session. The above notion contradicts Tsitsi’s perception, who said, “Use of technology gadgets enables us students to see clearly, write and record

notes easily.” Although her assertion could be true, particularly, on supporting multiple engagements with learning material, it appears some of the pre-service teachers lacked encouragement to seek strategic sitting positions for better view of the presentations. As a result, participation among pre-service teachers with disabilities was depressed in the observed sessions, which gives doubts on effectiveness in the use of technologies.

Analysis of data in this section revealed that pre-service teachers used technologies mostly to execute assigned learning tasks, which was largely at the Substitution and Augmentation levels of SAMR. Nevertheless, there were few instances where technology use went up to Modification and Redefinition levels, particularly when these were used in researching and conceiving innovative ways of making presentations. Through the use of technologies, pre-service teachers were able to substitute traditional modes of making presentations. It seems effectiveness in the use of technologies was dependent on facilitation strategies used and how teacher educators managed the learning contexts. In instances where teacher educators lacked awareness on the nature and severity of student disabilities, they were unable to make appropriate decisions on technologies and facilitation strategies to use. The analysis has exposed that pre-service teachers with hearing and visual disabilities had the tendency to occupy back row seats, such that they missed out on presentations because of poor audibility and visuals, which the teacher educators seem to have ignored.

From the analysis, it is clear that some of the teacher educators had low perceptions on the value of using technologies, which triggered negative attitudes. Others lacked skills to mount and operate the technologies. While a few often-sought the assistance of technicians in mounting and operating the technologies, others totally desisted from using the technologies. Although other teacher educators asked pre-service teachers to assist in the setting up, it appears their preference was on those without disabilities. To support inclusive practices and use of technologies, institutional authorities constructed ramps at strategic places, installed Interactive boards in some lecture rooms, besides purchasing the technologies and facilitating the participation of teacher educators in related workshops. The Ministry of Higher and Tertiary Education, Innovation Science and Technology Development provided policy direction, although this was not very explicit. It also supported participation of teacher educators and administrative staff in related workshops mounted by other stakeholders. The analysis also revealed efforts by teacher educators and pre-service teachers to provide personally owned technologies, which ameliorated the inadequacies of those provided by the

institution. There were however, instances where use of personally owned technologies resulted in the teacher educators' failure to give pre-service teachers effective assistance, because of being unfamiliar with some of the functions. Furthermore, the large size of student groups obstructed educators from effectively monitoring proper use of the personally owned technologies, which resulted in some pre-service teachers engaging social media platforms during lecture sessions. Compliance to the principles of UDL was generally low, whilst the use of technologies was mostly at Substitution and Augmentation levels of SAMR.

4.3.3 Experiences of technology mediated teaching and learning

This theme has two sub-themes which are: Use of technologies and inclusiveness in lecture sessions, and strategies in the use of technologies.

4.3.3.1 Use of technologies and inclusiveness in lecture sessions

This section examines the selection of technologies under the following categories: choice of technologies, involvement of pre-service teachers and the SAMR framework, technologies commonly used and other technologies anticipated to be used.

i) Choice of technologies, involvement of pre-service teachers and learning through substitution and augmentation in the SAMR framework

While commenting on the selection of technologies used in lecture sessions, Tsitsi said, "As students with disabilities, we are never involved." On the contrary, Chibwe (a teacher educator) said, "Ye-es! No-oh! Ye-es! Yes [which indicates doubts on the choice of technologies to use] I have to involve students with disabilities, as there is no way I can teach without consulting them." This excerpt shows that Chibwe was cautious to avoid statements that might expose flaws in his selection and use of technologies with pre-service teachers with disabilities. Despite admission that it was important to involve them, Chibwe's reaction makes its implementation doubtful. On being probed further, Chibwe then confessed, "The person who chooses the technologies is me - the lecturer, and I always select those with familiar functions." Emphasis on technologies that have familiar functions in the above quote infers unilateral decisions of the teacher educator. Barakasi (another teacher educator), similarly, stated, "The limited number of technologies at this institution makes selection of technology gadgets to use very challenging, such that I do it myself, although students with disabilities would assist in the choice of technologies that suit their needs." Similar

sentiments were echoed by Phedie, who alleged, “There isn’t much selection, since lecturers mainly use the projector.”

To emphasize importance in integrating students’ input on choice of technologies, Barakasi said, “The disabilities are diverse, which obligates use of specific technology gadgets for students with particular impairments.” Barakasi sounds convinced that pre-service teachers with particular disabilities were better placed to know technologies that matched their needs. His view substantiates a notion that choice of appropriate technologies promotes multiplicity in the ways students engage with learning material, as influenced by their specific disabilities. Klerk (a pre-service teacher) even suggested, “Even the principal should consult us on infrastructural improvements and technology equipment needed, as persons with the disabilities we know what is needed better.” Similar sentiments were expressed by Chimbadzi (a teacher educator), who said, “Involving students in the selection of technology gadgets is necessary, since their disabilities are different and cannot be accommodated through a one size fits all approach.” She however, admitted, “It’s me, the lecturer who chooses the technologies used in lecture sessions.” To justify her practice, Chimbadzi explained, “As the lecturer, I know the content to be delivered and also make plans on facilitation methods to use.” Although Chimbadzi’s argument might sound credible, the pre-service teachers now have access to the course outlines, which makes them equally privy to the topics to be covered. Barakasi further disclosed, “Students provide their own laptops and phones, whilst we lecturers often use our laptops.” Although this infers some degree of collaborative provision of technologies, this may not influence the choice of technologies used by teacher educators to make presentations. Such a scenario deprived teacher educators the opportunity to effectively determine and influence SAMR levels to which technologies were used in pedagogic engagements. As a result, the technologies were mostly used at Substitution and Augmentation levels, as shown by substituting hand written notes with typing and photo recording. Teacher educators could not steer the use of technologies to higher levels of Modification and Redefinition in the SAMR effectively, especially by basing that on personal gadgets of the students.

Another significant obstruction to collaborative choice of technologies used during lectures was resource constraints, because the institution had a limited collection of technologies. The restricted selection of technologies also limited technologies that teacher educators could use to facilitate multiple representation of content and expression to benefit students with

disabilities, as expected through the lens of the UDL philosophy. Participants in this study generally considered input of students in selection of technologies used as critical. Despite the foregoing perspective, it was evident that pre-service teachers only made choice on personal technologies which teacher educators had little or no control over. Nevertheless, the predominant use of personally owned technologies by the pre-service teachers obstructed teacher educators from projecting and guiding how these were used, as well as the levels of SAMR framework.

ii) Technologies used to benefit pre-service teachers with disabilities

I also sought to establish the types of technologies whose use was frequently facilitated by teacher educators to buttress learning for pre-service teachers with disabilities. From that premise, Barakasi disclosed, “I use the computer and projector in all my lectures to make power point presentations.” From this excerpt, Barakasi seemed contented with predominant use of the cited technologies, although such practice appears ineffective in accommodating pre-service teachers with diverse disabilities.

I noted that speakers mounted in the lecture room used by Barakasi were dysfunctional, but no portable speakers were brought in as a stop gap measure. This scenario appeared detrimental to students with hearing disabilities, who needed sound amplification for better audibility of the presentations. Such circumstances impeded provision of multiple presentations that would cater for that segment of pre-service teachers. Nevertheless, Chibwe claimed, “I often use the institutional desktop computers or my own laptop in conjunction with the projector, while students also use their personal laptops and tablets to capture notes.” Chibwe sounded very appreciative of the techno-competences demonstrated by pre-service teachers. He then added, “In fact, most students are very competent in the use of computers.” Chibwe proceeded to say, “I sometimes use audios and also support students with disabilities, as they use laptops with adapted keypads or other suitable operating systems, like the JAWS.” This quote evidences application of multiple engagements, where pre-service teachers used various technologies. As I observed lecture sessions, I also noted use of technologies like laptops, tablets, smart phones and many more to capture notes. In Chibwe’s lecture session, I noted, [Jimmy had set his smartphone to recording mode and then placed it on the desk and then recorded the entire presentation, as shown in figure 4.16].



Figure 4.16: Jimmy (a pre-service teacher) with his phone on the desk to record proceedings

In addition to the audio recording, Jimmy still continued to write down notes, which he said would augment transcriptions from the recordings. Besides Jimmy, another lady had also put her phone on the same desk top, presumably to record the presentations, although I could not establish whether she had a disability as well. In the same session, I also noticed [Jud, who had multiple physical disabilities that impeded writing and punching computer keys, visibly struggled to keep in pace with Chibwe's speed of presenting]. Although Jud continued typing notes into her computer, she later received the notes in electronic format, which exemplifies use of technologies at both Substitution and Augmentation level of SAMR. When the pre-service teachers were allowed use of technologies they could provide, it evidences efforts on upholding multiple representations and engagements to optimize their learning.

On technologies frequently used in lectures, Tsitsi said, "Technologies mostly used include; Laptops, projectors, smart phones, tablets, and student laptops, video player and video recordings." Tsitsi's list was similar to that given by teacher educators, but she added video - based technologies and smart phones. Citing of the smart phone was not surprising, as it was common possession for the pre-service teachers. In Chibwe's session, I noticed [Besides note capturing, students used smart phones and laptops for quick researches, verifying spellings and accessing various websites]. This demonstrates Augmentation and Modification, where technologies assisted in checking correctness of spellings as an alternate to the physical dictionary (Augmentation) and also provided access to different websites, in place of using hard copy books. The photo in figure 4.17 shows pre-service teachers using smart phones to capture notes from the screen.



Figure 4.17: Phedie and colleagues using smartphones to capture photo notes

Other pre-service teachers even used cell phones with just the basic functions like calling and texting, whilst others used tablets, which demonstrate the value given to cell phone technologies in learning processes. On another note, Chimbadi confirmed having saved her presentations in a computer memory stick and also printing hard copies before lecture sessions. She applauded the convenience in using the flash stick, like enabling her to use a borrowed laptop, whilst the hand-outs enabled provision of comprehensive notes. Figure 4.18 shows hand-outs that Chimbadi had prepared for the students.



Figure 4.18: Hand-outs that Chimbadi had for the pre-service teachers

The hard copies shown in figure 4.18 infer use of a printer and perhaps a photocopier as well, although these were not cited among technologies available at the institution. There could have been other technologies which study participants were not aware of, unless they did not mention them after considering that they were not specific to students with disabilities. Jimmy (a pre-service teacher) remarked, “Lecturers in Mathematics usually use the

Interactive board with us.” Although, I did not witness use of such equipment in the observed lectures, this quote confirms its availability at the institution. I also noted Interactive boards installed in some of the lecture rooms. In Chibwe’s session Tinny (a student with visual challenges) was seen using a magnifying glass to read and verify notes with those of a colleague, as shown in figure 4.19.



Figure 4.19: Tinny using a hand-held magnifying glass to aid reading during a lecture session

Analysis in this section shows effort by teacher educators to facilitate use of technologies that embraced visual and audio appeal in presenting content through multiple representations. The technologies used include; projectors, laptops, smartphones, printers, photocopiers, video players and Interactive Boards. These were either provided by the institution or by teacher educators and the pre-service teachers. The different technologies enabled varied modes of content presentation, which benefitted pre-service teachers with visual, physical or hearing disabilities. It however, seems the institution was lagging behind with regards to embracing diverse vital modern technologies for pre-service teachers with specific disabilities. Such circumstances forced other pre-service teachers to use personally owned technologies clandestinely, as a ploy to evade the notice of teacher educators.

iii) Other technologies that participants desired to use

Although the principal lamented the depressed financial situation at the institution, participants in this study wished additional and more diverse technologies could be acquired. In that context, Richie (a pre-service teacher) remarked, “I have never seen the Braille

machine being used at this college.” It appears Richie was disturbed by this scenario, especially when the institution purported to pursue inclusive education practices. He sounds convinced that the equipment would make pre-service teachers with visual disabilities feel recognized and accepted at the institution. Such technologies would also expose the pre-service teachers to presentations whose comprehension is not affected by their disabilities, as well as support appropriate engagements with content. Furthermore, the pre-service teachers would be able to express and demonstrate evidence of having grasped concepts, in view of the principles of UDL.

Tinny (a pre-service teacher) similarly raised the following concern, “Technology gadgets are inadequate at this college, as you might find only two projectors, yet there are so many student groups that need to use them.” This excerpt implies desire for the acquisition of additional projectors and perhaps other technologies. To support the above perspective, Phedie (another pre-service teacher) said, “The institution must procure other technology gadgets that can help to accommodate students with specific disabilities.” Barakasi further added, “Students have been bringing their own gadgets like computers with functions that are not familiar to us, such that we could not effectively provide effective support in their use.” It is clear that Barakasi wished technologies similar to what students were using be procured, to enable teacher educators to familiarise with their functions. Barakasi added, “We need more resources and to adjust to the current demands for technology use.” He even alleged, “College has no specialised technologies for students with disabilities, so we request for specialised laptops, braille machine, braille computers, as well as printers.”

Data presented in this section has revealed need for the institution to acquire essential technologies for pre-service teachers with specific disabilities, and also increase the number of those technologies already available. However, participants’ awareness on technologies that could assist pre-service teachers with specific disabilities seemed limited. Besides citing the need for technologies like the braille, more projectors and computers adapted for specific disabilities, participants in this study advocated for technologies that would support multiple representations and enable pre-service teachers with visual impairment to give feedback on content learnt as multiple expressions. Also revealed was the need for authorities to liaise with students that already had special vital technologies for those with particular disabilities, to enhance awareness on additional technologies to procure. The proposed initiatives were

envisaged to prop learning for students with diverse disabilities through compliance with the principles of UDL.

4.3.3.2 Strategies in the use of technologies

This sub theme examines strategies applied in the use of technologies and these are examined under the following categories; Successes in the use of technologies at substitution and augmentation of SAMR to support multiple representation, expression and engagement, challenges in the use of technologies, strategies of using technologies, as experienced by pre-service teachers and strategies to enhance the use of technologies.

i) Successful use of technologies at substitution and augmentation, to support multiple representations, expressions and engagements

This segment analyses experiential testimonies on the use of technologies. For instance, Gidza (a pre-service teacher) narrated, “I recall a video that helped me comprehend Pavlov’s Conditioning Theory, as we could see the dogs salivating, which helped conceptualization.” From this reflection, it is clear that visual presentations from the video etched lasting memories in the pre-service teacher’s mind. Similarly, Jud (another pre-service teacher) shared, “We watched the video on Skinner’s Stimulus - Response Conditioning Theory, which I mastered so well.” This except illustrates appreciation of videos and video viewing in learning engagements, which reinforced learning. Tinny (another pre-service teacher with visual disabilities) also confessed, “Watching videos enables me to understand what will be happening step by step, rather than reading notes.” When Tinny used the phrase, ‘rather than’ she indicates being miffed by the over- use of text presentations, hence, videos provided relief. These perceptions highlight the importance of applying multiple means of presentation, as espoused by the UDL philosophy, where pre-service teachers use technologies that suit their disabilities. Another pre-service teacher, Phedie narrated the following episode, “In a workshop on Life Skills Education, the sessions had become extremely exhaustive for everyone until a related video clip was played, which then revitalized our concentration.” Playing the video clearly broke monotony and helped to vary methods of presenting content, which also reinvigorated students’ attentiveness and learning through the multiple presentations. Video viewing therefore, strengthened learning for Tsitsi and Tinny who had physical and visual disabilities, respectively.

Tsitsi (another pre-service teacher) recounted, “The first lecture in which the projector and laptop were used, marked the first time that I managed to capture all the notes.” She also added the following “The lack of a laptop had also seriously affected my studies, but after getting one, compilation of my assignments became easier.” Use of the laptop by Tsitsi illustrates Substitution in the SAMR framework, where its use replaced writing by hand; hence, she was able to produce printed assignments, which denotes Augmentation. Similarly, Jimmy (a pre-service teacher) recounted, “We were being taught how to draft a scheme of work and the process was beamed through use of the computer and projector, which enabled us to follow the process step by step.” This excerpt depicts appreciation of screened illustrations and sequential processes in the formulation of schemes of work, where traditional chalkboard illustrations were substituted through the use of technologies. Besides depicting use of technologies at the Substitution level, the above cited practice also illustrates Modification, as use of the technologies supported step by step innovative demonstrations on drafting schemes of work. Biala (a pre-service teacher) similarly recounted, “In a session on Sexually Transmitted Infections, the lecturer showed us unforgettable pictures and videos of real infected human organs.” The visual presentations clearly made lasting impressions and enabled Biala to grasp, as well as recall the concepts better. This incident depicts use of technologies at Augmentation in the SAMR framework, where the teacher educator embraced visuals in the explanations.

Klerk also gave the following narration, “In one Psychology lecture, we were shown a video from session introduction, which enabled me to understand everything even before additional explanations from the lecturer.” Clearly, Klerk viewed that session as well planned and effectively supported through the use of appropriate technologies. Barakasi (a teacher educator) also shared:

I only knew of the existence a blind student after citing a bible excerpt which infers that the blind cannot lead the blind, which I related to leadership. This triggered wild murmurs, until one student alerted me of the student. This embarrassed me and had to apologize before modifying interpretation to infer strategic and visionary blindness, rather than physical blindness. I later prepared a hand-out for the student, which she converted to braille format, which then became a trend in subsequent sessions.

The depressing excerpt cited above, however, epitomises triumph because on becoming aware, the educator eventually provided befitting assistance to the student. The experience further enthused preparation of customised hand-outs, which the student later transcribed to braille format. While the teacher educator augmented his presentation with the hand out, the

student was also able to transcribe the text into an accessible format. The whole practice illustrates use of technologies at augmentation and modification levels. Study participants provided narrations that exposed diverse experiences in using technologies in pedagogic processes. However, the technologies seem to have been largely used at substitution and modification, with very few cases going up to the redefinition level of SAMR. Similarly, the multiple of representations was the most prominent UDL principle practiced in using the technologies.

ii) Challenging encounters in the use of technologies

This section analyses data related to disappointing encounters in the use of technologies. For instance, Chibwe (a teacher educator) narrated, “After planning on using the projector, we sometimes experience power outage, when there is no back-up source. “He continued to say, “Furthermore, some of the equipment is obsolete, like power cables in the lecture theatre that do not function properly.” Chibwe added, “When preparing for sessions I usually run around to get the equipment and may not have sufficient time for that.” It appears, Chibwe skirted narrating a specific incident, whilst preferring to outline challenges usually encountered in the use of technologies. The aspect of having to run around before sessions was also noted in Barakasi’s session, whereby some of the pre-service teachers came late while hunting for a projector screen. To add on to the challenges, Barakasi lamented, “Power outage obstructs us from using technologically based media, which is worsened by frequent malfunctioning of the old technologies even in the midst of a session.” I also noted that technologies used by Barakasi malfunctioned during the lecture session and functionality was restored by some techno-savvy students, when he was like an on looker, as captured in figure 4.10. It seems power outage, malfunctioning and obsolescence of technologies were common obstructions cited by study participants.

Chimbadzi (another teacher educator) also seemed reluctant to share her unpleasant encounters in the use of technologies. All she could say was, “It is tricky and my only challenge is on gadgets that I have not been trained to use” She proceeded to say, “I have not experienced any major challenges so far.” Gleaning from this excerpt, Chimbadzi’s circumstances were perhaps premised on her earlier submissions that she predominantly used the laptop and projector, which she affirmed to be very conversant with. Based on that, she probably had capacity to contain setbacks associated with using those particular technologies. Phedie (a pre-service teacher) relived the following incident:

We had a very long lecture in Education Media Technology, with many notes to write, but the projector slides were scrolled very fast, such that we could not keep pace in note capturing. The lecturer seemed focused on finishing the topic, but I benefitted very little from the session.

From the above quote, it seems teacher educators at times facilitated use of technologies in ways that failed to accommodate some pre-service teachers with disabilities. They seem to have taken use of technologies for granted and felt this could be approached in a slapdash manner. Another pre-service teacher, Tinny also reflected, “In Bio-mechanics (a course module in Physical Education and Sports), the presentations screened through the projector had many big words, which the lecturer did not explain and I then failed to understand to topic.” Although technologies were used in the narrated episode, Tinny and perhaps other pre-service teachers obtained little benefit from it because of the unexplained new terms. It seems Tinny and perhaps other pre-service teachers hesitated to query the teachers educators’ approach for wary of being tagged slow learner.

Klerk (another pre-service teacher) shared the following encounter, “The projector was used to screen the periodic table with scantily visible small figures, which made me feel left out, despite sitting near the screen.” He continued, “Effort to search for the presentation using my phone was futile and I feel the lecturer misused the technology equipment.” It is clear that choice of technologies and facilitation strategies in the above narrated incident were inappropriate. Perhaps, the educator prepared the session hurriedly and disregarded essential accommodations for pre-service teachers like Klerk. While analysis shows that the technologies were used at Substitution level, however, the presentations did not embrace UDL principles that help to accommodate diversity among students. Similarly, Titie (another pre-service teacher with visual disabilities) reflected on the following scenario:

Although the lecture theatre has provision for screening presentations with a permanently fixed projector, some lecturers still bring an old projector that produces smaller and skewed pictures that I struggle to see, which leaves me relying mostly on the audio output, while missing out on the visual appeal.

Opting to use older equipment with poor visual output by the teacher educators might indicate deficiency in skills to operate the newer and more modern technologies, which shows a lack of induction in their functions. Richie (a pre-service teacher) also gave this reflection, “The lecturer in Theory of Education just screened notes without giving any explanations until the end, such that I neither enjoyed nor benefitted from the lecture.” It

appears the teacher educator had almost assigned all facilitation roles to technologies, which did not benefit pre-service teachers like Richie. This practice depicts use of technologies at the basic Substitution level of SAMR, which was however futile for some of the pre-service teachers.

This segment has presented unique exciting, as well as unpleasant episodes in the use of technologies, in which these were used at substitution and augmentation with very few cases of modification. The reflections given indicate that teacher educators had more of challenges than successes in using technologies. Furthermore, they seemed hesitant or afraid of using newer technologies, which reduced effective implementation of UDL principles. As a result, the pre-service teachers were not benefitting as expected, since strategies used in facilitation did not match their disabilities. In addition, power outages, malfunctioning of technologies and deficient planning were evidently major inhibitions on the use of technologies.

iii) Strategies experienced by pre-service teachers in the use of technologies

Analysis in this section focuses on facilitation strategies in the use of technologies and how these were experienced by pre-service teachers with disabilities.

a) Multiple representations and engagements for inclusive session introduction through use of technologies at substitution and augmentation levels

Pursuant to my inquiry on session stages at which teacher educators used technologies, Jud (a pre-service teacher) remarked, “Lecturers use the laptop and projector at introduction, because they want us to see where the lesson is headed.” This was corroborated by Jimmy (another pre-service teacher) who said, “At the introduction, *ndipo panenge pachida kuonekwa kuti tabata zvinodiwa* (that is where lecturers seek to ascertain whether we are geared for what is expected in the session). In the above excerpt Jimmy views the use of technologies at lecture introduction stage as a strategy that promoted inclusiveness, to avoid leaving anyone behind. It seems the technologies were evidently used to stimulate students’ enthusiasm and readiness for the lecture. Such usage paved way for multiple presentations, in which the senses of sight and hearing were embraced right from lecture onset. It appears particular technologies were used to facilitate multiple ways of expression among students, as influenced by one’s disabilities or abilities. It would seem the use of technologies at this stage was mostly at the Substitution level, which augmented the educators’ usual verbal introductions that often disadvantage pre-service teachers with hearing disabilities. The

technologies therefore, saved pre-service teachers with disabilities from losing out, since complementing the usual verbal introductions with visuals laid foundation for the lecture sessions. Although the use of technologies at session introduction was valued, use of these was not restricted to this stage. For instance, Klerk (a pre-service teacher) remarked, “At times lecturers just use technology equipment for the introduction.” When Klerk used the phrase ‘at times,’ it suggests that technologies could also be used at other stages of lecture sessions.

b) Facilitating use of technologies at substitution and augmentation to support multiple representations and engagements in session development

Chimbadzi (a teacher educator) revealed, “I usually make technology aided presentations in my sessions, which usually precedes activities like pair and group work.” This practice reveals complementarity between use of technologies and interactive learning, where technologies support the students’ multiple presentations and engagements in assigned tasks. Such usage supported student-student interactions, which characterizes inclusiveness. The technologies clearly supported multiple engagements were pre-service teachers used multiple senses for conceptualization. Gidza (a pre-service teacher) added, “Technology gadgets are used just after the introduction, because that is where a lot of content is covered.” This view was reinforced by Barakasi, who remarked, “I usually use technology gadgets after the introductory stage, because I often vary these depending on group size, nature of presentation and lecture room used.” Barakasi probably delayed using technologies in his lectures to establish adjustments needed on facilitation strategies, based on the pre-service teachers’ observed disabilities. Such practice denotes efforts on adopting multiple representations that match the pre-service teachers’ disabilities. It was also noted that Barakasi only used technologies after the introductory phase, which allowed assigned pre-service teachers to finish setting up the technologies, as well. Nevertheless, the shift from verbal to the use of technologies after introduction reveals how alternate facilitation helped Barakasi to promote multiple representation of learning content. Tsitsi also intimated, “The body of the lecture provides ample time and space for using technology gadgets to enhance understanding.” Similar sentiments were also echoed by Gemu and Titie.

Analysis in this section has portrayed session development as a stage with activities that provide opportunity for using various technologies. This perception highlights importance for teacher educators to facilitate use of appropriate technologies that benefit pre-service teachers

with disabilities, so that they do not miss out. Data also shows that technologies could be used from Substitution to Redefinition levels of SAMR, as dictated by facilitation strategies and the learning tasks at hand. Furthermore, the use of technologies clearly provided opportunities for multiple engagements with the learning content and enabled the pre-service teachers to embrace varied modes of expressing their ideas or evidence of concepts grasped. It seems the inference on non-use of technologies at session introduction, was proof of deficient clarity on what session introduction entails. For instance, some participants seem to suggest that mere greetings from the teacher educator constitute session introduction.

c) Upholding multiple representations in entire lecture sessions through the use of technologies at substitution and augmentation levels

Biala (a pre-service teacher) remarked, “In sessions where technology gadgets are used, it is usually from beginning up to conclusion.” Klerk similarly, said, “Our lecturers often use technology gadgets, like the projector for the whole lecture session, although these are at times just used in the introduction.” Such views were supported by Chibwe (a teacher educator) who claimed, “I usually vary presentation methods, but for the projector or video, I often use these before face-to-face discussions and then revert to them before concluding the session.” He went further to say, “I use technologies throughout the lesson, although this depends on the topic and targeted content.” I witnessed this practice in his session, where Chibwe used the projector and laptop at session introduction until conclusion. Such practice evidences adoption of diverse facilitation methods that embrace the use of technologies to uphold multiple representations of content.

Richie also gave the following narration, “Technology gadgets are used throughout the lecture, to ensure that important concepts are not missed by some of us who have disabilities.” In concurrence to the above excerpt, Tinny (another pre-service teacher) added, “Depending on the topic, the use of technology equipment often stretches from introduction until session conclusion, since lecturers want us to effectively grasp the concepts.” The above cited quotes acknowledge that use of technologies help to uphold multiple representations to buttress multi-sensory conceptualization, as well as counteract effects of disabilities on learning. In apparent support to the foregoing, Barakasi stated, “At times I use technologies to summarize the whole computer aided presentations.” Reference to computer aided presentations, infers that Barakasi used the computer from beginning up to end of the session, although he stressed on the summary part.

However, from an administrator's perspective, Mbofayo (the principal) remarked, "A lecturer who is techno-savvy uses the technologies throughout, whilst one in doubt applies these at the introduction, forgets about it midway, and maybe goes back to it towards the end." Implications are that an adept teacher educator uses the technologies throughout and not being restricted to a segment. Thus, Mbofayo viewed intermittent use of technologies as an indicator of incompetence of the teacher educator. Mbofayo proceeded to say, "Lecturers in (name of subject provided) use power point, but lack vital skills, as their slides have too much content, which resembles copying the whole book, while slides should only have the major points." Whilst that practice irked Mbofayo, I also noted that pre-service teachers were equally miffed by that, as evidenced by those like klerk who was seen walking out from Barakasi's lecture session.

Analysis in this section has revealed that use of technologies traversed from introduction up to conclusion of lecture sessions, which varied with teacher educators and topics delivered. Factors like disposition of particular teacher educators and session topics significantly influenced the strategies of using technologies in teaching and learning processes. Data has generally shown that restricting use of technologies to part of the session signifies poor planning and incompetence of the teacher educators.

iv) Strategies that can enhance use of technologies in teaching and learning processes

This segment focuses on views related to up scaling the use of technologies, as expressed by participants. The following categories of conceptual perspectives are used: diversity in technologies, infrastructure, policy and monitoring, acquisition of technologies, synergies with stakeholders and capacity development.

a) Diversity in technologies, infrastructure, policy and monitoring use of technologies

Biala (a pre-service teacher) remarked, "The administration must provide support to every student, whether with or without disabilities." She added, "They should buy more technology gadgets that cater for everyone." This was supported by Phedie (another pre-service teacher), who said, "Specific equipment for students with particular disabilities should be procured, to enable regular use." Similarly, in her comments, Chimbadzi (a teacher educator) reflected on the following incident:

The institution lacks some essential gadgets, as I remember a blind student who had to withdraw from the course after the institution failed to provide specialised gadgets or software that could assist him with mathematical formulae and related processes.

Similar perspectives were given by Jud (a pre-service teacher) who suggested:

We must have a resource centre for students with disabilities, like at Mutare Teachers' College [another teacher education institution in Zimbabwe]. This will give us time to practice, unlike using technologies in the computer laboratory, where we usually find all computers occupied by abled bodied colleagues.

The above cited excerpts resonate with Barakasi (a teacher educator), who said, "The College must acquire and reserve technology gadgets where they are safe, secure and readily accessible to students with disabilities, like setting up a Disability Resource Centre." He added, "The College must purchase gadgets reserved for students with specific disabilities and perhaps have a committee that focuses on aspects of inclusiveness." This sounded like calls for the acquisition of technologies that address the needs of pre-service teachers affected by specific disabilities, like hearing, visual and the physical. The proposed committee might also assist in sourcing essential technologies for these pre-service teachers.

Suggestions were also given on additional and essential technologies for pre-service teachers with various disabilities, besides having a resource centre where they are accommodated. Such a provision would perhaps enable the pre-service teachers to access technologies easily during and outside scheduled lecture sessions. Barakasi remarked:

Resources must be sought for an Inclusive Education Centre, to avoid the current arrangements where we are referred to the United College of Education or the Disability Resource Centre at the University of Zimbabwe; yet their equipment is out dated and needs to be replaced with more modern technologies, as well.

Barakasi added, "Learning environments and infrastructure need to be modified to promote inclusiveness for students, because some of them are old or need adjustments to cater for those with disabilities."

On another note, Phedie (a pre-service teacher) remarked, "The administration and lecturers in charge must check on how we get along with colleagues in using technologies, since they already have information on students with disabilities." Phedie seems to advocate for strategies on monitoring how technologies are used, to ensure that these also benefit pre-service teachers with disabilities. In corroboration, Richie (a pre-service teacher) commented, "Authorities must not assume that lecturers have skills to use these gadgets, but monitor how

they use them.” This quote illustrates concern on possible complacency, hence, need for more robust supervisory and monitoring frameworks that are perhaps integrated in policies on Inclusive Education and use of technologies.

While commenting on policy formulation, Klerk remarked, “Authorities must also include us in policy drafting and decisions on essential infrastructural improvements, as students with disabilities.” He added, “I know my needs better than the principal or lecturers, who must then liaise with us on technological support that is needed.” This citation hints on aspects that authorities should liaise with disabilities, especially on issues that concern them, which is a basic tenet for effective inclusion of the pre-service teachers. Chibwe similarly, proposed, “We need policies on Inclusive Education and the use of technologies, which are known to both students and staff members,” He then added, “We also need a policy that mandates channelling of funds towards acquisition of technologies that support learning for students with disabilities.” In the same context, Chimbadzi suggested, “The ministry must craft policies that support students with disabilities, in order to influence institutional practices.” Data shows that participants like Klerk, Chibwe and Chimbadzi already had ideas on what could be included in policies on Inclusive Education and the use of technologies.

b) Acquisition of technologies, strengthening synergies with stakeholders and capacity development for teacher educators

On the acquisition of technologies, Tinny commented, “The government must provide teachers’ colleges with technology equipment needed to support learning for students with disabilities.” Implementation of the above proposal has potential to enhance the capacity of teacher educators to apply multiple content presentations that suit pre-service teachers with specific disabilities. The cited initiative would also provide teacher educators with the leverage to project SAMR levels to which technologies are used and ability to control how these are used during lecture sessions. This may also change the extant scenario where technologies were predominantly used at substitution and augmentation levels and extend this to higher stages of SAMR. Barakasi similarly, remarked, “The Ministry of Higher Education must procure equipment needed in the teaching of students with disabilities.” Similar sentiments were echoed by Chimbadzi, who said, “The College must develop links with institutions like Jairoso Jiri High school and others that cater for persons with disabilities.” This move would perhaps capacitate teacher educators on the use of technologies for pre-service teachers with specific disabilities. The initiative might also assist in elevating the use

of technologies to Modification and Redefinition levels, where pre-service teachers execute more complex tasks and probably appropriately redesign their course of learning, despite the disabilities.

Chimbadzi sounded convinced that stronger synergies and networks with relevant organizations would prop inclusive practices through access to support on the use of technologies. Such links might as well create platforms for collaborative exchange of latest information on technologies and other developments on Inclusive Education. Barakasi similarly, suggested, “The College must interact with stakeholders and civic bodies that have vested interest on Inclusive Education, to enhance access to continuous capacity development on appropriate ways of giving curricular instructions to students with disabilities.” Barakasi proceeded to say, “College authorities can liaise with organizations that can provide advice and relevant resources that include Jairosi Jiri Association, Female Students Network (FSN) and the Disability Resource Centre at the University of Zimbabwe.” These excerpts evidence existence of members who could apprise on and promote issues of Inclusive Education at the institution, hence, authorities only needed to identify these and assign the responsibilities. Barakasi further commented, “The Ministry of Higher and Tertiary Education must train tutors that specialise on the use of technologies for students with disabilities, which must be done at ministry level to cut on costs and facilitate easy deployment.” Such an initiative could perhaps ameliorate impediments on inclusive practices like use of technologies at this and other institutions. Teacher educators trained or inducted through the cited initiative would then cascade the skills gained to colleagues, which eliminates excuses for not using technologies. Gemu (a pre-service teacher) poignantly remarked, “There is lack of variety in technologies used, because lecturers always bring a projector, which they ask students to help in operating, so, they need training in using this and other equipment.”

The above cited suggestion was corroborated by Tsitsi (another pre-service teacher), who remarked, “Lecturers must be capacitated in using technology gadgets through workshops and training.” Similarly, Titie (another pre-service teacher) supported the idea, by saying, “lecturers must be trained so that they can sympathize and empathize with students with disabilities, which would eventually improve their practice.” According to Biala, “Lecturers must be capacitated in the delivery of lectures with the aid of technology gadgets.” However, Chibwe (a teacher educator) added another dimension and suggested, “There is need for capacity development for institutional administrators to enhance their awareness on

challenges faced by students with physical and other disabilities.” Gleaning from preceding analytic excerpts, capacity development in using technologies and upholding inclusive practices seems critical for both teacher educators and institutional authorities.

Titie joined the fray, by saying, “Staff members should be trained on how to assist students with special needs and ways to address their requirements through the use of newer technologies.” In the same context, Klerk (a pre-service teacher with albinism) remarked, “The institutions must conscientize staff members on disability, because they might have awareness on students with disabilities, but lack knowledge on how to handle and deal with them.” He added, “For example, I have sight problems, whereby, I am affected by light, such that I don’t need much exposure to a lot of light, which forces me to always wear a hat, but lecturers are not aware of it.” This is clear justification on the need to conscientize teacher educators, lest they continue disadvantaging students with disabilities. Klerk went further, to say, “The Lecturer in charge has even instructed me to stop wearing my hat in class and as a result, even if I sit in the front I cannot see due to light reflected onto the eyes.” This scenario exposes how deficient capacitation of teacher educators can impede learning. In view of the narrated experiences, Klerk proposed, “The administration must educate everyone on Inclusive Education and aspects on disabilities.” Although Klerk cited administrative staff as possible trainers, such members might also lack requisite knowledge. Perhaps, Klerk just wanted to acknowledge the administration staff’s role in capacitating staff members, which infers need for outsourcing expert services. Klerk further raised the following concerns:

We must be allowed to use personal gadgets like smart phones. For instance, I have problems with reading written notes, so, I capture these on the phone, which some lecturers stop me from doing, assuming that I will be on social media, like WhatsApp.

The above scenario sounds disturbing, especially, after seeing other pre-service teachers using smart phones in sessions facilitated by Chibwe, Barakasi and Chimbadzi. Such an incident shows that, whilst some teacher educators valued students’ use of smart phones, others still needed conscientisation on choice of technologies and how these could be used in pedagogic contexts. Further suggestions were given by, Gemu, who said, “Lecturers should know that they have so and so with such disability, to enable proper decisions on equipment to use, like braille or electronic books.” In concurrence, Biala insisted:

Lecturers must be informed on students with disabilities. As I am seated here, no one can tell that I have disabilities. It appears, the teacher educators are never given the information which seems only known by the dean of students and the administration.

The above quote sounds like Biala was urging the authorities to devise better strategies of making teacher educators aware of pre-service teachers that had disabilities. In the same context, Mbofayo (the principal) added, “We need to capacitate lecturers and other members of staff in identifying students with disabilities and their specific needs, so that they can present content or mediate in a proper manner.” This excerpt highlights the importance of capacitating staff members in the selection of technologies that match disabilities of particular pre-service teachers. However, despite the above sentiments, Klerk remarked:

Some lecturers know that we have disabilities, but often ignore me, when I expect them to ascertain visibility of screened text to everyone. Upon realising that of the 500 students, it was only me who did not have clear view of screened text, I no longer pester for increased font size. Therefore, lecturers can’t claim effective use of the projector, when its use only benefits students without disabilities.

In view of the above excerpt, Mbofayo commented, “A lot of convincing is needed to change perceptions and attitudes of lecturers towards the use of technologies, as some are not convinced that it works.” This excerpt highlights the need for a paradigm shift in the teacher educators’ perceptions and attitudes, which could be achieved through capacity development initiatives. These may also enhance their alertness on identifying pre-service teachers with specific disabilities.

Data analysed in this section has shown that, while pre-service teachers with disabilities appreciated their integration in mainstream contexts, they wished for explicit initiatives that facilitate better access and effective use of appropriate technologies. In that regard, Richie remarked, “A specific schedule or time table can be created for us with disabilities to use technologies in the computer resource room.” Gidza also added, “Some computers in the library can be reserved for students with disabilities, since we are obstructed by physical disabilities to reach the library fast enough, such that we usually find all computers taken by others.” Although this initiative sounds exclusionary, it can reduce competition for the technologies with colleagues without disabilities.

In summary, analysis in this section has revealed need to increase the number of essential technologies for pre-service teachers with specific disabilities. Furthermore, a resource centre for the storage and use of technologies by such pre-service teachers is critical. Alternatively,

the institution could set up a designated resource centre or give students with disabilities a schedule for using technologies in the resource rooms without scrambling and competing with able-bodied colleagues. Further adaptations are also needed to make learning environments more user friendly for pre-service teachers with disabilities. In addition, data has revealed calls for stronger networking and synergies with organisations that deal with issues of disability, as well as closer monitoring on how teacher educators facilitate the use of technologies, which seem to have been overlooked by the institutional authorities. Also highlighted was need for capacitating teacher educators in the use of technologies, which could help to transform their perceptions and attitudes towards the use of technologies.

4.4 Chapter Summary

In this chapter I have analysed data gathered from twelve pre-service teachers, three teacher educators and the principal. Data was extracted from reports on observations, interviews and focus group discussions, whose findings revealed participants' unique experiences and perceptions on the use of technologies. There were areas of commonalities and common challenges related to the use of technologies, for which study participants suggested strategies to enhance effectiveness and efficient use. The technologies used were either provided by the institution or by both teacher educators and pre-service teachers. Those provided by the institution could be accessed from particular departments, the library and a general resource centre. Teacher educators used various facilitation strategies to promote multiple representation and engagement designed to benefit pre-service teachers with disabilities. These strategies however, largely accommodated pre-service teachers that had disclosed their disabilities or noticed by alert teacher educators. The analysis revealed several impediments to effective use of technologies that include; inadequacy or even lack of essential technologies for pre-service teachers with specific disabilities, large student group sizes, as well as inadequate support from institutional and ministry authorities, especially on policy guidance. General consensus revealed need for further infrastructural adaptations, acquisition of more technologies, capacitation of educators, as well as compilation of an accessible comprehensive data base on pre-service teachers with disabilities. More importantly, to facilitate effective use of technologies, teacher educators should embrace the three SAMR levels of substitution, augmentation and redefinition. Learning contexts should be made more inclusive through the use of technologies that promote multiple representations, expressions and engagements. To achieve the foregoing, data has shown that teacher educators need to take cognisance that disabilities among students are diverse and extent of severity varies as

well. This analysis paved way for articulation of major findings, conclusions and recommendations in the next chapter.

CHAPTER 5: DISCUSSION OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

In the previous chapter, I presented and analysed data, while in this chapter focus is on discussions of findings, conclusions and recommendations. The chapter also summarises study processes by outlining the methodology used in this qualitative single case study, which focuses on influence of technology mediated teaching and learning in preparing pre-service teachers with disabilities. The discussions focus on practices, facilitation and experiences in the use of technologies to support learning for pre-service teachers with disabilities. These discussions inform implications for teacher education, recommendations for further research and conclusions to this study.

Findings show collaboration between the government and civic organisations in mainstreaming students with disabilities in teacher education and other higher education pursuits (MHTEISTD, 2019; Government of Zimbabwe, 2013). Although the existence of explicit institutional policies to guide use of technologies to support learning for students with disabilities could not be established, literature reviewed in Chapter 2 revealed related excerpts in national and global pronouncements that could be used as reference (see table 4.4). These excerpts suggest that integrating technologies in pedagogic processes is important. However, these do not articulate suitable strategies for contexts that mainstream pre-service teachers with disabilities. Inclusive enrolments were therefore, largely informed by global conventions like the UNCRPD of 2012.

Processes of gathering data and analysis were explained in Chapter 3. These would assist interested researchers with guidelines to explore any similar studies. The discussion of findings constantly refer to literature reviewed in Chapter 2, which informs recommendations for practice and policy in teacher education, as well as future studies and conclusions for this thesis. The study sought to answer the main question: *How does technology-mediated teaching and learning influence preparation of pre-service teachers with disabilities?* This primary question is buttressed by four sub-questions that seek more elaborate responses. The sub-research questions and methods used in gathering related data are presented in table 5.1.

Table 5.1: Sub-questions and instruments used to gather data

Question	Instruments used
1. What are the inclusive practices in the preparation of pre-service teachers with disabilities?	Semi-structured interviews, focus group discussions and observations in lecture sessions
2. How do teacher educators facilitate technology - mediated teaching for pre- service teachers with disabilities?	Semi-structured interviews, focus group discussion and lecture observation
3. How do pre-service teachers with disabilities experience technology – mediated teaching and learning?	Semi-structured interviews, focus group discussions and lecture observation
4. How can practices and experiences of technology - mediated teaching and learning for pre-service teachers with disabilities be understood and explained?	This is addressed through discussions of findings from sub-questions 1,2 and 3 in Chapter 5

This qualitative single case study was conducted at an institution that mainstreamed pre-service teachers with hearing, physical and visual disabilities. Social constructivism was adopted as the research paradigm, which then influenced choice of methods of gathering perceptions and narratives from study participants to establish reality regarding the study phenomena (Lincoln & Guba, 2005; Neuman, 2014). Data gathering involved three focus group discussions, observations and semi-structured interviews. These multiple methods helped to obtain broader and deeper study findings. For instance, data gathered from observed lectures was triangulated with that from interviews and focus group discussions to bolster trustworthiness.

This study was anchored on Universal Design for learning (UDL), a theoretical framework conceived by the Centre for Applied Special Technologies (Rose, Meyer, & Hitchcock, 2005). It is important to mention that mainstreaming of pre-service teachers with disabilities created opportunities to implement the three principles of UDL in teaching and learning processes. The three UDL principles discussed under section 2.2.3 in Chapter 2 informed strategies, resources and instructional techniques used to reach out to and accommodate students' diversities that include disabilities. For instance, educators facilitated use of technologies that incorporated verbal and visual appeal, which supported content presentation to benefit students with visual and hearing disabilities. Here, the findings converge with Rose and Meyer (2012), which proves that multiple representations, engagements and expressions are fundamental for both educators and students in pedagogic processes. A significant

obstacle in the use of technologies to offset the effects of hearing, visual and physical disabilities in pedagogic processes was non-disclosure of disabilities by the pre-service teachers. Nevertheless, adoption of technology mediated teaching and learning approaches yielded more engaging learning contexts and strengthened concept acquisition as technologies helped to embrace the three UDL principles, which arguably benefitted pre-service teachers with disabilities (Sopko, 2008; Burgstahler, 2008). Besides traditional verbal presentations, teacher educators supported learning of pre-service teachers with disabilities by facilitating use of various technologies. Zehner, Chen and Aladsani (2017) assert that multiple representations of the ‘what of learning’, which is content, benefits majority of the students. Use of the technologies somehow accommodated pre-service teachers with particular disabilities, through availing options for multiple content representations. As proof, pre-service teachers with impaired vision received text material in Braille format, while those with impaired hearing benefitted from video viewing. Moreover, Schelly, Davies and Spooner (2011) urge educators to reinforce students’ learning by projecting facilitation strategies and technologies that uphold multiple representations at session planning. This study noted cases where use of technologies enabled multiple expressions, where pre-service teachers got options to articulate personal views and demonstrate evidence in the acquisition of targeted concepts, as espoused by the Ohio State Partnership Grant (2011). Pre-service teachers with profound visually impairment used computers installed with the JAWS software, whilst others with physical disabilities frequently illustrated evidence of learning points by using the Interactive board. Schelly, Davies and Spooner (2011) advance that these fundamental responses alleviate effects of particular disabilities on learning processes. Pre-service teachers affected by various disabilities could therefore use technologies to demonstrate prior and newer knowledge gains in learning encounters in line with the views of Meyer et al. (2014). The use of technologies supported teacher educators’ efforts to achieve more captivating learning engagements and enhance pre-service teachers with disabilities’ control over their learning processes through access to multiple engagements (Hitchcock et al., 2005).

The SAMR conceptual framework discussed in section 2.3.2 of Chapter 2, helped establish levels to which technologies were used in pedagogic processes (Schrok, 2018). Romrell, Kidder and Wood (2019) designate substitution, augmentation, modification and redefinition in SAMR as benchmarks that inform strategies related to the integration and evaluation of effectiveness in the use of technologies. In consistent with Hockly (2013), the use of

technologies was mostly at substitution, where these supported learning tasks which pre-service teachers could still accomplish without. Examples are capturing notes on laptops, which pre-service teachers could still achieve using pen and paper. However, this does not nullify that use of technologies enhanced efficiency in task execution, which Loescher (2018) acknowledges as augmentation. As augmentation, pre-service teachers used the spell check function in word processing, which is fast and more efficient than the hard copy dictionary (Puentedura, 2013). As modification in SAMR, technologies were at times used to support significant restructuring of academic tasks (Puentedura, 2013). Reflections were submitted on instances where pre-service teachers accessed feedback on assessed work through virtual learning platforms like email and WhatsApp, which Traxler (2010) acknowledges as use of technologies at the modification level (see section 4.3.1.3.ii). This makes it clear that technologies helped pre-service teachers to identify and eliminate disparities between initial intentions and outcomes in assignments before submission for assessment, as espoused by Nicole and Macfarlane (2006). While use of technologies at redefinition was limited, the few reported cases enabled pre-service teachers with disabilities to execute innovative learning tasks, as recommended by Johnson et al. (2016). This can be exemplified by the use of video player and Interactive board to illustrate situations and processes that appeared risky for pre-service teachers to engage in practically (Moore, 2014). Redefinition was also apparent when both educators and pre-service teachers used technology-aided simulations and illustrations. Liu and Tsai (2013) view such practices as redefinition, since use of the technologies enhanced participation in engagements that pre-service teachers with disabilities would not ordinarily partake in.

The next section discusses the findings, including their significance, as well as implication for teacher education and policy. The findings are premised on interviews and focus group discussions data from the principal, three teacher educators and twelve pre-service teachers that reflected on personal experiences with using technologies, which was then supported with data from observed lecture sessions. Engagements of gathering data were systematically recorded, before being used collaboratively to yield comprehensive explanations on practices and experiences in technology mediated teaching and learning for pre-service teachers with disabilities. These discussions facilitate conceptualisation on how technology-mediated teaching and learning influences preparation of pre-service teachers with disabilities.

5.2 Major Findings

5.2.1 Sub-question 1

What are the inclusive practices in the preparation of pre-service teachers with disabilities?

5.2.1.1 Enrolment of pre-service teachers with disabilities as an inclusive practice

Although no explicit related policy frameworks were in place, inclusive practices could still be informed by national and global declarations like the United Nations Convention on the Rights of Persons with Disabilities, Sustainable Development Goals, the national constitution, as well as ministry and institutional strategic plans (UNCRPD, 2012; MHTEISTD, 2019; Government of Zimbabwe, 2013). These contain supportive narratives on mainstreaming pre-service teachers with disabilities, whose enrolment provided basis to accommodate students' diversities through embracing UDL principles. Such enrolments reduced discriminatory tendencies and upheld human rights such as access to social services like education (Thompson, 2017). This promoted multiple representations, expressions and engagements to benefit pre-service teachers affected by various disabilities. Although there were no explicit strategies of informing teacher educators on pre-service teachers with disabilities, they however, sought to detect these at enrolment, as well as seeking information from authorities, like the dean's office. In view of limited access to such critical information, teacher educators also used observations, personal ingenuity and voluntary disclosures by the pre-service teachers. While teacher educators managed to identify some pre-service teachers with disabilities, they however, missed out others, particularly those with mild hearing and visual impairments (see section 4.3.1.1.ii).

Notwithstanding the inclusive enrolment, no systematic strategies were in place to support capturing information on pre-service teachers with disabilities, which is critical for effective inclusion. Such details could have been captured at enrolment and conveyed to the teacher educators. This thwarted the teacher educators' efforts to accommodate all affected pre-service teachers, which forced those affected to make own arrangements like aiding reading with a magnifying glass (see figure 4.9). Due to insufficient knowledge about pre-service teachers with disabilities, teacher educators could not effectively choose technologies that effectively supported multiple engagements and expressions for those with particular disabilities (Blundell et al., 2022). They however, sought to use lecture rooms that accommodated pre-service teachers with various disabilities well, and upheld UDL on access

to suitable learning environments. Nevertheless, inclusive enrolment was no guarantee that pre-service teachers with disabilities accessed essential resources and accommodations. Teacher educators then made special concessions for pre-service teachers known to have visual, hearing and physical disabilities, like reserving seats for them in lecture rooms (UNCRPD, 2012). CAST (2018) asserts that students with undetected disabilities often endure ‘one - size fit all’ kind of provisions, because the educators cannot provide special accommodations.

5.2.1.2 Disabilities that affect pre-service teachers and conceptions on supporting their learning through the use of technologies

Some of the pre-service teachers had physical, hearing, and visual disabilities, which indicates inclusive enrolment, where admission into teacher education programs was not hindered by one’s disabilities. Among these, physical disabilities were predominant, which seemed to deprive affected pre-service teachers of particularised essential technologies as they received similar treatment with the rest, because of their larger number. Although these pre-service teachers anticipated enhanced access to technologies, they however, had to compete for these with colleagues without disabilities. While WHO (2011), asserts that physical disabilities have influenced most definitions on disability and related intervention strategies, this was not telling at the institution. Physical disabilities comprised impairment on lower or upper body limbs (paraplegia) and on both limbs (quadriplegia), as espoused by LCZT (2016). On the other hand, hearing impairment proved to be the least detectable disability, as evidenced by few cited cases and reservations by some participants that the institution had such pre-service teachers (Ocansey & Antwi, 2006). It was then noted that some pre-service teachers with hearing disabilities failed to access essential technologies and accommodations, unless they used personally owned technologies. A similar scenario applied to pre-service teachers with visual disabilities, except for those with easily detected profound cases or used own technologies (see figure 4.19). There were claims that the institution had pre-service teachers with perceptual disabilities who allegedly presented depressed expressive eloquence and, at times, delayed completion of studies (see Chibwe’s comments, in section 4.3.1.1.ii). Nwadinobi (2019) argues that impaired hearing sometimes affects eloquence, besides the perceptual disabilities.

A key finding affirms positive conceptions regarding the use of technologies to support learning for those with disabilities by both pre-service teachers and teacher educators. Since

these pre-service teachers pursued similar curricular with colleagues, conviction was that they were slower in grasping concepts, which necessitated the use of technologies (Majoko, 2018; refer to section 4.3.2.2.i). The positive conception on benefits of using technologies to support learning for students with disabilities affirms it as a strategy that counteracts effects of differences in pace of conceptualisation and further helps to accommodate diversity in learning styles (Fernandez-Betanero et al., 2022; Rensburg, 1999). Further demonstration of positive perceptions on the use of technologies was when pre-service teachers used personally owned technologies like laptops and smart phones, which complemented institutional efforts. This corresponds to the assertion by McNicholl et al. (2019), Xu (2018) and Jairos Jiri Association (2013) that the use of technologies is a strategy that makes learning contexts more inclusive. Generally, perceptions indicate that the use of technologies made learning tasks easier for pre-service teachers with disabilities, in addition to providing varied and clearer presentations (refer to section 4.3.2.2.i). Other perceptions reflect those technologies enhanced knowledge acquisition and facilitated autonomous or independent learning for pre-service teachers with disabilities (Xu, 2018; Yankova, 2019; Bekteshi, 2015). Further findings reveal conviction that perceptions and attitudes had significant influence on frequency and levels to which the technologies were used.

In appreciating the use of technologies like video viewing, submissions confirm that this rescued pre-service teachers from an overdose of verbal presentations and rekindled their concentration (refer to section 4.3.3.2.i). They also helped to yield more captivating learning engagements that bailed out pre-service teachers with disabilities which reduce concentration span (refer to section 4.3.2.2.i). Moreover, Kart and Kart (2021) concur with McEwen and Demmans (2013) that technologies provide an ‘opportunity window’ for more exciting pedagogic engagements boosts motivation and enhances academic performance.

The findings indicate that technologies promoted options in facilitation strategies and materials that match students’ disabilities. To substantiate the foregoing perception, text in Braille was provided to pre-service teachers with extreme visual impairment in place of word text, while test questions were projected on a screen instead of printing question papers. Projecting text on a screen enabled zooming in and out to benefit particular pre-service teachers and further saved resources like paper and ink for printing (refer to section 4.3.1.3.i). Where physical disabilities impeded writing with pen on paper, laptops and other technologies were used to capture notes and compile assignments (see figure 4.2). Fernandez-

Betanero et al. (2022) concur with Gaulin and Dunn (2005) as they all assert that the use of technologies is an approach that counteracts effects of dysfunctional limbs or senses.

Pre-service teachers with hearing and physical disabilities benefitted from visuals from picture and video illustrations that complemented or even substituted audio presentations (see section 4.3.3.2.i). General consensus was that these strategies made content delivery more inclusive, teaching more humanistic and increased confidence to handle pre-service teachers with particular disabilities (McNicholl et al., 2019; Wachira & Keengwe, 2010) (see section 4.3.2.2.2). This illustrates perceived efficacy on the integration of technologies in pedagogic processes (Scholl, 2002).

While the above discussions brought out positive perceptions, there were claims that other pre-service teachers with disabilities shied away from technologies like computers, while another one without hands proceeded on teaching practice with inadequate affordances to operate the projector, although it was critical for presentations in the classroom (4.3.2.2.ii). Balmeo et al. (2014) assert that the use of technologies makes students with disabilities collaborators in overcoming barriers to their learning. The cited pre-service teachers was pursuing computer studies, which should have positioned her well to acquire requisite skills to operate the technologies before teaching practice. Although one could perceive these as effects of the pre-service teacher's depressed motivation to use the technologies, this seems to have been effects of intransigence by teacher educators who provided limited access. To illustrate positive attitude, the pre-service teachers developed skills to operate the technologies through personal ingenuity, when already on teaching practice (see section 4.3.2.2.v). This demonstrates how exposure and access to particular technologies can motivate pre-service teachers to use them (Ertmer, 2005). Findings also revealed that any negative attitudes towards particular technologies of the teacher educator easily cascades to the pre-service teachers. Some participants alleged that the use of technologies often wasted time, which implies a negative attitude (see section 4.3.2.2.ii). It however, seems such concerns were triggered by poor planning, which could imply a negative attitude towards the use of technologies. The study noted delays in one observed lecture, as efforts were made to locate and set up the projector and other allied accessories. Although findings confirm existence of possible assistance from technicians, this often requires prior arrangements. This highlights the need for teacher educator capacitation on effective integration of technologies

to enhance quality of education provision, in line with the Sustainable Development Goal number 4 (UNESCO, 2015b).

5.2.1.3 Provision of technologies at the institution

The institution provided technological devices like desk top computers, laptops, projectors, printers, television sets, sound amplifiers photocopiers and related software that could be accessed from the departments (refer to table 4.5). Scarce technological equipment was then accessed through inter-departmental borrowing, although some teacher educators snubbed this provision (see section 4.3.1.3.iii). Others then sought to provide personally owned technological gadgets, but they could not cater for all the pre-service teachers with disabilities, although O’Connell et al. (2010) confirm these as efforts to highlight and support uniqueness among the students (see 4.3.1.3.iii).

Findings however, revealed that students with disabilities had depressed capacity to own vital personal technological devices, which WHO (2011) attributes to poor resource backgrounds of most persons with disabilities. Although findings highlighted the need for specialised technological equipment that enhance learning for pre-service teachers with visual, hearing and physical impairments, procurement of these received peripheral attention (see section 4.3.1.3.i). It appears assumption was that use of the available equipment equally benefitted all pre-service teachers , regardless of disabilities. Most pre-service teachers with disabilities used personal devices, which enhanced their exposure to matching technologies that then supported articulation of diverse ideas in pedagogic engagements (Judson, 2010). Nevertheless, the use of such personal gadgets was not adequately monitored and some of these were then used in unproductive ways that evaded notice of the teacher educators (see figure 4.19). While Jameel (2011) and Eckstein (2022) view such practice as effort by the pre-service teachers to conceal their disabilities for fear of stigmatisation, others were however, using these to engage social media platforms during lecture sessions. As a result, the findings revealed that many pre-service teachers received little support from teacher educators, as they used these technological gadgets.

5.2.1.4 Use of technologies to support pre-service teachers with physical disabilities

This study noted efforts to adjust pace of presenting or dictating notes to accommodate pre-service teachers with physical disabilities that affected fast writing or note capturing with technologies (see section 4.3.1.2.3). Regardless of severity of their physical disabilities,

LCZT (2016) concedes that all of these often obstruct learning processes. In spite of concern for inadequate information about pre-service teachers with disabilities, others were often discovered by default, which however, embarrassed some of the teacher educators. In one incident, a pre-service teacher was only noticed writing with the pen supported between toes, way into the lecture (refer to section 4.3.1.2.i). Besides feeling embarrassed, the teacher educator acknowledged that the discovery enabled him to designate a seat and make appropriate decisions on technologies, as well decide on more effective facilitation strategies. The pre-service teacher was later given text in a format that she could use without being impeded by her disabilities, which counteracted effects of insufficient awareness on pre-service teachers with disabilities (Schelly, Davies & Spooner, 2011).

The study noted reluctance by teacher educators to cite technologies they used to benefit pre-service teachers with particular disabilities, which perhaps indicates their conviction that pre-service teachers with disabilities equally benefitted from any of the technologies used in the mainstreamed contexts (see section 4.3.1.3.i). These technologies included projectors used for screening presentations, laptops used to make presentations by both teacher educators and students, while printing facilities assisted in producing hard copies of learning materials. Also used were speakers that amplified sound for the benefit of students with mild hearing impairment and the interactive board which aided visual illustrations by those with various disabilities. The video player supported audio visual presentations, whilst visual recording equipment was used to capture processes that students could not engage in practically because of disabilities. (see table 4.5). This collection of technologies did not include technologies particularised to those with physical disabilities, although UNCRPD (2012) says persons with disabilities require special concessions and accommodations (refer to section 4.3.1.3.i).

Technologies like the video recorder and player were also used to illustrate events and processes that pre-service teachers could not engage in due to physical disabilities. For instance, segments of a field trip that involved long walks were recorded, and this promoted multiple representations for such pre-service teachers (see section 4.3.1.3.ii; CAST, 2018). In some instances, the projector was synchronised to an adapted laptop, which enabled use by pre-service teachers with missing or deformed body limbs (Kavcic, 2005). Others captured notes into a laptop by punching the keys with toes and these pre-service teachers also confirmed doing the same to access internet and compile assignments (see figure 4.1).

Reynolds and Ruedel (2015) asserts that customised technologies enable use by students with particular disabilities, which Sharp (2002) exemplifies with mouse functions that are integrated in the keyboard to allow easy iteration between mouse and text input functions. However, no special technologies were in place for pre-service teachers with particular disabilities, which O’Connell et al. (2010) confirm as common in most institutions. These pre-service teachers in turn sought to circumvent that by using their own cell-phones, smart phones, iPods and tablets to carry out research, capture notes and share pedagogic feedback. Findings also revealed use of technologies such as the computer and allied software and applications like the JAWS to support verbal contributions by the pre-service teachers, as well as other pedagogic engagements often impeded by compromised eloquence related to disabilities. Laabidi et al. (2014) reiterate the use of technologies as a strategy that enhances students’ interactions and execution of tasks.

5.2.1.5 Supporting learning for pre-service teachers with visual disabilities through the use of technologies

Findings revealed efforts to complement pre-service teachers’ dysfunctional visual senses through the use of audio-based technologies like radios, video players, speakers, sound amplifiers and the microphone (see table 4.8). Despite limited access to information about pre-service teachers with visual disabilities, teacher educators often identified these through personal ingenuity, like noticing difficulties in reading screened text. In that context, LCZT (2016) highlights the need for high alertness so that teacher educators can detect mild visual impairment and other obscure disabilities. Other teacher educators got insight into suitable technologies that support learning for pre-service teachers with disabilities through enhanced rapport with those affected (see section 4.3.2.2.viii). However, pre-service teachers with undisclosed visual disabilities or not identified by teacher educators frequently sneaked out of lectures when the use of technologies seemed exclusionary (see Klerk’s comments in section 4.3.3.2.ii). Nwadinobi (2019) regards sneaking out as a repulsive action to express feelings of being neglected. These pre-service teachers however missed out on vital learning despite integration of technologies in these lecture sessions. If the teacher educators were aware, they would perhaps strive to use technologies to yield more befitting learning activities for these pre-service teachers (Mtetwa, 2011). Nevertheless, the teacher educators often sought to provide text material with large font, besides reserving strategic seats for pre-service teachers known to have visual disabilities (LCZT, 2016). The initiatives such as strategic seats and adapted material were customised responses that promoted access to multiple content

presentations (Cast, 2018). These demonstrated how teacher educators sought to match learning content and modes of presentation to the students' disabilities (Schell, Davies & Spooner, 2011).

Visual disabilities often manifested as short sightedness (myopia), long sightedness (hypermetropia) and total blindness (Mogk & Goodrich, 2004) (see table 4.2). Some of the affected pre-service teachers struggled to read screened material, others sat on chairs bending forward, while others exhibited poor visual attention (see section 4.3.1.1.ii). Some frequently brought reading material closer or further from the eyes or wore hearing aids, which (Pacey, 2011) confirms as indicators of hearing impairment. While some participants refuted existence of pre-service teachers with this disability, it was observed that a number visibly struggled to keep pace with note capturing without technologies in place to prop them up (refer to section 4.3.1.3.ii). A few of these received abridged hand-outs and large print text, which they read from closer proximity during and after lectures. Those with total blindness received material in Braille format, in line with Sharma and Tripathi (2010). Members from an invited organisation were also seen demonstrating the use of Braille note taker and Braille tablet to the pre-service teachers who generally appreciated inherent capacity of these gadgets to store Braille information for future reference (see figure 4.8a). Besides raising awareness, these demonstrations stimulated the pre-service teachers' desire to use the gadgets and illustrated the value which authorities ascribed to techno-aided learning for those with disabilities (Gupta & Bostrom, 2008). Since essential technologies for pre-service teachers with particular disabilities were limited, this was viewed as a factor that necessitated stronger liaison with suppliers of the technologies (refer to section 4.3.2.1.ii).

Computers installed with Job Access with Sound (JAWS) or other special packages were used by blind pre-service teachers, while no special provisions existed for those with mild visual disabilities. For these, WHO (2011) and TechTrek (2003) recommend enlarged keyboard keys which are easy to locate when using the computers. The teacher made presentations with the aid of laptops, while pre-service teachers with visual disabilities captured notes and performed other learning tasks with theirs. Findings also revealed use of computers that converted text to speech, for which TeachThought Staff (2023), as well as Christmann, Badgett and Lucking (1997) say should also incorporate talking browsers or speech synthesiser programmes that aid reading text displayed on the computer screen. As discussed earlier, a pre-service teachers (Tinny) used a magnifying glass to aid reading of

text, which CAST (2018) qualifies as a strategy to uphold customised representation and engagements (see figure 4.19).

5.2.1.6 Enhancing learning of pre-service teachers with hearing disabilities through the use of technologies

Awareness of pre-service teachers with hearing disabilities was limited among teacher educators, which acted as an impediment to the choice of matching instructional strategies and technologies used. It also obstructed provision of multiple content representations through the use of technologies (CAST, 2018). Although some teacher educators sought to establish the nature of students' disabilities before each lecture, this failed to yield effective accommodations as they were no technologies particularised to those with hearing disabilities (Hurst & McCarthy, 2001). The accommodations mainly benefitted pre-service teachers with observable disabilities, as also noted in other contexts by Tai et al. (2022).

The study found out that unfamiliarity with the UDL philosophy had little influence on the teacher educators' practice, as alleged by Cooper et al. (2008), as cited in Mavrou & Symeonidou, (2014). Although they had little knowledge of UDL, teacher educators managed to embrace its tenets through experience and availed electronic presentations which pre-service teachers saved in laptops and other technologies for use during and after lectures (refer to figure 4.9). Provision of text in soft copy illustrates adoption of multiple content representations to accommodate pre-service teachers of diverse predispositions (Zehner, Chen & Aladsani, 2017).

Pre-service teachers with hearing disabilities not known to the teacher educators visibly struggled to capture oral presentations, since walls of lecture rooms were not sound proofed to reduce distortion on sound output. Some pre-service teachers often sat on the edge of their chairs and leaned forward for enhanced hearing (Refer to section 4.3.1.2.ii). Others turned an ear towards the teacher educator, while keeping focus on the teacher educator's mouth to exploit lip reading (Nwadinobi, 2019). Although these behaviours and actions were very noticeable, no responsive interventions seemed forthcoming from teacher educators. Milton et al. (2016) contend that the way educators manage learning contexts and respond to learning obstructions determine how their lecture rooms become conducive to learning. Blamires (1999) (as cited in Mavrou & Symeonidou, 2014), similarly argues that educators need to reflect on students' disorders like hearing and other auditory impairments in order to conceive appropriate facilitation strategies. Vigilance to detect impaired hearing early is

critical, as Winzer (1996) says 5% of the global population has compromised hearing. Findings also indicate that non-disclosure of hidden disabilities impeded effective facilitation. Eckstein (2022) and Jameel (2011) blame such non-disclosure to the students' fear of stigmatisation and labelling. Findings have revealed that poor audibility in oral and even technology-aided presentations influenced some pre-service teachers to frequently shift seats, dose off or become apathetic, which resulted in the loss of vital learning (Rose & Meyer, 2012).

Pre-service teachers with mild hearing impairment benefitted from enhanced sound output from the use microphone and speakers, which McNicholl et al. (2019) concur with Meyer at al. (2014) that it helps to accommodate students with hearing impairment, besides making learning engagements more flexible. In that context, TeachThought Staff (2023), as well as Liman and Longpoe (2015), recommend the frequency modulated (FM) amplification system, which links the educator's microphone with the students' hearing aids. Some pre-service teachers were seen wearing hearing aids behind ears, and these functioned as a mini public audio system for them (Hasselbring & Glaser, 2000; TeachThought Staff, 2023). The study revealed non-availability of specialised technologies for pre-service teachers with hearing impairment who, however, benefitted from the use of a video player and recordings to capture certain processes they could have missed due to their sense of hearing. Pre-service teachers derived further benefit from the use of other technologies such as the sound system, computers and projectors, as these complemented visual presentations (refer to table 4.7). Others used smart phones for audio and photo recording notes, which they read later at their own pace to strengthen concept acquisition (see figure 4.17).

5.2.1.7 Support for technology mediated teaching and learning processes

This section focuses on support for technology mediated teaching and learning from the responsible ministry and institutional authorities.

i) Ministry support

Mandate for policy guidance on inclusive practices was with the Ministry of Higher and Tertiary Education, Innovation, Science and Technology Development (MHTEISTD), whilst institutional authorities supervised and monitored implementation. However, this study could not establish the existence of any robust ministry policy frameworks, although Abosi (1996) cites Zimbabwe among nations with such policies in place. Gronlund et al. (2010) assert that a policy is fundamental for effective use of technologies. However, literature reviewed in

Chapter 2 revealed excerpts in the national constitution that sought to promote rich and more inclusive contexts for students with disabilities (Government of Zimbabwe, 2013). The ministry also compelled mainstreaming of students with disabilities to uphold inclusivity (see section 4.3.1.1.i). This was supported by the UNCRPD (2012) as well as the minister's statement on inclusion and use of newer technologies to enhance learning (MHTEISTD, 2019). This concurs with CAST (2018) that policy provides a safety net against a 'one - size fit all' approach in education provision. The ministry further collaborated with stakeholder organisations to capacitate educators on inclusive practices, in line with its strategic plan of 2019 (see section 4.3.2.1.ii). This initiative highlights the need for teacher educators to continually update skills on supporting learning for pre-service teachers with disabilities (Eckstein, 2022; Gray & Ruedel, 2015).

ii) Support from institutional authorities

Institutional authorities facilitated erection of ramps for easy access into learning environments by pre-service teachers with physical disabilities, an initiative which upheld the universal design principle on access by the majority (see figure 4.6a and figure 4.6b) (Burgstahler, 2008; Yvel, 2014). The authorities further supported teacher educators to participate in workshops mounted by stakeholder organisations on inclusive practices (see section 4.3.2.1.ii). In addition, they invited experts that came to update teacher educators on ways to handle pre-service teachers with specific disabilities, although the study could not establish whether this enhanced their skills to use technologies that match particular disabilities. Furthermore, members from the information technology department were tasked to periodically raise awareness on newer technologies (see section 4.3.2.1.ii). Such initiatives assisted teacher educators to transform perspectives on pre-service teachers with disabilities and using technologies when responding to student diversities (CAST, 2018). Links and synergies developed with these corporate bodies further enhanced access to advice on inclusive practices, donation of technologies and opportunities to borrow essential technologies (see submissions from Barakasi and Mbofayo in section 4.3.2.1.ii).

However, authorities at the institution often prioritised acquisition of technologies that would serve the majority of pre-service teachers and accorded peripheral attention to those particularised to students with disabilities and this, according to TEAL (2010), seem discriminatory. However, even technologies meant to serve the majority remained acutely inadequate and pre-service teachers with disabilities often struggled to access them, as they

were often outpaced to the resource rooms (see section 4.3.1.3.iii). Furthermore, there were no explicit strategies to promote equal access; hence, these pre-service teachers largely relied on using their personal technologies.

Another finding revealed a lack of reserved budgetary allocation for procuring technologies, which seems prudential in the allocation of resources (CAST, 2018) (see section 4.3.2.1.ii). Even after the authorities' approval, purchasing of technologies was often delayed by bureaucratic procurement processes. Although authorities claimed that they could authorise a waiver to expedite procurement, most participants seemed unaware of that provision (refer to section 4.3.2.1.ii). Furthermore, monitoring the extent to which technologies were used to benefit pre-service teachers with disabilities was inadequate (see section 4.3.3.2.iv). Walimbwa and Mayende (2014) view monitoring as fundamental to enable authorities to identify other needed technologies and competence gaps among educators. However, findings show that use of technologies was in the purview and discretion of the teacher educators, as individuals.

5.2.2 Sub-question 2

How do teacher educators facilitate technology - mediated teaching and learning for pre-service teachers with disabilities?

Discussions under this section focus on findings regarding the way teacher educators facilitated use of technologies to support learning for pre-service teachers with disabilities.

5.2.2.1 Choice and facilitating the use of technologies, in cognisance of UDL and SAMR

The technologies used to facilitate learning in lecture sessions were mostly selected by the teacher educators, whose choice was influenced by those they could operate (refer to section 4.3.2.2.iv). As a result, the use of newer and technologies that teacher educators were unfamiliar with remained low and disadvantaged some pre-service teachers. Although teacher educators sometimes involved pre-service teachers in the choice and setting up of technologies, it was usually those without disabilities. Their argument was that the available selection of technological devices was limited at the institution. Mattingly and Ratisifandrihamanana (2016) however blame this on traditional practices that marginalise views of persons with disabilities. Findings however, revealed general conviction among study participants that it was critical to involve pre-service teachers, as that assists in choice of technologies that match their particular disabilities. Nevertheless, choice by these pre-

service teachers was limited to personal technologies like laptops and smart phones, where they could select those matching their specific disabilities. The scenario made it inconceivable to have mutually planned teaching and learning strategies based on the pre-service teachers' different technologies. Teacher educators were therefore, left with little influence on the extent and level to which personal technologies were used. As a result, technologies were largely used to substitute pen and paper in note capturing.

i) Facilitating the use of technologies to support learning

Findings show predominant use of the computer and projector, whose visual and sound output accommodated pre-service teachers with physical, visual and hearing disabilities (see section 4.3.2.2.i). However, concern was that over-use of the cited technologies deprived other pre-service teachers with disabilities that necessitated use of particularised technologies. On particularised technologies, Bekteshi (2015) cites the chat programme for students with speech or language inhibitions and technologies that incorporate voice output for those with visual disabilities. TeachThought Staff (2023) and Adebisi et al. (2015) similarly, underscore the need for educators to facilitate use of technologies that provide options for multiple expressions and engagements. In this case, the pre-service teachers were supported to use technologies like smart phones, tablets and other suitable equipment to capture notes and do other pedagogical tasks (see figures 4.1; 4.3 and 4.11b). Teacher educators used technology like the projector for presentations, which were well structured, and electronic copies of these were availed to the pre-service teachers afterwards. The good layout on soft copies of presentations enabled students to produce hard copies using own printers (see figure 4.9). Teacher educators also sought to enhance sound output from their presentations by using speakers, which benefitted pre-service teachers with compromised hearing.

Pre-service teachers that had profound visual disabilities often received presentations in electronic format, which they saved in laptops installed with special software like Job Access with Sound (JAWS). They then listened to these through earphones during and after lecture sessions. This demonstrates access to multiple representations of content and how the use of technologies at the augmentation level of SAMR counteracted effects of compromised hearing (Mishra, Sharma & Tripathi, 2010). While JAWS and allied gadgets enhanced multi-sensory learning for pre-service teachers with visual disabilities, others with physical disabilities that impeded writing or punching computer keys received the notes in electronic

format. Such responsive actions illustrate efforts on upholding multiple representations of content and multiple engagements in pedagogic processes (Meyer et al., 2014). Teacher educators further encouraged and supported pre-service teachers with physical, visual and hearing disabilities to save notes and presentations in technologies like laptops, smart phones and tablets, as a way of supporting alternative engagements during and after lecture sessions. They also stored and transferred their presentation into the students' personal technologies by using devices like computer flash sticks, which illustrates use of technologies at substitution and augmentation to sustain alternative engagements (Puentedura, 2013). Such actions also promoted multiple accesses to and sharing of learning content with and among students. The provision of printed notes and presentations in hard copy revealed use of printers and photocopiers to buttress alternative content presentations (Puentedura, 2013).

Teacher educators also sought to enhance concept acquisition by using the video player and Interactive board to make illustrations, in addition to video viewing of processes that pre-service teachers with disabilities could not engage in. This reveals use of technologies at the redefinition level and promotion of alternative presentations of learning content (Zehner, Chen & Aladsani, 2017). The teacher educators also gave assignment tasks that required pre-service teachers to research on the internet, which promoted learning with and from technologies (Gupta & Bostrom, 2008; refer to 4.3.2.2.ix). That strategy enhanced the pre-service teachers' access to more academic search engines, promoted befitting engagements and expressions as they were obliged to use smart phones, tablets, computers or other accessible technologies. The electronic-based research exemplifies substitution, where the use of technologies served as an alternative to traditional hard copy books. Besides equalising learning opportunities, the use of technologies enhanced autonomy in learning processes (Hilton, 2017; Xu, 2018). Furthermore, insistence on submission of printed work by teacher educators compelled pre-service teachers to use standard or adapted technologies, depending on their particular disabilities. This also encouraged pre-service teachers to verify correctness of grammar and spellings through the use of word processing applications like spell and grammar check. Such processes illustrate augmentation, where the technologies substituted use of the hard copy dictionary (Loescher, 2018).

Although pre-service teachers with visual, hearing and physical disabilities occasionally used the Interactive board to demonstrate mastery of concepts as alternative expression, this was allegedly minimal due to lack of skills by teacher educators (refer to section 4.3.1.3.ii).

Perhaps the teacher educators needed capacitation in operating such equipment and other novel technologies (Reiser, 2001). Nevertheless, the use of technologies supported multiple presentations, expressions and engagements, where educational tasks became easier and more efficient for pre-service teachers with disabilities (see section 4.3.2.2.i). This is substantiated by the OECD (2001), which views the use of technologies as a strategy that helps to accommodate students' diverse learning needs and also promote equal learning opportunities. More importantly, the teacher educators facilitated use of technologies to support multiple representations and expressions, besides helping to mainstream issues of disability in the pedagogic processes (Rose & Meyer, 2012). Findings revealed that the technologies used included projectors, laptops, smart phones, printers, photocopiers, video players and interactive boards. Nevertheless, closer scrutiny exposes a lack of technologies that were meant to match specific disabilities, which Balmeo et al. (2014) blame on skewed priorities and discriminatory tendencies.

5.2.2.2 Strategies used in processes of technology mediated teaching and learning

In this section, the discussions focus on how the use of technologies was facilitated in lecture sessions, which covers introduction, development and conclusion of the lecture sessions.

i) Use of technologies at session introduction

Technologies like the laptop and projector were frequently used at session introduction, which laid foundation for the lesson and also captured the pre-service teachers' desire to learn (see section 4.3.3.2.iii). Use of these technologies supported presentations that incorporated both audio and visual appeals, which are fundamental inclusions at session introduction (refer to section 4.3.3.2.iii). Rose and Meyer (2002) acknowledge that use of technologies enhances students' readiness and enthusiasm to engage in learning processes. Furthermore, use of the technologies paved way for multiple content representations by harnessing students' multiple senses. In cases where a student's sense was compromised, the others then complemented to support learning processes. Nevertheless, at this stage, use of personal technologies by pre-service teachers was minimal, hence, they largely benefitted from technologies like speakers that enhanced audibility of audio presentations.

ii) Use of technologies throughout the lecture session

Findings revealed an assortment of technologies used to support content presentations, illustrations and learning activities like note capturing, pair work and group work, as the lecture sessions progressed. Use of these technologies enhanced students' participation, despite their disabilities (Fernandez-Batanero et al., 2022). This stage involved broad content coverage, where technologies like, laptops, projectors, smart phones, televisions, video players and the magnifying glass were used by teacher educators and pre-service teachers to enhance concept acquisition. Adebisi et al. (2015) implores both educators and students to use mobile digital and other particularised technologies to enhance learning processes. As the lecture sessions unfolded, pre-service teachers used personal technologies like smart phones, laptops and tablets to capture notes and view presentations which helped offset effects of their specific disabilities in learning engagements. These technologies enhanced multiple representations where learning material was accessed in visual, audio and tactile form. For multiple engagements, some pre-service teachers physically manipulated the technologies in learning processes, whilst others even used toes to input information into their laptops, as they executed pedagogic tasks. For multiple expressions students used the interactive board for illustrations others made PowerPoint presentations as well as demonstration of learning processes, especially for those with disabilities that affected effective verbal communication. The video player enabled the students to follow sequential descriptions and demonstrations of some learning processes, such as the stages of compiling a scheme of work. Use of these technologies supported more efficient capturing of notes, as well as enhanced learning for pre-service teachers affected by physical, visual and hearing disabilities. This scenario demonstrates efforts to comply with calls by the integration of technologies in pedagogic processes (MHTEISTD, 2019). Thus, technology use enabled multiple learning activities that also influenced the nature and extent of interactions, as well as acquisition of knowledge by the pre-service teachers (Vygotsky, 1978).

The use of technologies generally spanned from introduction up to session conclusion (refer to section 4.3.3.2.iii). Teacher educators that facilitated intermittent use of technologies were considered inept as their approach allegedly caused loss of critical concepts by some pre-service teachers with disabilities (see comments from Mbofayo in section 4.3.3.2.iii). O'Connell et al. (2010) and McNicholl et al. (2019) similarly, urge educators to facilitate the use of technologies throughout lecture sessions to counteract learning challenges related to disabilities. Reiser (2001) likewise advances that the use of technologies can help transform students' disabilities into learning differences and further equalise learning opportunities.

While the laptop and projector were used throughout most of the lecture sessions, concern was on slides that contained too much detail (see section 4.3.3.2.iii). Slides with dense information often forced pre-service teachers with visual disabilities or shorter concentration span to abandon lecture sessions in midstream (see section 4.3.2.2.vii). Findings noted participants' desire for MS PowerPoint slides that only capture major points, which teacher educators then expand as they present.

This study established that factors like the topic, depth of content, nature of students, and the discretion of teacher educators significantly influenced facilitation strategies and the extent to which technologies were used. The use of technologies was common throughout lecture sessions, with only a few cases where this was limited to particular stages. Hilton (2017) and Eckstein (2022) concur that the extent and success in the use of technologies vary with individual educators.

5.2.3 Sub-question 3

How do pre-service teachers with disabilities experience technology mediated teaching and learning?

Discussions in this section focus on how pre-service teachers with disabilities experienced the use of technologies in their learning processes.

5.2.3.1 Access to technologies provided at the institution

Technologies like the interactive board were permanently mounted in lecture rooms, which made these readily accessible to groups using the specific lecture rooms; even though other groups needed special arrangements for access (see figure 4.4 and comments from Barakasi in section 4.3.1.3.iii). Most technologies could be accessed from departments, whilst inter-departmental borrowing enabled access to scarce ones. Although this arrangement sound sustainable, borrowing was often snubbed by some teacher educators, which deprived pre-service teachers of exposure to scarce technologies and, consequently, befitting content representations. For instance, the Department of Professional Studies had no projector and members relied on borrowing from other departments (refer to section 4.3.1.3.iii). Although pre-service teachers could access some technologies from resource centres, those with disabilities found it challenging as the technologies were often monopolised by those without disabilities. Findings discovered that this scenario could be circumvented by; providing them with a schedule to use the resource rooms, designating a resource room for pre-service

teachers with disabilities, and ensuring that technologies used by teacher educators are accessed from a central resource centre (See section 4.3.1.3.iii).

5.2.3.2 Resourcefulness to enhance technology mediated learning

Both teacher educators and pre-service teachers used innovative initiatives to complement the inadequate technologies at the institution. One such initiative involved mounting a board on two chairs to serve as projector screen (see section 4.3.1.3.iii). Alternatively, part of the wall would be covered with cloth to act as screening surface. Kurt (2010) asserts that improvisation helps to reconfigure learning environments, which enhances teaching and learning processes. Both teacher educators and pre-service teachers also used personal technologies like laptops in place of the desktop computers provided by the institution. Wi-Fi was used for internet connection in place of the usual local area network (LAN) (see section 4.3.1.3.iii). Provision of own laptops and smart phones demonstrated attempts at complementing the efforts of institutional authorities.

5.2.3.3 Evidence of success in technology mediated teaching and learning

Reflections revealed enhanced concept acquisition through the use of technologies as some pre-service teachers clearly confessed that visual illustrations from these had etched lasting memories and aided clarity in the teacher educators' explanations (see section 4.3.3.2.i). Video viewing, for example, broke monotony, rekindled zeal to learn and revitalised attentiveness (see section 4.3.3.2.i). Also acknowledged was concept mastery, which allegedly surpassed instances where written text presentations were used. The use of technologies, therefore, took cognisance that disabilities often reduce concentration span or impede fast mastery of concepts and, thus, served pre-service teachers from the long and boring explanations often used by the educators.. Meyer et al. (2014) assert that over-use of text-based media makes learning contexts less stimulating, which Rensburg (1999) blames on poor facilitation skills where educators fail to accommodate student diversities. In other instances, technologies were used to harness the pre-service teachers' multiple senses, which enhanced multiple content presentations. Further reflections show that technologies helped depict real life scenes that pre-service teachers could relate to, while laptop and projector presentations quickened mastery of the sequence in cited pedagogic processes (see section 4.3.3.2.i). Such innovative techno-based presentations depict that the use of technologies had reached modification level to complement verbal explanations (Puentedura, 2013). In other cases, using the laptop made compilation of assignments easier for pre-service teachers

whose physical disabilities impeded writing with a pen. Using technologies therefore, helped counteract effects of disability in learning tasks.

In one incident, the teacher educator used an example that sounded offending to a blind pre-service teacher whose presence was unknown to him. However, upon realising the pre-service teacher's presence, the teacher educator hastily modified the implications of the example and later provided customised Braille material (see section 4.3.3.2.i). This illustrated the use of technologies at substitution level (SAMR) as well as provision of alternative representations (Hilton, 2017; Cast, 2011). The above reflections reveal using technologies at substitution and augmentation levels, while multiple representation and expression were the mostly applied UDL principles.

5.2.3.4 Disappointing experiences in technology mediated teaching and learning

Findings uncovered challenges of electricity supply outage and the absence of alternative electric power sources. This hindered the use of technologies (see section 4.3.3.2.ii). Some technologies were old or obsolete, which resulted in frequent malfunctioning even in the midst of lecture sessions. Furthermore, electricity cables in some lecture rooms were worn out or damaged, while some power sockets had been vandalised. Such circumstances deterred pre-service teachers from using personal technologies, especially for those that had faulty batteries that needed constant power supply (see figure 4.5). Other impediments included fear of electrocution and damage to personal technologies.

In one instance, the onset of a lecture session was delayed, as efforts were being made to find alternatives for the screen and assistance in setting up technologies. Arguably, these were effects of poor planning or inadequate capacitation of the teacher educator.

Another challenge reflected upon by pre-service teacher participants related to preference for older technology versions by some teacher educators, which indicated insufficient skills to operate the more modern ones (see section 4.3.3.2.ii). However, the US-OET (2017) advocates for timeous capacitation of educators upon procurement of any new technologies, as well as on appropriate facilitation strategies. Another incident reflected referred to fast scrolling of PowerPoint slides, which then impeded effective grasp of concepts and note capturing by pre-service teachers with disabilities (see section 4.3.3.2.ii). In another case, the teacher educator failed to explain new terms used in a technology-aided presentation, which

affected mastery of concepts as none of the pre-service teachers raised concern for fear of being labelled slow learner. This substantiates a notion by Wray (2011) that disabilities often trigger low self-esteem and feelings of being less able. Another shared testimony alleged the use of small font in the presentations, which forced the use of smart phones by some pre-service teachers to search for similar information from the internet. It would seem the facilitation strategies and technologies used were inappropriate for pre-service teachers with visual disabilities. According to Meyer et al. (2014), educators have to always reflect on projected instructional strategies and correlate these with students' diversities before lesson delivery.

Findings revealed instances where multiple representations, expressions and engagements were disregarded, an oversight which created most of the challenges experienced in the effective use of technologies, although others emanated from power outages, malfunctioning of technologies and unsuitable facilitation strategies.

5.2.3.5 Strategies that enhance technology mediated teaching and learning for students

The following discussions focus on strategies that can strengthen technology mediated teaching and learning for pre-service teachers with disabilities. Focus is on increasing variety in technologies, adaptations of infrastructure and monitoring usage, acquisition of technologies, capacitation of teacher educators and strengthening synergies with relevant stakeholders.

i) Increased diversity in technologies, infrastructural adaptations and robust monitoring

Findings have revealed need for the acquisition of additional technologies, which were either inadequate or non-existent, especially, those essential for pre-service teachers with specific disabilities. Although TechTrek (2003) affirms existence of mathematical software packages for students with visual disabilities, findings uncovered that unavailability of such provisions forced a blind pre-service teacher to withdraw from the course (see section 4.3.1.1.ii). Such provisions often equalise learning opportunities for students despite their disabilities (UNCRPD, 2012). Some conceptions indicated the need to reserve technologies for pre-service teachers with disabilities in existing resource rooms or provide a schedule when they can access these without competing with colleagues (see section 4.3.3.2.iv). Alternatively, a separate resource room could be set up for them. Although the strategies sound exclusionary or discriminatory, they can however increase the pre-service teachers' access and use of the

technologies. Another proposal was on setting up a committee that spearheads inclusive practices like identification and acquisition of essential technologies. Such initiatives could then increase the number of technologies, as well as promote timeous replacement of obsolete and dysfunctional technologies (Reiser, 2001). Xu (2018) asserts that strategies of this nature can make learning environments more accommodative to students with disabilities.

Closer monitoring has been deemed critical to help determine the extent to which technologies benefit pre-service teachers with disabilities (see section 4.3.3.2.iv). The study discovered that supervision and monitoring were prerogatives of the principal and heads of departments, but these processes needed to be strengthened. Romrell, Kidder and Wood (2019) affirm substitution, augmentation, modification and redefinition levels of SAMR as apposite monitoring benchmarks, which can also assist authorities in identifying skill gaps on facilitating use of technologies. From the reviewed literature, the responsible ministry had renewed commitment to monitor the use of technologies, which could perhaps compel the integration of monitoring strategies in both ministry and institutional policies (MHTEISTD, 2019). Findings also highlight the need for policy reviews or drafting new ones that capture input from students with disabilities and further include budget allocation for technology acquisition.

ii) Acquisition of technologies, teacher educator capacitation and strengthened synergies

Efficient and effective use of technologies in the preparation of pre-service teachers with disabilities require periodic purchasing of novel gadgets, updating of teacher educators knowledge and skills, as well liaison with stakeholder organisations and manufacturers of the various technologies. In that context, the study discovered wish for enhanced ministry support in the acquisition of technologies among the study participants. Nevertheless, reviewed literature highlighted the ministry's pledge to increase resource support in the learning of students with disabilities, as well as strengthening synergies with organisations that support persons with disabilities (see section 4.3.3.2.iv). Such initiatives are well positioned to increase access to information on newer and more specialised technologies, besides creating opportunities for staff capacitation. US-OET (2017) underscores the need for continuous capacity development of educators focused on enhancing their skills, which could perhaps target the use of particular technologies, identification of pre-service teacher with disabilities, as well as transforming perceptions and attitudes on the use of technologies. Timeous repair and maintenance of the technologies proved fundamental to reduce their

malfunctioning during lectures and these responsibilities could be assigned to specific personnel like the technicians.

5.3 Limitations to this Study

This study was conducted at one institution located in an urban area, and this could limit generalisability of findings to institutions in other geographic locations. However, involvement of more than one institution would also not yield homogeneous finding since these were semi-autonomous. The adopted single case design restricted the number of study participants which, however, did not compromise depth of the findings, since sampled participants provided data with significant trustworthiness, which was further strengthened by a raft of measures during data gathering processes.

To circumvent limited transferability, multiple data gathering tools and sources were used to obtain diverse perspectives that yielded findings that are transferable to similar contexts. In cognisance that few participants in case studies could be considered inadequately representative; the study prioritised multiple realities regarding the use of technologies rather than focus on the number of participants (Kumar, 2005). While Creswell (2013) concedes that about five participants are sufficient, sixteen were involved, to circumvent possible criticism. Their submissions yielded data with value that surpasses what a larger sample could have provided. Nevertheless, spreading the study to more institutions could have yielded broader and deeper knowledge on the study phenomena; hence, findings are largely applicable to this, and other institutions with similar settings. Future studies could perhaps involve institutions from dissimilar geographic locations, like peri-urban and rural settings.

5.4 Implications and Recommendations for Practice in Teacher Education and Policy

Findings have implications on practices in teacher education, capacity development for teacher educators, provision of technologies and possible focus for future studies.

5.4.1 Implications for practice in teacher education

Increased admission of students with disabilities in teacher education and other tertiary institutions of Zimbabwe only occurred recently since, previously, only 7% of these persons proceeded to higher education (NASCOH, 2013). This compelled adoption of technology mediated teaching and learning approaches, which most teacher educators had inadequate capacity to implement. Furthermore, students often have disabilities that are diverse in nature

and severity, which compels using technologies to promote befitting engagements, active participation and effective concept acquisition. Teacher educators also need further capacitation in detecting those affected, choice and use of befitting technologies, as well as appropriate facilitation strategies. Capacity development should also focus on modifying perceptions and attitudes on the use of technologies, so that teacher educators effectively respond to student diversities. Capacity development can be institutional or at national levels, where the latter covers all teacher education institutions. This can be through strengthened links and synergies with stakeholder organisations that can then assist in raising awareness on newer technologies and other inclusive practices.

Gathering information on students' disabilities requires systematic strategies as the information is critical for choice of facilitation strategies and technologies to use. Access to technologies by pre-service teacher with disabilities also needs enhancement, by either reserving technologies in existing resource centres or designating a resource centre, as well as acquisition of technologies particularised to those with specific disabilities. Alternatively, pre-service teacher with disabilities can have a schedule to access technologies in the resource centres without competing with able-bodied colleagues. These initiatives might then influence the extent to which technologies are integrated, besides reducing the challenges encountered in learning engagements by pre-service teachers with various disabilities.

5.4.2 Implications and recommendations for policy

Both the ministry and institution need explicit policy on technology mediated teaching and learning. Besides creating new policies, those already in existence could be reviewed so that they capture aspects on the use of technologies. Such processes also need to capture input from pre-service teacher with disabilities so that policies provide effective guidance on ways to accommodate with various diversities. This would then yield robust policies that strengthen inclusiveness, mandate budget allocations for the acquisition of technologies, as well as compel teacher educators to integrate technologies in their facilitation.

5.4.3 Implications and recommendations for future research

This qualitative single case study examined influence of technology mediated teaching and learning on the preparation of pre-service teachers with disabilities, whose findings largely apply to the specific study context. Future studies can be extended to institutions in different

settings for optimum relevance and applicability of findings. Universal Design for learning was used as theoretical framework, whilst SAMR served as conceptual framework for this study. The two helped establish the influence of technology mediated teaching and learning on preparation of pre-service teachers with physical, hearing and visual disabilities. These frameworks proved ideal when focusing on students with the cited disabilities, which makes them well positioned for future studies targeting those with other disabilities. Dialogical interactions helped to gather data from sampled teacher educators, pre-service teachers with disabilities and the principal, which was complemented with observations in lecture sessions. Future studies can perhaps include pre-service teachers with non-declared disabilities to obtain diverse insights from other participants in mainstreamed pedagogic contexts. Since this study focused on practices, facilitation and experiences of technology mediated teaching and learning only, future studies can include performance of pre-service teacher with disabilities based on continuous assessment. This study noted inadequate capacity development of teacher educators, as well as limited institutional support for technology mediated teaching and learning. Future studies could therefore examine effects of such anomalies on the implementation of this approach in preparing pre-service teachers with disabilities.

5.5 Contribution of this Study to the Body of Knowledge

The thesis contributes to knowledge on strategies, successes and challenges in the use of technologies in the preparation of pre-service teachers with disabilities. While practices in teacher education have embraced use of technologies, there is no empirical evidence of their influence on preparation of pre-service teachers with physical, visual and hearing disabilities in Zimbabwe. Findings have revealed that effective learning of these pre-service teachers takes place within contexts that embrace multiple representations, expressions and actions where appropriate technologies are used from substitution, augmentation up to the redefinition stage of SAMR. Technologies make teaching and learning more effective and efficient for pre-service teacher with disabilities since they provide support in researching for more information, compiling assigned tasks, engaging in discussions and faster access to feedback. Using technologies therefore transforms the pre-service teachers' disabilities into learning differences and enables them to effectively share ideas, knowledge, and perceptions. These pre-service teachers can also participate actively in activities like researching and presenting feedback on assessed tasks. In instances where there is lack of home-grown policy

frameworks on inclusive practices, the practice of teacher educators can alternatively be guided by global enunciations like the UNCRPD, Salamanca Statement and Plan of Action or SDGs, to cite a few. I have also noted that existing theories like UDL and SAMR can assist in making pedagogic contexts more conducive to and effective for pre-service teachers with disabilities. Where vital technologies are non-existent or inadequate, both teacher educators and pre-service teacher can collaboratively improvise, if they perceive value in the use of technologies. Furthermore, technology mediated teaching and learning has significant influence on the preparation of pre-service teachers with disabilities, but needs support from related researches and policy reviews at both ministry and institutional levels.

5.6 Summary of the Study

This study was critical in view of the upsurge in enrolment of students with diverse disabilities in teacher education that also pursue similar syllabi with colleagues in mainstreamed contexts. Disabilities often impede learning, which necessitates the use of appropriate technologies. Furthermore, job opportunities have become scarce such that employers prefer those exposed to various technologies as conviction is that they have better competences (Zehner, Chen & Aladsani, 2017; Fovet & Mole, 2013). This is critical for Zimbabwe and other developing nations, which Mugumbate and Nyoni (2013) affirm to have 75% of persons with disabilities. However, NASCOH (2013) alleges that only 7% of persons with disabilities progress to tertiary level like teacher education in Zimbabwe. This makes it fundamental to increase chances of students with disabilities to compete for limited job opportunities through integration of technologies in their learning processes. Mtetwa (2011) attributes most obstructions in their learning to societal and institutional failures to provide essential provisions that ameliorate the effects of disabilities on learning processes. In view of the foregoing, Jairos Jiri Association (2013) urges authorities to avail provisions that address exclusionary tendencies in education set-ups, while Xu (2018) asserts that educators should use technologies to transform teaching and learning contexts into more inclusive set-ups. For instance, this study noted that pre-service teachers sought to counteract learning challenges induced by specific disabilities through using personal technologies. However, if the use of technologies or other resources is not well monitored, it can be a major impediment to learning. Thompson (2017) cites a case in Tanzania where ineffective monitoring resulted in diversion of resources designated to support learning processes for students with disabilities. Robust implementation and monitoring frameworks are therefore fundamental, since these have significant influence on facilitation strategies and the extent to which pre-service

teachers with disabilities benefit from using technologies. Effective monitoring frameworks are therefore critical inclusions in both ministry and institutional policies.

Adoption of UDL and SAMR as theoretical and conceptual frameworks, respectively, helped to interpret and comprehend processes in facilitating the use of technologies to yield more inclusive pedagogic contexts for pre-service teachers with disabilities. This study noted that technologies enhanced teaching and learning for pre-service teacher with impending disabilities, as espoused by Bekteshi (2015). To help explore and comprehend significance ascribed to the use of technologies; this study adopted a qualitative approach as recommended by Ritchie and Lewis (2009). This approach helped to examine the study phenomena in its naturalistic contexts and further gave recognition to contributions from the researched (Creswell & Creswell, 2018). Adoption of the qualitative approach enabled this single case study to obtain highly dependable comprehensive data on intricacies of the research problem through focus group discussions, interviews and observations. Thus, multiple data sources and instruments helped to obtain wider perspectives from day to day experiences of significant actors in teacher education. These comprised the principal, pre-service teachers and teacher educators. Dependability in the data narratives was premised on behaviours and actions in technology mediated teaching and learning practices that involved pre-service teachers with disabilities.

This study explored practices, facilitation and experiences of technology mediated teaching and learning in the preparation of pre-service teachers with disabilities, whose findings revealed varied successes in mainstreamed learning contexts with over four hundred pre-service teachers. Teacher educators evidently strived to embrace UDL by facilitating the use of technologies that benefit pre-service teachers with disabilities. Nevertheless, predominant focus was on pre-service teacher with physical disabilities, whilst those with hearing, mild visual and other obscure impairments received minimal attention. The latter group of pre-service teacher used own technologies and sought strategic sitting positions to enhance learning during lectures. Nevertheless, those detected by alert teacher educators or disclosed their disabilities received special accommodations like notes in accessible format and designated sitting positions for better view and audibility of presentations. They also received notes in electronic copy, which they uploaded into personal laptops or converted to Braille format before lecture sessions. Such practice demonstrated multiple content representations in which learning material was provided in customised format. Nevertheless, technologies

were predominantly used at substitution and augmentation levels, while cases of modification and redefinition stages were limited. This was exacerbated by the fact that the teacher educators could not project the levels of technology use based on students' personal technologies. Although they augmented institutional efforts by using own technologies, this did not yield optimum benefit for pre-service teacher with disabilities. Furthermore, some technology-based presentations were inadequately audible or visible to pre-service teachers with hearing and visual disabilities, respectively, while others with physical disabilities could not use technologies mounted on the stage since access was only through climbing steps. Although in their facilitation, teacher educators frequently shifted positions to verify visibility and audibility of screened material, this did not adequately accommodate pre-service teacher with various disabilities. Input on choice of technologies used in lecture sessions by pre-service teachers with disabilities was minimal, and this deprived them of chances to suggest essential technologies for their specific disabilities. The few involved in setting up technologies or operating them were mostly without disabilities. Such exclusionary practices deprived pre-service teacher with disabilities opportunity to practice using technologies before teaching practice. A pre-service teacher with missing hands confessed inability to operate the projector at onset of teaching practice, yet it was critical for lesson delivery. Nevertheless, other pre-service teacher with disabilities supported their learning by using either standard or adapted technologies. Of note is the pre-service teacher without hands who punched laptop keys with toes, others used smart phones to capture notes, while another one aided her reading with a magnifying glass. The study established that use of technologies was critical in the learning of pre-service teachers with disabilities. However, success was influenced by perceptions and attitudes of individual teacher educators, as well as availability of the technologies. This study noted the need for supporting frameworks, capacitation of teacher educators and acquisition of technologies that enhance learning for pre-service teachers affected by specific disabilities.

5.7 Conclusions from this Study

This study sought to explore how technology mediated teaching and learning influences preparation of pre-service teachers with disabilities. The research was based on experiential reflections of a principal, teacher educators and pre-service teachers. Comparison between SAMR, the study's conceptual framework, and findings reveal immense benefits for pre-service teachers with visual, hearing and physical disabilities when technologies are used in

pedagogic processes. Such benefits include enhanced participation in learning tasks, enhanced grasping of concepts, as well as motivation to learn, all which reduce feelings of being less able (Wray, 2011). Correlating the findings with the UDL theoretical framework affirmed the integration of technologies as fundamental in the preparation of pre-service teachers with disabilities in mainstreamed contexts. Use of the techno-scientific technologies facilitated multiple means of representation, expression and engagement to strengthen the learning for pre-service teachers with disabilities, since execution of learning tasks became easier and more efficient. Technologies also supported varied and clearer presentations that enhanced knowledge acquisition (Duffy & Bryan, 2014; O'Connell et al., 2010). Teacher educators frequently facilitated technology mediated teaching and learning through various strategies, as they sought to create better learning contexts for pre-service teachers with disabilities. Although the teacher educators encountered various challenges in implementing technology mediated teaching and learning, this approach was premised on these motives:

- i) To compensate functions of impaired limbs and senses that impede learning (O'Connell et al., 2010)
- ii) To make teaching and learning more effective, motivational and inclusive (Rose & Meyer, 2002).
- iii) To promote student centeredness, accommodate diversity and autonomy in learning processes (Xu, 2018).

Challenges in technology mediated teaching and learning included a lack of resources, inappropriate infrastructure and inadequate capacitation of teacher educators in the use of technologies that benefit pre-service teachers with disabilities with disabilities. These were obstacles to effective and successful implementation of technology mediated teaching and learning, which necessitates continuous capacity development of teacher educators to nurture positive attitudes and perceptions related to using technologies. It is also critical for the responsible ministry and institution to create policies that promote acquisition and use of appropriate technologies to support learning for pre-service teachers with disabilities with disabilities. Availability of supportive policies and essential technologies helps to foster positive attitudes in both teacher educators and pre-service teachers, which inspires them to improvise when necessary to enhance the use of technologies. There is an avalanche of inclusive practices in the preparation of pre-service teachers with disabilities that include use of technologies, and these often counteract impediments to skills and knowledge acquisition that emanate from effects of disabilities.

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LIST OF APPENDICES

Appendix A: Turnitin report

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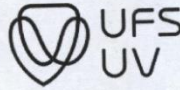
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Appendix B: Ethics clearance approval

UNIVERSITY OF THE
FREE STATE
UNIVERSITEIT VAN DIE
VRYSTAAT
YUNIVESITHI YA
FREISTATA



GENERAL/HUMAN RESEARCH ETHICS COMMITTEE (GHREC)

18-Feb-2020

Dear Mr Manyinyire, Fanuel F

Application Approved

Research Project Title:

Influence of technology mediated teaching and learning on the preparation of pre-service teachers with disabilities

Ethical Clearance number:

UFS-HSD2019/2006/1702

We are pleased to inform you that your application for ethical clearance has been approved. Your ethical clearance is valid for twelve (12) months from the date of issue. We request that any changes that may take place during the course of your study/research project be submitted to the ethics office to ensure ethical transparency. Furthermore, you are requested to submit the final report of your study/research project to the ethics office. Should you require more time to complete this research, please apply for an extension. Thank you for submitting your proposal for ethical clearance; we wish you the best of luck and success with your research.

Yours sincerely

Prof Derek Litthauer

Chairperson: General/Human Research Ethics Committee

Digitally signed by
Derek Litthauer
Date: 2020.02.18
20:47:09 +02'00'

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Bloemfontein 9300
Tel: 051 401 9398 /
7619 / 3682
RIMS@UFS.ac.za
www.ufs.ac.za



Appendix C: Editor's Note

HUMAN RESOURCES RESEARCH CENTRE

Human Resources Research Centre
□ P.O. Box MP167, Mount Pleasant, Harare,
Zimbabwe
□ (263) 772241953
□ E-mail: gamatw@gmail.com



FACULTY OF EDUCATION

UNIVERSITY OF ZIMBABWE

24 June 2023

To whom it may concern

This serves to certify that PhD thesis titled: **Influence of technology mediated teaching and learning in the preparation of pre-service teachers with disabilities**, by Fanuel Manyinyire, was edited by an experienced editor/proofreader. I have edited the document and advised the candidate to effect various changes including the mechanics of language, technical editing, general formatting, and referencing style.

I am of the view that the content of the document is of generally accepted academic standards.

Thank you.

A handwritten signature in black ink, appearing to read 'T.W. Gama'.

T.W. Gama
(Editor)

Appendix D: Ministry letter of permission to research at the institution

All official communications should be addressed to:
"The Secretary for Higher & Tertiary Education
Telephones: 795891-5, 796441-9, 730055-9
Fax Numbers: 792109, 728730, 703957
E-mail: thesecretary@mhet.ac.zw



Reference:

MINISTRY OF HIGHER AND TERTIARY
EDUCATION, SCIENCE AND
TECHNOLOGY DEVELOPMENT
P. BAG CY 7732
CAUSEWAY

04 November 2019

Mr F. Manyinyire
Belevedere Technical Teachers College
Mutare

Mr Manyinyire,

REQUEST FOR AUTHORITY TO CARRY OUT RESEARCH ON "INFLUENCE OF TECHNOLOGY MEDIATED TEACHING AND LEARNING ON THE PREPARATION OF PRE-SERVICE TEACHERS WITH DISABILITIES": MINISTRY OF HIGHER AND TERTIARY EDUCATION, SCIENCE AND TECHNOLOGY DEVELOPMENT

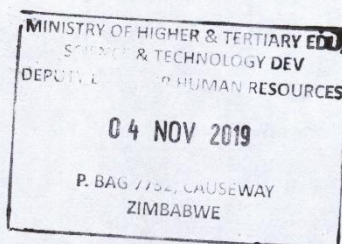
Reference is made to your letter in which you requested for permission to carry out a research on **"INFLUENCE OF TECHNOLOGY MEDIATED TEACHING AND LEARNING ON THE PREPARATION OF PRE-SERVICE TEACHERS WITH DISABILITIES": MINISTRY OF HIGHER AND TERTIARY EDUCATION, SCIENCE AND TECHNOLOGY DEVELOPMENT.**

Accordingly, please be advised that the Head of Ministry has granted you permission to carry out the research.

It is hoped that your research will benefit the Ministry and it would be appreciated if you could supply the office of the Permanent Secretary with a final copy of your study, as the findings would be relevant to the Ministry's strategic planning process.

A handwritten signature in blue ink, appearing to read 'S. Nhenjana'.

S. Nhenjana (Mr)
Deputy Director - Human Resources
FOR: PERMANENT SECRETARY



Appendix E: Principal letter of permission to research at the institution



BELVEDERE TECHNICAL TEACHERS' COLLEGE
MINISTRY OF HIGHER AND TERTIARY EDUCATION,
SCIENCE AND TECHNOLOGY DEVELOPMENT
1 Harvard Road, P.O Box BE100, Belvedere, Harare
Telephone: 263-4-778180/2/5/6
Fax: 778171
e-mail: belvederetehtc@gmail.com
www.bttc.ac.zw

16 November 2019

Mr. Manyinyire Fanuel
3312/3 Tsambatsi Street
Zengeza 2
P.O. Zengeza
Zengeza

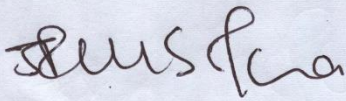
Mr. Manyinyire

PERMISSION TO CARRY OUT RESEARCH ON 'INFLUENCE OF TECHNOLOGY MEDIATED TEACHING AND LEARNING ON THE PREPARATION OF PRE-SERVICE TEACHERS WITH DISABILITIES.

Reference is made to your letter in which you requested for permission to carry out a research on "Influence of technology mediated teaching and learning on the preparation of pre-service teachers with disabilities". A case study of Belvedere Technical Teachers' College, as partial fulfilment of your studies.

Accordingly, please be advised that the administration at Belvedere Technical Teachers' College has granted you permission to carry out the research.

It is hoped that your research will benefit the institution and it would be appreciated if you could supply the office of the Principal with a final copy of your study, as the findings would be relevant to the institution's strategic planning purposes.


Mbofana J.R. (Ms.)
Principal

OFFICE OF THE PRINCIPAL
BELVEDERE TECHNICAL
TEACHERS' COLLEGE
18 NOV 2019
P.O. BOX 100, BELVEDERE
HARARE 04-778180/2/5/6

Spreading the Light

Appendix F: Information sheet for study participants

Date: 24 February 2020

Title of The Research Project: Influence of technology mediated teaching and learning on the preparation of pre-service teachers with disabilities

Researcher's Name and Contact Numbers:

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What Is The Aim Of The Study?

The aim of this study is to explore how technology mediation influences teaching and learning of pre-service teachers in teacher education. The intention is to establish how preparation of pre-service teachers with disabilities is influenced by practices, experiences, opinions and perceptions on technology mediation, by teacher educators and the affected pre-service teachers themselves.

Who Is Doing The Research?

My name is **Fanuel Manyinyire**, a PhD student in the Faculty of Education at the University of the Free State. This is a research for the doctoral thesis. The topic of the research is "Influence of technology mediated teaching and learning on the preparation of pre-service teachers with disabilities." I wish to invite twelve pre-service teachers, three teacher educators for Professional Studies and the principal, at one teacher education institution as participants in this study. I will engage pre-service teachers in focus group discussions, whilst the principal and teacher educators are interviewed, besides one lecture observation session for each teacher educator.

Has The Study Been Approved?

This study has been approved by the Ethics committee at UFS (**Number-UFS-HSD2019/2006/1702**), The Permanent Secretary in the Ministry of Higher and Tertiary Education, Innovation, Science and Technology Development and the Principal of the selected college. Copies of the approval letters can be obtained from the researcher.

Why Are You Invited To Take Part In This Research Project?

Students: Pre-service teachers with disabilities benefit directly or are affected when technology mediation is either used or not. Data from them is therefore, important in giving

lived experiences. Purposive and Snow ball sampling shall be used to select pre-service teachers with physical, visual and hearing disabilities.

Lecturers: Professional Studies, a generic subject for all pre-service teachers, avails higher chances to catch up with majority of pre-service teachers with disabilities in the sessions, which provide a wider pool for participant sampling. Teacher educators for Professional Studies largely groom pre-service teachers for classroom practice, hence, are better placed to create conducive environments for the learning of all students, e.g. through the use of technology mediated approaches.

Principal: The principal is the institution's sub-accounting officer who monitors policy implementation, supervises and sanctions resource procurement. The principal is therefore, well positioned to inform on aspects like how human interactions, resource availability and policy frameworks that influence technology mediation in teacher education.

What Is The Nature Of Participation In This Study?

Pre-service teachers will participate in Focus Group Discussions comprising six pre-service teachers each, for 1½ hours. Each teacher educator will be engaged in a one to one interview for one hour, besides having one of his or her lecture session observed. The principal will be interviewed for about one hour.

Can The Participant Withdraw From The Study?

Participation is voluntary, and there is no penalty for non-participation. Involvement in the study is voluntary and all participants are under no obligation to consent to participate. If a prospective participant decides to take part, he or she will be given this information sheet to keep and be asked to sign a written consent form. The students and teacher educators are free to withdraw at any time, without giving a reason. However, once the collected data has been used in compiling the research report it then becomes difficult for anyone to withdraw from the study.

What Are The Potential Benefits Of Taking Part In This Study?

There are no explicit material benefits or merits for participating in this study. However, participation provides pre-service teachers and teacher educators an opportunity to reflect on how technology mediation is being applied and how it can be improved for more efficient and effective teaching and learning for pre-service teachers with disabilities.

What Is The Anticipated Inconvenience Of Taking Part In This Study?

Participation of pre-service teachers in this study may inconvenience them, since they have to spare time to engage in research related tasks. These will be reduced by making prior arrangements that minimize disruptions to their academic engagements. The same also applies to teacher educators and the principal, so that their professional duties are not disturbed.

Will What I Say Be Kept Confidential?

The identities of pre-service teachers and teacher educators, including the institution remain confidential. These will not be recorded anywhere and no one will be able to connect any of the participants to the information they provide. Data responses will be assigned fictitious codes and pseudonyms that are then used in place of the real names in data information and the research report. The data gathered may only be handled by me or my research supervisor to safeguard confidentiality, as both of us shall strive to uphold high ethical and professional principles. The data responses may however, be reviewed by selected colleagues to ensure research is done properly, for instance, in cross-checking on the transcriptions. However, by then aspects that might give away anonymity will already be to ensure that data is used in compiling the research report is anonymous. The report will be compiled such that study is participants non-identifiable, unless a particular individual personally relates to some data when reading the report. However, in the case of Focus Group Discussions, I may not be able to guarantee confidentiality by all participants, hence, they will be urged to maintain confidentiality and avoid disclosing information deemed too personal and sensitive during discussions.

How Will Research Information Be Stored and Subsequently Destroyed?

Hard copies of data responses will be stored by the researcher for a period of up to five years in a locked cabinet. Data will be kept for such a period for reference and verification by authorized persons only. Electronic information will be stored on a password-protected computer, while hard copies of data responses and memos will be destroyed by shredding, before disposal at the lapse of five years.

Is There Payment Or Incentive For Participating In This Study?

No costs are anticipated to be incurred by the participants; therefore no remuneration should be expected for participation.

How Are Participants Informed Of Findings or Results Of The Study?

If you would like to be informed of the final research findings, please contact Manyinyire Fanuel on +263772422206 or fmanyinyire@gmail.com, fmanyinyire@yahoo.co.uk. Findings from this research are expected to be accessible by about January, 2022. Should you require further information or want to contact the researcher on any aspect of this study, please contact, fmanyinyire@gmail.com or Manyinyire +263772422206. Should you have concerns about the way the research has been conducted, you may contact the University of the Free State.

Thank you for taking time to read this information sheet and for participating in this study.



(Manyinyire Fanuel)

Appendix G: Consent form to participate in the study

CONSENT TO PARTICIPATE IN THIS STUDY

I, _____ (participant name), confirm that the person asking my consent to take part in this research has informed me about nature, procedure, potential benefits and anticipated inconvenience of participation.

I have read and understood the study as explained in the information sheet. I have also had sufficient opportunity to ask questions and am prepared to participate in the study. I understand that my participation is voluntary and that I am free to withdraw at any time without penalty. I am aware that findings of this study will be anonymously processed into a research report, journal publications or conference proceedings.

I agree to recording of the Interview, Focus Group Discussion/ Observation.

I have received a signed copy of the informed consent agreement.

Full name of participant: _____

Signature of participant: _____ Date: _____

Full name of researcher: _____

Signature of researcher: _____ Date: _____

Appendix H: Interview protocol for the principal

Assigned Code:..... **Date:**.....

Venue:..... **Time:**.....

(Prior to the interview session, the researcher will capture the following details: code assigned to interviewee, venue date & time)

Type of Interview: Face-to-face, one-on-one, to be held at convenience of the interviewee.

Title: Influence of technology-mediated teaching and learning on the preparation of pre-service teachers with disabilities

Instructions to interviewee

- 1. You are kindly asked to provide responses to the following questions.*
- 2. Please take note that the interview proceedings are going to be recorded and subsequently destroyed upon finalization of this research.*
- 3. You are required to sign on a form provided to show your consent before the interview begins.*

Main Research Question:

How does technology-mediated teaching and learning influence the preparation of pre-service teachers with disabilities?

Sub-question1

What are the inclusive practices in the preparation of pre-service teachers with disabilities?

1. When did the college enrol the first students with disabilities and what were the nature of the disabilities and gender?
2. What prompted this college to enrol students with disabilities?
3. Which institutional, national and global frameworks inform the institutions in the enrolment of students of students with disabilities?
4. How does the college promote inclusive education for students with these disabilities?
 - a. Physical disabilities
 - b. Visual disabilities
 - c. Hearing Impairments
5. What are some of the college's successes and challenges with regards to enrolment of students with disabilities?
6. How do lecturers know of the nature of disabilities for specific students?
7. Has enrolment of students with disabilities influenced the practice by lecturers? **(How?)**
8. Comment on the effects of informing or not informing lecturers on the nature of disabilities that newly enrolled students have? **(For example teaching methods, motivation).**

9. What does technology mediated teaching and learning mean to you?
10. What frameworks guide and support technology mediated teaching and learning for student teachers in general, then students with disabilities in particular, in this the college?
11. Which technology equipment has the institution procured to support learning for students with these disabilities?
a. physical impairments b. visual impairments c. hearing impairments
12. Which technology equipment do lecturers use with students with these disabilities?
a. physical impairments b. visual impairments c. hearing impairments
13. Which technology equipment do students with disabilities bring for themselves to support their own learning?
14. What mechanisms are in place to facilitate identification and procurement of needed technology gadgets for students with disabilities?

Sub-question 2

How do teacher educators facilitate technology-mediated teaching for pre-service teachers with disabilities?

15. How do you rate lecturers' competencies in using technology with students with **physical, visual and hearing** disabilities?
16. How does the college empower lecturers for the use technology gadgets in lectures?
17. What other methods does the administration use to support use technology gadgets for pre-service teachers with disabilities? (***Infrastructure, learning contexts, equipment, staff development***).
18. How can the selection and use technologies that are specific to student with disabilities be approached?
19. Do lecturers need to give special attention to technology mediated teaching and learning for students with disabilities? **Explain**
20. At what stage of session delivery do lecturers mostly apply technology mediation with students with disabilities? (***Introduction, session development, student activities, conclusion***).
21. Are there technology gadgets and software that the college procured in the past three years to support technology mediation for students with disabilities? (***Please state them***).

Sub-question 3

How do pre-service teachers with disabilities experience technology - mediated teaching and learning?

22. In what way does technology mediated teaching and learning support preparation of Student teachers with disabilities?

23. What influence does the presence of students with disabilities have on the lecturers' methods of delivery?

24. How can technology mediated teaching and learning for students with disabilities be improved?

25. Do you have any other information on technology mediated teaching and learning for student teachers with disabilities that you want to share?

Thank you for your time and contributions.

Appendix I: Interview protocol for teacher educators

Teacher educator's assigned code:.....Date:.....

Gender..... Venue:.....Time:.....

(Prior to the interview, the researcher will capture the following details: Code assigned to interviewee, venue, date & time)

Type of interview: Face-to-face, one-on-one, interview to be held after lecture session observation of the interviewee.

Research Title: Influence of technology-mediated teaching and learning on the preparation of pre-service teachers with disabilities

Instructions to interviewee

- 1. You are kindly asked to provide responses to the following questions.*
- 2. Please take note that the interview proceedings are going to be recorded and subsequently destroyed upon finalization of this research.*
- 3. You are required to sign on a form provided, to show your consent before the interview begins.*

Main research question:

How does technology-mediated teaching and learning influence the preparation of pre-service teachers with disabilities?

Sub-Question1

What are the inclusive practices in the preparation of pre-service teachers with disabilities?

1. What do you think about enrolment of students with disabilities in teachers' colleges?
2. Upon joining teacher education, did you expect to deal with students with disabilities?
3. When was the first batch of students with disabilities enrolled at this college?
4. What is the nature of disabilities that students have and how many are they?
5. How are you as an individual promoting inclusivity for student teachers with disabilities?
6. How does the college make lecturers aware of new students that have disabilities?
7. Comment on the practice of being informed or not informed of new students with disabilities?

(For example teaching methods, motivation). 3

8. What is your understanding of technology mediated teaching and learning?
- 9 .Cite critical technology gadgets for teaching and learning for students with disabilities?
a. physical impairments b. visual impairments c. hearing impairments
10. What technology equipment do you use to benefit students with specific disabilities?
11. How does use of such technologies influence your practice, when dealing with students with disabilities?
12. How do you rate the extent to which you apply technology with students with disabilities?
13. Who provides the technology gadgets that you use with students with disabilities?
(College/ students or both. Please state the gadgets).
14. Should there be technologies solely meant for students with disabilities during lecture sessions? **(Please explain your line of thinking).**
15. How does the college empower and encourage lecturer to apply technology mediation for students with disabilities?
16. How do you rate your capacity to use technology mediated approaches in lectures?
17. Comment on your willingness and enthusiasm to use technology mediation for with students with disabilities?
18. Comment on the capacity of lecturers in this college to use technology mediated teaching and learning approaches with students that have disabilities.
19. What support does the college administration give for technology mediated teaching and learning for students with disabilities? **(Modifying infrastructure, learning contexts, availing technology equipment, staff development).**
20. Which institutional factors influence your implementation of technology mediated teaching and learning? **(Administration, location of college, college culture, class size, session time).**
21. Which external factors tend to influence the preparation of pre-service teachers with disabilities? **(Policies, department of teacher education, politicians, parents, civic bodies, etc.).**
22. Which national and institutional frameworks guide the use of technology mediation for pre-service teachers with disabilities?
23. How would you rate your interactions with pre-service teachers with disabilities versus contemporary trends in education provisioning? **(Traditional, progressive methods, fusion of methods).**

Sub-question 2:

How do teacher educators facilitate technology-mediated teaching for pre-service teachers with disabilities?

24. Does enrolment of students with disabilities influence the way you teach? ***(How? Why not?)***
25. Explain how you apply technology mediated teaching and learning in lecture sessions to benefit students with disabilities?
26. At which stage of session delivery do you mostly use technology mediation for students with disabilities? ***(Introduction, session development, student activities, conclusion) (Give reasons).***
27. Explain your frequency in the use of technology mediated teaching and learning approaches with students with disabilities?
28. Has there been an instance where you were compelled to adjust your teaching approach to accommodate students with disabilities? ***(Please share the experience).***
29. What challenges do you experience when using technology with students with disabilities?
30. At what level do you use technology with students that have disabilities? (SAMR) ***(E.g. substituting usual ways of executing a task, making task execution faster, introducing newer features to task execution, enabling students to be innovative and think out of the box).***
31. How does technology facilitate redesigning of pedagogical contexts to enable the diversity of students to benefit (UDL)? ***(Please explain).***

Sub-question 3

How do pre-service teachers with disabilities experience technology - mediated teaching and learning?

32. Do students with disabilities need special technologies for effective learning? ***(Explain).***
33. Comment on selection, setting-up and use of technologies that specifically target students with disabilities?
34. How do you involve students in selecting and setting up mediation technology for students with disabilities?
35. During your tertiary level education did you have colleagues who had disabilities? ***(Describe the nature of disabilities that they had).***

36. Compare the way you deal with students with disabilities now, with how colleagues with disabilities were treated then, during your tertiary education?
37. Who chooses, sets-up and operates technology gadgets in sessions? (*Give reasons*)
38. Who do you think should select, set-up and operate technology used in sessions? (*Give reasons*)
39. What role and responsibilities do pre-service teachers with disabilities have in technology mediated teaching and learning which targets them?
40. How can technology mediated teaching and learning for students with disabilities be improved?
41. Do you have any other information concerning technology mediated teaching and learning for students with disabilities that you want to share?

Thank you for your time and contributions.

Appendix J: Focus group discussions protocol for pre-Service teachers

Codes for pre-service teachers involved:.....

Venue:.....**Date:**.....

Time:.....**Duration:**.....

(Prior to the FGD session, the researcher will capture the following details: Code assigned to participants, venue, date & time)

Research Title: Influence of technology-mediated teaching and learning on the preparation of pre-service teachers with disabilities

Instructions to -participant

- 1. You are kindly asked to make unreserved contributions in the discussions.*
- 2. Please take note that discussions are going to be recorded and recordings will be destroyed upon finalization of this research.*
- 3. You are required to sign a form provided to show your consent before discussions begin.*

Main Research Question:

How does technology-mediated teaching and learning influence the reparation of pre-service teachers with disabilities?

Sub-question 1

What are the inclusive practices in the preparation of pre-service teachers with disabilities?

1. Zimbabwe introduced Inclusive Education to accommodate students with disabilities. What do you think about this?
2. What motivated you and other colleagues with disabilities to enrol at the college?
3. How does teaching and learning at the college show support for inclusive education?
4. What disabilities are common among students at this institution?
5. How does the administration know about the nature of student disabilities?
6. How do lecturers know about the nature of student disabilities?
7. How does the college manage information on the nature and the number of students with disabilities? How does this affect teaching and learning e.g. technology use in lecture sessions?
8. Comment on the impact of informing or not informing lecturers about nature of student disabilities? *(For example teaching methods, motivation).*

9. What do you think about use of technology equipment by lecturers in lecture sessions?
10. How does use of technology affect the fulfilment of your expectations on joining college?
11. How does presence of other students with disabilities affect your learning, especially where technology is used?
12. Which technologies do lecturers use to support learning for students with these disabilities?
a. physical disabilities, b. visual impairments c. hearing impairments
13. Which other gadgets can lecturers use to support learning for students with these disabilities?
a. physical disabilities b. visual impairments c. hearing impairments
14. What successes and challenges do you realise by use of technology gadgets in your learning?
15. At what stage do you mostly experience use of technology gadgets in lecture sessions? (*Introduction, session development, student activities, conclusion*). **Give possible reasons.**
16. How often do lecturers use technology equipment that benefits students with disabilities?
17. What are the possible reasons for this frequency in use technology in lectures?
Low, Average, High
18. Do pre-service teachers with disabilities need special attention in processes of technology mediated teaching and learning? (**Give reasons**).
19. Comment on administration support for technology use in the learning of students with disabilities. (*E.g. modifying infrastructure, learning contexts, availing technology equipment, organizing staff development sessions*).

Sub-question 2

How do teacher educators facilitate technology - mediated teaching for pre-service teachers with disabilities?

20. Which policy documents guide enrolment of students with disabilities, Inclusive Education and use of technology use in the college?
21. Comment on your lecturers' capacity to use technology gadgets in lecture sessions.
22. Comment on selection, setting-up and operating of technologies in lecture sessions?

Sub-question 3

How do pre-service teachers with disabilities experience technology - mediated teaching and learning?

23. Comment on the way lecturers deal with students with disabilities in comparison to how they deal with colleagues without known disabilities in lecture sessions?
24. How have lecturers involved you in selecting or setting up and operating technology equipment in lecture sessions?
25. Comment on technology mediation and your grasp of concepts as students with disabilities.
26. Relive instances that you enjoyed/benefitted when technology was used in lectures.
27. Share instances in which technology was used but you did not enjoy or felt uninspired in the session.
28. How can use of technology to support learning for students with disabilities be improved?
29. Do you have anything else to share, regarding use of technology to support the learning of students with disabilities?

Appendix K: Observation guide protocol for lecture sessions

Nature of Observer: Non-participant

Number of Pre-Service Teachers in the Session.....

Codes of Pre-Service Teachers Involved

Date: **Time:** **Duration of Session:**

Title: Influence of technology-mediated teaching and learning on the preparation of pre-service teachers with disabilities

Main Research Question: *How does technology-mediated teaching and learning influence the preparation of pre-service teachers with disabilities?*

Sub-Research Questions:

- 1. What are the inclusive practices in the preparation of pre-service teachers with disabilities?*
- 2. How do teacher educators facilitate technology - mediated teaching for pre-service teachers with disabilities?*
- 3. How do pre-service teachers with disabilities experience technology - mediated teaching and learning?*

Observation Point

Description

Planning and preparation

Learning context (*conformity to UDL*
(*representation, action and expression*)

Sitting arrangement for students

Technology equipment availed.

Source materials

Original documents,

Pictures/drawings

Models,

Realia

Aims and objectives

Embrace & attainable for those with disabilities.

Sensitivity to students with disabilities.

Adaptations for inclusiveness

Varied representation, expression and engagement
(UDL).

Student settling down/readiness

Seating arrangement (UDL) for physical, visual
and hearing impairments

Orderliness (inclusiveness)

Setting up of technology equipment

Session introduction

Technology use:

Provision for UDL

Application(SAMR) for the *physical, visual & hearing impairments*.

Session progression

Inclusiveness

Participation by students with :

Physical impairment

Visual impairment

Hearing impairment

(Attentiveness, volunteerism for tasks).

Teaching/learning approaches (UDL)

Educator presentations

Questioning

Notes giving/taking

Whole group discussions

Pair/ group work

Individualized technology based tasks

Other approaches

Recall, narration, description

Reference books/ original documents.

Hand-outs/models/ Realia /pictures

(UDL for inclusiveness/Depth of technology use

(SAMR)

Session conclusion

Technologies used

Involvement of students with disabilities to assess accomplishment of objectives

Successes of technology mediation noted

Challenges of technology mediation noted

Overall observance of UDL

Overall observance of SAMR

Appendix L: Institution's call for applicants for pre-service teachers

RE
CEMBER 2020

BELVEDERE TECHNICAL TEACHERS COLLEGE
MINISTRY OF HIGHER AND TERTIARY EDUCATION,
SCIENCE AND TECHNOLOGY DEVELOPMENT
1 Harvard road, P.O. Box BE100, Belvedere, Harare
Telephone: 263-4-778180/2/5
www.bttc.ac.zw

Zimbabwe

DIPLOMA IN EDUCATION (SECONDARY) FEBRUARY 2021 INTAKE

GENERAL REQUIREMENTS:
O' LEVELS PASSES WITH GRADE 'C' OR BETTER, INCLUDING ENGLISH LANGUAGE, MATHEMATICS, SCIENCE AND THE SUBJECT OF STUDY.

PROGRAMME	ADDITIONAL REQUIREMENTS	DURATION
1 Post 'O' Level Science	A pass in 'O' Level Science/A pass in 'O' Level Integrated Science plus a pass in Biology/Physical Chemistry/Physical Science is an added advantage.	3 years
2 Physical Education and Sport	A pass in 'O' Level Integrated Science or Biology; Evidence of competitive participation in any sport is an added advantage.	3 years
3 Post 'O' Level Mathematics	A pass in 'O' Level Mathematics is a requirement.	3 years
4 Post 'O' Level Art and Design	A pass in 'O' Level Art or any design related subject is an added advantage.	3 years
5 Post 'O' Level Agriculture	A pass in 'A' Level Agriculture is an added advantage.	3 years
6 Building Technology and Design	'O' Level pass in Building Studies or NFC in Brick and Block laying.	3 years
7 Textile Technology and Design	'O' level passes in Fashion and Fabrics, or NFC related subject.	3 years
8 Computer Science	A pass in 'O' level Mathematics with grade B or better; NFC in IT, 'O' Level Computer Studies, is an added advantage.	3 years
9 Metal Technology and Design	'O' Level pass in Metalwork is an added advantage.	3 years
10 Technical Graphics and Design	'O' Level pass in T.G. is an added advantage.	3 years
11 Food Technology and Design	'O' Level passes in Food and Nutrition or NFC related subject OR equivalent is an added advantage.	3 years
12 Wood Technology and Design	'O' Level pass in Woodwork or NFC related subject.	3 years

FURTHER INFORMATION

- HOW TO APPLY: Download application form from the college website: <http://www.bttc.ac.zw> and pay \$200.00 upon submission of the form at college or obtain application form from Belvedere Technical Teachers' College Selections office upon payment of \$200.00 non-refundable application fee.
- People with disabilities are encouraged to apply.
- Do not send money through ordinary mail.
- Last day of submission of completed application forms is 31 December 2020.
- Only short-listed candidates will be invited for interviews.

NE: All communications should be addressed to:

The Principal
Attn: Admissions Committee
Belvedere Technical Teachers' College
P.O. Box BE100, Belvedere, Harare

Appendix M: Record of transcribed interview with the principal (Mbofayo)

Authority's Assigned pseudonym: Mbofayo

Date: 01 Feb. 2021

Venue: Principal's office

Time: 0900- 0945

Prior to the interview session, the researcher will capture the following details: Code assigned to interviewee, venue date & time)

Type of Interview: Face-to-face, one-on-one, to be held at the convenience of interviewee.

Title: Influence of technology-mediated teaching and learning on the preparation of pre-service teachers with disabilities

Instructions to Interviewee

- 1. You are kindly asked to provide responses to the following questions.*
- 2. Please take note that the interview proceedings are going to be recorded and subsequently destroyed upon finalization of this research.*
- 3. You are required to sign on a form provided to show your consent before the interview begins.*

Main Research Question:

How does technology-mediated teaching and learning influence the preparation of pre-service teachers with disabilities?

Sub-question1

What are the inclusive practices in the preparation of pre-service teachers with disabilities?

1. When did the college enroll the first students with disabilities and what was the nature of their disabilities?

A-Ah! (With a chuckle) I am not very sure. I came here in 2014, we had some then, I don't know when the first students with disabilities had been enrolled, but I remember we had some visual impaired students, yes students with physical disabilities, the hearing no , but the visual impaired I think we had two with visual impairment.

2. What prompted this college to enroll students with disabilities?

Firstly there was the national policy, which sort of implored institutions to give preference to students with disability, so that we do away with discrimination. That was the major drive, I think. Even when we advertise, we ended up stating categorically that preference would be given to those with disabilities

3. Which institutional, national and global frameworks inform the institutions in the enrolment of students with disabilities?

At global level there are lots of them. There is this eeeh, what you call it, I can't remember and that is directed actually at the national level. Policies at national level, there are there. But then at institutional level I think we were just picking directly from the global level and

national frameworks. At ministry level something has been coined through the ministry, but still needs to be solidified. There is a disability policy of some sort even nationally. That's what we use to guide us and also the issue of availability of resources and capability of those that will be teaching.

There have been efforts working NGOs like Leonard Cheshire. Some corporate bodies, independent companies they have come to advertise the gadgets we can use to assist those who will be handling the students with particular disabilities

4. How does the college promote inclusive education for students with these disabilities?

a. Physical disabilities

We have a number of platforms and ways of handling that e.g. First of all the infrastructure we have tried by all means that we don't disadvantage them e.g. setting up ramps around the college. Although we could do better than that. We still have a long way to go, to meet the global standards. We are still far behind but we have tried our best with the little resources we have putting ramps here and there. I have noted particularly when we go for assembly in the great hall those with physical disabilities, those on wheel chairs end at the back as they can't even proceed into the hall. Plans are under way to address that.

b. Visual disabilities

This has been a problem, one, the manpower itself, the lecturers need training, they need staff development, and there is need for serious staff development. Anyway we have recruited and managed to go through, but at some stage we could not proceed with some of the students because of that incapacity. We had to send away students, relocating them to other colleges who were in a position to handle those students.

c. Hearing Impairments

I think we have never taken someone with hearing impairment. But only those with partial we have, not the serious ones with complete hearing impairment, because we don't have the capability at the moment. Probably, there could be those that did not disclose, but I wonder how they would proceed if I don't know, because we need to buy equipment for them. I don't remember anyone coming forward with such information.

5. What are some of the college's successes and challenges with regards to enrolment of students with disabilities?

Well, successes yes, we have managed to enroll some Students. We have had an increase in the numbers because there was a deliberate effort to enroll the students. Even those with visual impairment, the physical yes. But then the challenges have had mainly related with the physical disabilities on the infrastructure, where students for instance, in the hostels students had to stay on the ground floor, the bathrooms were not suitable, yes we had to make changes here and there in order to suit what the students have. Their movement around the college, we had to address that again, because of the ramps as I mentioned earlier we did not have enough. The software for the visual impaired that was a problem and the issue of braille reading and the like, as well. We had to go out of our way in order to address that, to engage a number of people that could assist us. We ended up transferring one of the students, because of that incapacity, because we could not meet it there and there, we were delaying the progress of the student.

We have tried to, for gadgets like a young lady who is physically challenged, who used her toes for operating the computer, perhaps there could be software that would help her to do the things faster. For the visually impaired software like JAWS. What we found out those things are very expensive. We had to outsource borrow and do something like that, it has been a challenge

6. How do lecturers know of the nature of disabilities for specific students?

At enrolment stage the LIC are the ones who enroll the students. We have a process, they apply, and interviews are done by the lecturers themselves. As they do the final selection they become aware of which students have disabilities. There is deliberate effort to enroll such students after having assessed the extent of disability.

7. Has enrolment of students with disabilities influenced the practice by lecturers? (How?)

I am sure it has, both negatively and positively. I know I would get an outcry from some of them, like how can you enroll this one, yet you know we don't have the capability of handling such a student. With others it was most welcome because they were learning new things. They ended up learning braille, getting acquainted with the kind of atmosphere suitable for persons with disabilities. Looking at it nationally we are required to be able to interact in a positive manner with all persons whether they are disabled or not.

8. Comment on the effects of informing or not informing lecturers on the nature of disabilities that newly enrolled students have? (For example teaching methods, motivation).

If not informed it does affect the attitudes of the lecturers negatively, because it's a surprise you get in and you find, it is not business as usual. You need to deal with somebody and you are not even sure where to start. I have had such complaints, even in the staff meetings. We need a better way of communicating. The LICs may know, but the other lecturers don't know and therefore people will get angry you get in and find someone is visually impaired and they don't even know where to start. That has affected relations and even some students have even come back to say that the way they were being treated is not what they expected. I actually had one group, of first years from Chikurubi prisons who had enrolled and they went away because they felt we don't have enough facilities here. They actually wrote a report listing what they expected from an institution like this one. We have tried to address the simple ones that we could afford but the major ones we could not because of financial resources like the ramp. The others are infrastructurally difficult to implement in a short time, as it needs consulting relevant ministry departments like ministry of public works to come and change the plans. The buying of software has been difficult.

9. What does technology mediated teaching and learning mean to you?

Inclusion of ICT, use of the gadgets, the tools, the computer itself and the soft wares we were talking about, in order to get concepts to the disabled students.

10. What frameworks guide and support technology mediated teaching and learning for student teachers in general, then students with disabilities in particular, in this the college?

Covered earlier'

11. Which technology equipment has the institution procured to support learning for students with these disabilities?

a. physical impairments

We bought wheel chairs for one of the students, off course we have had laptops donations, soft wares installed on some computers.

b. visual impairments

We had the requisite software, off course we would at times share with the University of Zimbabwe, the software required by some of them, borrow from here and there in order for them to be able to proceed with their studies.

c. hearing impairments

As I have said earlier, I can't remember having one with hearing impairment.

12. Which technology equipment do lecturers use with students with these disabilities?

a. physical impairments

From what I seen, the students use it like everybody else

b. visual impairments

Borrowing of the software

c. hearing impairments

Covered earlier

13. Which technology equipment do students with disabilities bring for themselves to support their own learning?

Omitted

14. What mechanisms are in place to facilitate identification of needed teaching and learning technologies for students with disabilities, as well as facilitate procurement of such equipment?

The normal procedures which they do with other students, they identify the equipment, contact their subject head, go on to their LICs, who goes to submit to the HOD, who compiles a list. If it is urgent, they can come directly to us, so that we attend to that. The onus is on those who are directly involved to identify which specific ones needs to be bought, for them to be able to carry out their duties effectively.

Sub-question 2

How do teacher educators facilitate technology-mediated teaching for pre-service teachers with disabilities?

15. How do you rate lecturers' competencies in using technology mediated teaching and learning approaches with students with physical, visual and hearing disabilities?

That applies to technology in general as a whole. I am not quite pleased with the way they expose themselves, they show their knowledge. I think there is lack of knowledge on use, lack of use of the technologies we have, tendency is to resort to the old traditional ways of doing things. There has been a lot of insistence on our part as admin, to encourage them to make use of technology. Even the interactive boards which have been installed in the lecture rooms, we find the usage is very low. There are a few who have developed an interest and those are the ones who continuously use what is available.

16. How does the college empower lecturers for technology mediated approaches?

The workshops, we have had one or two workshops here and there. We have outsourced knowledgeable persons to come and workshop these, to give them more skills. We have attempted to do that.

17. How does the administration support technology mediated teaching and learning for pre-service teachers with disabilities? (Infrastructure, learning contexts, equipment, staff development).

Covered in earlier excerpts

18. How can the selection and use technologies that are specific to student with disabilities be approached?

Left out

19. Do lecturers need to give special attention to technology mediated teaching and learning for students with disabilities?

Left out

20. At what stage of session delivery do lecturers mostly apply technology mediation with students with disabilities? (Introduction, session development, student activities, conclusion).

I have noted that if someone is into it, if one is techno-savvy, they use it throughout, but if one is doubting it is the introduction, forgets about it midway and maybe towards the end come back to whatever technology they are using. In TOE they are using the power point, some of them, but the skill in using power point is lacking in that, you get the presentation crowded with a whole lot of things, yet that is not the purpose, its PowerPoint you are putting your points there, then explain, yet you find a person copying the whole book.

21. Are there technology gadgets and software that the college procured in the past three years to support technology mediation for students with disabilities? (Please state them).

Left out

Sub-question 3

How do pre-service teachers with disabilities experience technology - mediated teaching and learning?

22. In what way does technology mediated teaching and learning support the preparation of Student teachers with disabilities?

There isn't much of that, there is still a lot to be done. It's the traditional methods. There is still a lot to be done

23. What influence does the presence of students with disabilities have on the lecturers' methods of delivery?

Not answered

24. How can technology mediated teaching and learning for students with disabilities be improved?

Capacitating the members of staff, the lecturers, resources, identify what is needed for them to be able to go and present, mediate in the proper manner. Professional development along those lines. There is a lot of convincing which needs to be done on the usefulness of the technology. We have to work to change their perceptions and attitudes. That is the major

problem; people are not convinced that it works. Once they are convinced they will go and do it. The students themselves know a lot, they can assist you at the end of the day, if you expose them, initial exposure then you will get a lot from the students and even learn from them.

25. Do you have any other information on technology mediated teaching and learning for student teachers with disabilities that you want to share?

We are still lagging behind. With the advent of this Covid 19, we now need e-learning; we talk of Moodle but people don't want. There has to be an appreciation. Students are better than the lecturers, I think they do appreciate maybe we discourage the students from the way we look at it.

Appendix N: Transcription of the interview with Chimbadi (a teacher educator)

Assigned pseudonym: L3-Chimbadi

Experience: 29yrs. **Date:** 25 August 2020

Gender: Female **Venue:** D20

Time: 1043-1136 (53 mins).

Type of interview: Face-to-face, one-on-one, interview

Research Title: Influence of technology-mediated teaching and learning on the preparation of pre-service teachers with disabilities

Instructions to interviewee

- 1. You are kindly asked to provide responses to the following questions.*
- 2. Please take note that the interview proceedings are going to be recorded and subsequently destroyed upon finalization of this research.*
- 3. You are required to sign on a form provided to show your consent before the interview begins.*

Main research question:

How does technology-mediated teaching and learning influence the preparation of pre-service teachers with disabilities?

Sub-Question1

What are the inclusive practices in the preparation of pre-service teachers with disabilities?

1. What do you think about enrolment of students with disabilities in teachers' colleges?

It is quite a noble idea, because it gives opportunity to all potential candidates, regardless of whether they are living with disabilities or whether they are the so called normal able bodied. Enrolling these students fulfils that vision of inclusiveness in terms of disabilities

2. Upon joining teacher education, did you expect to deal with students with disabilities?

The only kind of disabilities that I had only envisioned regards albinos, because I had encountered learners with albinism in the schools. I did not expect other forms of disability on student teachers that I was going to teach.

3. When was the first batch of students with disabilities enrolled at this college?

I think from around the year 2000. I think they were just about 2 or 3. I remember they were 2 females, 1 male or 3. I think it was because it was the period when the policy on gender balance, increasing more female students than males, when the policy was being effected.

4. What is the nature of disabilities that students have and how many are they?

I have seen students that are physically disabled, either the hands, the legs, I have also seen blind students, and I can't say much of those with hearing impairments, because it is not obvious, those three categories ooh and albinism. Uuuh probably those that have visible disabilities are up to ten.

5. How are you promoting inclusivity for student teachers with disabilities?

Now that I am aware of that we have students with disabilities in my subject area, one of the aspects that I personally do and also encourage colleagues to do is to organize trips and activities that would not disadvantage those with disabilities, especially those with physical

disabilities. We look for an alternative so that they can just walk on flat ground. I am conscious now to find out before settling for a trip destination.

6. How does the college make lecturers aware of new students that have disabilities?

AAAAH! I am not sure about that, but I would say from the orientation workshops where we have whole college activities such as orientation to Health and Life Skills Education, that particular area, orientation to gender and orientation to Education for Sustainable Development ESD which specifies the need for Inclusive Education as well.

Aaaah! To tell the truth, aa-hm! Apart from just mentioning that we are all equal regardless, and that is an ESD principle, I haven't made any isolationist activity to isolate them or to identify them, just treat everyone equally during orientation.

7. Comment on the practice of being informed or not informed of new students with disabilities? (For example teaching methods, motivation). 3

It's actually probably a slight weakness in the college practice, because maybe from what I think from what I now know, perhaps the college should from the first assembly indicate that we have students with different needs. They should encourage that wherever possible any of those students that may need assistance if that could be offered so that everyone can offer assistance. Mention in the very first assembly that we have differences. If everybody attends assembly it means it's to benefit each and every one of us. Because if you are aware even the way you talk or comment about disability when you are aware you become more sensitive.

8. What is your understanding of technology mediated teaching and learning?

I am not very sure, but taking from the word mediation, I think we are talking about technological assistance that can be offered to the learners or students with disabilities.

9. Cite critical technology gadgets for teaching and learning for students with disabilities?

a). Physical impairments

Well, apart from their own wheel chairs, ramps to all learning places, I think even the type of chairs that they need should be considered because that would create an environment where they feel comfortable, I have noticed that some lecture rooms have high stools and yet they need lower to make them feel comfortable. For the physical, I am looking at those with difficulty in walking or have no limbs like arms and hands, Physical gadgets to assist them. Availability of computers to enable them to catch up with writing, I think it will be helpful to have recording gadgets, so that if they are unable to follow through the lecture they can play the audio recordings later at their own pace.,

b) Visual impairments

Audio recording gadgets would be very helpful, computers with keyboards not with a mouse only. Although I have not seen it in our college, braille facilities, I haven't seen that, would be helpful.

c) Hearing impairments

Although they usually have their own assistive devices for hearing, but I think I have not seen these in the college, gadgets that enhance sound i.e. sound amplifiers. For those with hearing impair if the sound can be enhanced they would benefit

10. What technology equipment do you use to benefit students with specific disabilities?

To tell the truth in my area we have not had students with visual impairment. The only gadget that I have used is beamers and laptops, where I can increase font size for those with sight impairment to see.

For those students that strain eyes to see, I have not used any specific gadgets. I ask them to come and sit closer to the board. I am inhibited by the lack of other gadgets. What I find important is to be able to identify such students, talk to them in such a manner that they feel that they are part of the group.

11. How does use of such technologies influence your practice, when dealing with students with disabilities?

It makes my practice become more humanistic and more sensitive. It makes me be particular about the way I plan for the lessons, taking the fact that I have students with disabilities.

12. How do you rate the extent to which you apply technology with students with disabilities?

It is medium. It takes a while sometimes to identify students that might actually need me to use those gadgets. When I finally identify them, the college may not have the gadgets that I need to use with the student teachers and finally if the gadget is there, I may not be aware that it exists or may not be able to use it.

13. Who provides the technology gadgets that you use with students with disabilities? (College/ students or both. Please state the gadgets).

So far it is the college that provides the beamer and audio gadgets. If I want to play a video, I use what the college provides. A-ah, I have not encountered a situation where students have provided their own.

14. Should there be technologies solely meant for students with disabilities during lecture sessions? (Please explain your line of thinking).

I think so. The fact that such students need those gadgets. It is essential, because of the differences in the disabilities, there is need to cater for those differences, it cannot be just one size fits all.

15. How does the college empower and encourage lecturers to apply technology mediation for students with disabilities?

There hasn't been any particular sessions where we can say we are being empowered to do that, but we have general encouragement on being able to use different types of educational technologies e.g. through the ICT sessions and training workshops, once in a while.

16. How do you rate your capacity to use technology mediated approaches in lectures?

I would put it at eeeeh, depending on the technologies, if it is to do with computers, beaming and so forth. I would say it is quite high. But if it is do with special or specialized gadgets like what I have heard about jaws or braille, I am very poor because I haven't been trained in the use of any of those. My capacity to use technology on the average I would put it at 50%.

17. Comment on your willingness and enthusiasm to use technology mediation for with students with disabilities?

I don't mind being trained in any of these, because I think that would also make me confident in assisting the students.

18. Comment on the capacity of lecturers in this college to use technology mediated teaching and learning approaches with students that have disabilities.

They are capable, but the capacity is still very low. I have seen lecturers with phones, but when it comes to setting up projectors quite a lot of lecturers are unable to even set up a projector for use.

This has definitely affected their use of technology. I would put the other lecturers' capacity to use technology between 10 to 20%.

19. What support does the college administration give for technology mediated teaching and learning for students with disabilities? (Modifying infrastructure, learning contexts, availing technology equipment, staff development).

It is limited support. I think enrolment was done before procurement of any of those gadgets and even after enrolment very little has been done apart the overhead projectors to have equipment.

The major modifications have included construction of ramps in most places of learning.

The issue about size of toilet doors, I think is still under discussion.

There have been some periodic workshops on Inclusive Education, workshops where the college has actually invited people who have special knowledge on different types of disabilities, to interact with and raise awareness among the lecturers.

The fact that in the SRC there is representation of students with disabilities.

20. Which institutional factors influence your implementation of technology mediated teaching and learning? (Administration, location of college, college culture, class size, session time).

The size of classes definitely, for example, a number of our students with physical disabilities are enrolled in the Computer Studies department, so the number of computers available to students would definitely affect.

21. Which external factors tend to influence the preparation of pre-service teachers with disabilities? (Policies, department of teacher education, politicians, parents, civic bodies, etc.)

It has to start with ministry regulations, policies on students with disabilities, whether there is a policy influencing practice in the institution and also the relationship between college and other institutions where we have disabled persons, for example relation between college and Jairosi Jiri high school and other rehabilitation centers. If there is more interaction between those institutions the rate of acceptance of persons with disabilities in our society becomes raised the awareness, level of acceptance and then our practice as well.

22. Which national and institutional frameworks guide the use of technology mediation for pre-service teachers with disabilities?

I do not know of any, except I have heard that there is, I am not sure whether it is in existence the policy on Inclusive Education which also incorporates disabilities.

23. How would you rate your interactions with pre-service teachers with disabilities versus contemporary trends in education provisioning? (Traditional, progressive methods, fusion of methods).

I am quite comfortable; I am not derailed from interacting with these students, once I am aware of them in the class and even asking some of them to be involved in setting up the gadgets because some of them might be even better than their able bodied counterparts.

Sub-question 2: *How do teacher educators facilitate technology-mediated teaching for pre-service teachers with disabilities?*

24. Does enrolment of students with disabilities influence the way you teach? (How? Why not?)

Apart from that extra sensitivity, once I am aware my practice is not influenced much, except to take caution on how to plan certain activities once I am aware.

25. Explain how you apply technology mediated teaching and learning in lecture sessions to benefit students with disabilities?

It has to start from my awareness of the nature of disability. The way I use technologies is dependent on the nature of disabilities.

26. At which stage of session delivery do you mostly use technology mediation for students with disabilities? (Introduction, session development, student activities, conclusion) (Give reasons).

Usually it is in the session development stage; this is where we have activities like pair work, group work and presentations using the beamer.

27. Explain your frequency in the use of technology mediated teaching and learning approaches with students with disabilities?

I can't isolate students with disabilities, the frequency is whenever I have a lecture, it means in each of the lecture sessions, once I am aware of the nature disabilities, then it is as frequent as the number of lectures that I conduct.

28. Has there been an instance where you were compelled to adjust your teaching approach to accommodate students with disabilities? (Please share the experience).

I have not come across that situation. It was only in a field trip when I was not aware and a student with physical disabilities walked a long distance when I could have shortened the distance by placing the student in a group that made a shorter tour or video recorded the episode.

29. What challenges do you experience when using technology with students with disabilities?

It is tricky; the only challenge is using gadgets that I have not been trained in. I have not experienced challenges of any nature so far.

30 At what level do you use technology with students that have disabilities? (SAMR) (E.g. substituting usual ways of executing a task, making task execution faster, introducing newer features to task execution, enabling students to be innovative and think out of the box).

N/A

31. How does technology facilitate redesigning of pedagogical contexts to enable the diversity of students to benefit (UDL)? (Please explain).

As long it is appropriate for the particular diverse range of disabilities it will definitely go a long way.

Sub-question3: How do pre-service teachers with disabilities experience technology - mediated teaching and learning?

32. Do students with disabilities need special technologies for effective learning? (Explain).

I think so, yes. If one has for example hearing impairments as an example the use of those sound amplifiers that is specialized equipment and it would benefit them more than one without that kind of disability.

33. Comment on selection, setting-up and use of technologies that specifically target students with disabilities?

Whilst it appears time consuming, the reason if there is shortage of such gadgets one has to spend a lot of time looking for freely available gadgets which you might have selected. If the gadget is a bit complicated for me I spend time looking for a technician to set it up. So, obviously it means preparation time becomes much longer than otherwise.

34. How do you involve students in selecting and setting up mediation technology for students with disabilities?

I involve students a lot, particularly in the setting up of the gadgets. Once I have selected and the gadget is available. I encourage students to take turns in setting up the gadgets so that they also gain experience, whether they have disabilities or not.

35. During your tertiary level education did you have colleagues who had disabilities? (Describe the nature of disabilities that they had).

No

36. Compare the way you deal with students with disabilities now, with how colleagues with disabilities were treated then, during your tertiary education?

N/A

37. Who chooses sets-up and operates technology gadgets in sessions? (Give reasons)

It's me, the lecturer, but the setting up that's where I said I facilitate for students to set up as well or colleagues who may be knowledgeable in the setting up.

38. Who do you think should select, set-up and operate technology used in sessions? (Give reasons)

The lecturers, because they know what content they want to deliver and they also have planned for the methods.

39. What role and responsibilities do pre-service teachers with disabilities have in technology mediated teaching and learning which targets them?

They need to be forthcoming and be prepared to learn with others and not to be taken as very special and isolated, but they should be willing to learn and to be taught.

40. How can technology mediated teaching and learning for students with disabilities be improved?

More practical sessions especially between the lecture and students as well peers to be involved, whether disabled or not.

41. Do you have any other information concerning technology mediated teaching and learning for students with disabilities that you want to share?

There are some gadgets that are not available, for example a case of a blind student who could not do Mathematics because there were no specialized gadgets to assist with mathematical formulae and so forth. If such a gadget would be found it would provide an opportunity for all.

Appendix O: Transcription of interview with Barakasi (a teacher educator)

Teacher educator's assigned pseudonym: L1-Barakasi **Date:** 09 -03 -2020

Qualification: Masters' degree

Gender: Male

Venue: D20

Time: 0900 -1000 (1hr)

Experience in teacher education: 10 years

Type of interview: Face-to-face, one-on-one, interview

Research Title: Influence of technology-mediated teaching and learning on the preparation of pre-service teachers with disabilities

Instructions to interviewee

1. You are kindly asked to provide responses to the following questions.
2. Please take note that the interview proceedings are going to be recorded and subsequently destroyed upon finalization of this research.
3. You are required to sign on a form provided to show your consent before the interview begins.

Main research question:

How does technology-mediated teaching and learning influence the preparation of pre-service teachers with disabilities?

Sub-Question1

What are inclusive practices in the preparation of pre-service teachers with disabilities?

1. What do you think about enrolment of students with disabilities in teachers' colleges?
AAAh I see there is a gap, because there was a rush by the ministry of higher and tertiary education and there was no preparedness and adequate planning on the enrolment of students with disabilities and other difficulties in tertiary education. You will realize that there are no preparations on their most needed tools; hence, colleges were not prepared for that. There is a policy yes, on inclusive education but adverse attitude added on inadequate resources that the implementation of this programme is far beyond the expected level. What was supposed to start is to have the material including the physical building infrastructure and then even the materials, including the training of the tutors for specific of tutors for specific difficulty areas. It is a very noble idea especially when you talk of inclusivity in both primary and secondary and especially that the constitution also allows and it's a right for those with difficulty to be enrolled in higher and tertiary education. The move is good and would request all the authorities responsible to ensure that they make the provisions necessary for the full enrolment of this disadvantaged sector so that they feel part and parcel of the normal process in higher and tertiary education. Right from the inception of the policy some five years ago.

2. Upon joining teacher education, did you expect to deal with students with disabilities?

Ye-e-e-s .You know... life is not fair, anybody can become disadvantaged at one point or another until death. So its part of life and it's a basic human right, so all should be planned as a condition anything can happen to anybody at any time.

3. When was the first batch of students with disabilities enrolled at this college?

I recall about 2013, 2014. It was with a few numbers of course, especially that in secondary schools there was no readiness to enrolling them. We only had history of the primary teachers' colleges like the specialist United College of Education. But in secondary schools up to now there is need for adjustment and improvisation for all facilities and infrastructure and the training of human resources to be able to enroll students with disabilities. Offhand can't recall but they were less than five. No- no there was no gender balance, but it tilted more towards the males.

4. What is the nature of disabilities that students have and how many are they? We have those with difficulty in seeing- visual and physical disabilities those without limbs others cannot walk, they use wheel chairs. A-a-ah I recall one who had some hearing aids but not that he was totally not hearing. It was only some difficulty. He had one side and would use a recorder maybe to say he would be able to listen later. I had several .After raising a point you pick on a participant who cannot repeat what you said. You inquire and he or she says "I did not hear". You ask another question and the same person says again I did not hear you clearly.it is at a low rate. Then after some are reluctant to open up. One female student, mature one had problems with hearing problems sat at the back and had to coerce her to come and sit in the front. She resisted at first but later complied and she was also assisted by the fact that I use technology in my lessons. And other media. Students are at times afraid of stigmatization. So far I have not seen any improvised measures for these students .There are no other special preparations for them and no one in the college has been trained in the use of such specialized equipment. Students have been bringing their own gadgets like computers. They use to write notes, examinations etc. Educators are not much conversant with these technologies as they are owned by students.

5. How are you as an individual promoting inclusivity for student teachers with disabilities?

Naturally I am a human rights activist. I am the voice of the people in several matters. I sit on several boards that promote accessible, quality free education, I am a member of quality education in higher education. I lobby with others for higher education to adjust the curriculum. I am a member of the board on quality education in higher education. I am one person eager to ensure inclusivity and making efforts to ensure even curriculum is adjusted to include terms that are neutral to gender, disability and that all should use such terms and prepare their teaching and learning instruction such that all disadvantaged are included. I always inquire before my lecture, the group size because they vary from intake to intake. The idea is to make a relevant plan and modus operandi for a particular group. For a larger group you would require to make handouts earlier, whether abridged version or full handout. I actually identify those individuals with special difficulties and try to find a way to assist them. Those that need something recorded, of cause we will have problems, like we had some guys who needed soft copies to convert into voice before the lecture session, because their

computers had that facility, so I give a copy before the lecture so that they will be able to follow as you make your presentation. I use large print for those with problems with vision, appropriate language, and suitable instructions. I inquire before the session to know the size of group in order to make a relevant plan. If group is large, I prepare handouts, even abridged version and soft copies to feed into particular students' laptops for conversion from word to voice, I prepare large print for those with visual impairments. I adopt a relevant *modus operandi*. I identify individuals with special needs and prepare for these accordingly.

6. How does the college make lecturers aware of new students that have disabilities?

That is a raw deal in this institution. I advocated for a standing committee to spearhead issues of disability. There is no adequate representation for such students. Only the student affairs run by the dean of students has information, but does not cascade this information to subject areas. I belong to a mass lecture subject, you only realize that there is one with disabilities when you are about to teach. There is a gap in ways of informing staff when students with disabilities have been enrolled. Some tutors even spend the whole year without knowing of the existence of such students, hence there are no special provisions for them, even in the examinations, there are no specialist materials or preparation for them.

7. Comment on the practice of being informed or not informed of new students with disabilities? **(For example teaching methods, motivation). 3**

I think it is because of attitude the admin and other relevant staff are not readily prepared to take on board the Inclusive Education to cater for the needy students. If there is a standing committee such members will be involved from advertising, interviewing for such members to have are already disadvantaged and cannot be treated as normal so they need special interviews. There is need for them to communicate when they advertise for the new intake, they should also be special considerations during the interviewing processes and for accommodation.

8. What is your understanding of technology mediated teaching and learning?

Delivery of curriculum and instructions using all available information communication technologies. We are living in a world of technology and there are various gadgets that can be used to deliver instructions. In fact they actually aid faster delivery of content to students. Each specific sector of students with disabilities has particularized and specific aids that are computerized. Those with hearing challenges have computers that convert from word to voice and there is braille. If you use these gadgets you will be able to include them in various ways and prepare for them accordingly.

9. Cite critical technology gadgets for teaching and learning for students with disabilities?

a. physical impairments

Computers that are custom made, speakers for voice to improve audio, projectors, printing out material, handouts,

b. visual impairments

Braille printers, large print, use of Realia, interactive teaching methods like fieldwork and resource persons

c. hearing impairments

Speakers to aid hearing, hearing aids, computers that convert from word to voice for specific individuals.

10. What technology equipment do you use to benefit students with specific disabilities?

Due to inadequate resource, I only use the overhead projector, laptop, printing facilities, speakers in the great hall are not functional, interactive boards.

11. How does use of such technologies influence your practice, when dealing with students with disabilities?

You are able to deliver curriculum instruction specified to the individual and you adopt specific delivery to particular individuals and you prepare consciously. I am motivated to be inclusive in my practice and get more connected to individual students, such that you want to learn more about a particular challenge and want to advise others on how to handle affected students.

12. How do you rate the extent to which you apply technology with students with disabilities?

With the concerns that I have towards students with disabilities, use of technology is still low. We need to move up to a higher level, so that we are able to include all students with all kinds of difficulties. We need to acquire more resources and adjust technologically to what is currently on demand.

13. Who provides the technology gadgets that you use with students with disabilities? **(College/ students or both. Please state the gadgets).**

That is a challenge, and I may say, the college admin and the other persons have got a negative attitude towards that. I have always had challenges in finding the necessary tools for the job. Even those that acquire resources at the college have lack of priority towards specialized tools. When you request for such specialized equipment and technologies they think you want to use them for your personal benefit, yet you want to use them for the benefit of students that they enrolled themselves. This has been the norm 'Stan' had his own computer and nobody could operate it, because it was his personal gadget, Lecturers are using their own laptops and the college is not making any effort to acquire any laptops or specialized laptops for the disadvantaged. There is no one laptop or any technologically focused specialized equipment for those students with difficulties.

14. Should there be technologies solely meant for students with disabilities during lecture sessions? **(Please explain your line of thinking).**

That is very obvious, because every student with difficulty has got a specific requirement and would need a specialized techno-based gadget for him or her use personally, because sharing would disadvantage the student and we need to focus the same towards providing such technologies even to the instructors and the instructors should be trained or work shopped to teach with such specialized gadgets and be able to prepare relevant material for the particular student. They would be able even to counsel and not wait for college counsellors. You should be able to counsel at every stage. So there is need to focus and spare more resources for an Inclusive Education center in this college That is why most lecturers are referred to United College of Education or the Disability Resource Center at the University of Zimbabwe, But you see, those institutions were established long back, such that the technologies there, are redundant and need to be replaced with more modern technologies.

15. How does the college empower and encourage lecturer to apply technology mediation for students with disabilities?

The truth is there has never been any effort, for the reasons I still go back to the issue of negative attitudes. There have been workshops to do with Inclusive Education, like I have mentioned before, I sit I some of boards were inclusive education is their core business and colleges are invited to capacity building workshops were ministry directors are invited, I have seen very few college principals or members from the colleges coming to these workshops. I think it's because of attitudes.

16. How do you rate your capacity to use technology mediated approaches in lectures?

It is fair, though I have potential to excel and if work shopped I can present anything at any time, given induction to any model, because I am computer literate and I am keen to know.

17. Comment on your willingness and enthusiasm to use technology mediation for students with disabilities?

I am very willing and eager to use technologies all sorts, at any time and even extent my free time to continue with such people, because I am part of that category of persons with disabilities.

18. Comment on the capacity of lecturers in this college to use technology mediated teaching and learning approaches with students that have disabilities.

Whereas, they may have the potential knowledge to use these technologies, I have realized and we have always commented that most of our staff are not motivated to use such technologies. They just take work as work and are ignorant of what is happening on the ground. Most of them don't even make effort to prepare specialized curriculum and instruction for students with difficulties. The lecturers must be self-motivated, as they are in the managerial level. They would require continuous staff development and awareness on the importance in the use of technologies. Some belong to departments where Educational Media Technologies are taught but they refrain from using the gadgets. They have the gadgets but they don't use them.

19. What support does the college administration give for technology mediated teaching and learning for students with disabilities? **(Modifying infrastructure, learning contexts, availing technology equipment, staff development).**

There is very little support. Though as we try to liaise with them, They acquired OHP, though there is a gap, we still request them to acquire for us other specified technological modems like the braille, brailed computer, braille printers and have overheard speakers in main lecture rooms to aid on those with hearing impairment.

20. Which institutional factors influence your implementation of technology mediated teaching and learning? *(Administration, location of college, college culture, class size, session time).*

The issue of large class sizes which are too big, you won't be able to identify students with disabilities easily, especially that you are not informed of the specific individuals with difficulties. And the lack of adequate time for lectures bar tutoring time. We have a congested timetable, such that having the students on one to one will be difficult, unless you have them off hours which again will have challenges.

21. Which external factors tend to influence the preparation of pre-service teachers with disabilities? (*Policies, department of teacher education, politicians, parents, civic bodies, etc.*).

The Inclusive education policy in the ministry of higher education was rushed on, before the ministry and other stakeholders were readily prepared to implement such a challenging program. At ministerial level we would request them to have lecturers and specified tutors be trained for the various forms of disabilities. The institutions themselves should develop infrastructure that is quality and relevant to the specific needs of the various groups of people living with disabilities. The acquisition of resources, I think a big budget should be allocated to acquire modems that should be used for students with disabilities so that every institution has got such facilities and equipment specialized for students with disabilities and even have their own specific rooms, where such gadgets could safely be stored and they can access them at any time when they need them.

There are various boards and organizations that are concerned with provision of quality inclusive basic education in higher & tertiary education. There are many civic bodies that have been assisting ministries of education and the parents themselves have been meeting all the expenses for their learners with disabilities at all levels, including the church and other community members, they have also been chipping in more than the government itself.

Examples of civic bodies that have been assisting are: Jairoso Jiri Association, Education Coalition Zimbabwe (ECOZ), Female Students Network (FSN), Forum for African Women Educators Zimbabwe (FAWEZI), Catholic Church and the Ministry of Higher Education itself.

22. Which national and institutional frameworks guide the use of technology mediation for pre-service teachers with disabilities?

The Constitution of Zimbabwe section 20 of 2013, has a specific clause on students with disabilities and then we have the Millennium Development Goals (MDGs) I can't specify which goals but there are those that talk of Quality Education and Inclusive Education, The Sustainable Development Goals (SDGs), the Inclusive Education policy in the Ministry of Higher and Tertiary Education, it is said to be there, but its full implementation is questionable. I am told there is a certain policy, I have tried to get a copy of it, but never managed.

23. How would you rate your interactions with pre-service teachers with disabilities versus contemporary trends in education provisioning? (*Traditional, progressive methods, fusion of methods*).

I have a keen interest in such students and I have always tried to interact well with them especially that I want to learn more and be able to prepare for their specific individual needs. I have tried to identify them and I interact with them so often and tried to socialize with them so that they feel part of the group. On initial enrolment they refrain from interacting with senior staff, but as time goes by they become closer to you and they are able to share with you, their successes and challenges, and you realize that their life become so easy and they become free to participate in your lecture. Give them special attention in the lectures so they

become part of the group and they want to expose their knowledge, where they are able and show their challenges when you are open to them.

Sub-question 2:

How do teacher educators facilitate technology-mediated teaching for pre-service teachers with disabilities?

24. Does enrolment of students with disabilities influence the way you teach? **(How? Why not?)**

No, it does not influence me, because when I identify them I prepare special material for them and if they are not there, I teach the normal way.

25. Explain how you apply technology mediated teaching and learning in lecture sessions to benefit students with disabilities?

I use the technologies like the computer, projector, interactive board and I prepare specifically for their individual needs.

26. At which stage of session delivery do you mostly use technology mediation for students with disabilities? **(Introduction, session development, student activities, conclusion) (Give reasons).**

My lectures are all delivered through technology medium in one way or the other it's either the interactive board, the projector or other aids.

It varies with the type of presentation that I will be making, at times I use demonstrations, resource persons or students demonstrating to others. I usually use interactive methodologies that vary depending at the nature of presentation. I usually use technology after the introductory stage. My introductions are usually varied and are situational in terms of the size of lecture, type of lecture room I will be operating in such that you may need to reorganize the room, nature of presentation, and nature of group. I also use technology in summarizing the whole presentation, so that it will be computer aided.

27. Explain your frequency in the use of technology mediated teaching and learning approaches with students with disabilities?

All my lectures are technological aided, to encompass all, I use power point presentations. I also try in these difficulty times to have prepared handouts including abridged versions or with large print.

28. Has there been an instance where you were compelled to adjust your teaching approach to accommodate students with disabilities? **(Please share the experience).**

I remember one, when I discovered that I had a blind student, I didn't know that, I realized that I had a blind student in the group like I indicated that authorities will never inform you, you will only meet it when you are there. So actually what made me realize was, I had a presentation where there was statement quoted from the bible 'the blind shall not lead the blind' referring to leadership and there was some negative response from the group, and when I enquired what the problem was and students said we have a blind person here. I felt really bad and I had to apologize to the whole group and the individual concerned and tried to change the interpretation and said I am not talking of the physical blind, but those that are

strategically and visionary blind. I prepared specific handouts that the student later converted to braille format. I am forgetting the name, but it was some four years ago.

29. What challenges do you experience when using technology with students with disabilities?

Financial resources are scarce, material resources are not adequate and other contingent challenges like power cuts they bar us from using modems that are technologically based, if power goes or there is any problem with the gadgets like failure to operate. These gadgets are getting old or they have a technical problem and you get stuck midway.

30 At what level do you use technology with students that have disabilities? (SAMR) **(E.g. substituting usual ways of executing a task, making task execution faster, introducing newer features to task execution, enabling students to be innovative and think out of the box).**

This varies with the content itself, at times you let them to discover on their own, you let them on the computers to research through the internet and I also demonstrate to them using technology equipment and times I let students demonstrate for others.

31. How does technology facilitate redesigning of pedagogical contexts to enable the diversity of students to benefit (UDL)? **(Please explain).**

The equipment is mostly mobile, hence can be moved from room to room, where there is no screening surface, I improvise by covering part of the wall with cloths and use it for screening. Where there is no desk top computer, I use a laptop where Wi-Fi connectivity enable the use of internet. So specific rooms may not be that of a problem as we can always adjust and adapt.

Sub-question 3

How do pre-service teachers with disabilities experience technology - mediated teaching and learning?

32. Do students with disabilities need special technologies for effective learning? **(Explain).**

Yes. Forms of disability are diverse, hence need specific gadgets and equipment.

33. Comment on selection, setting-up and use of technologies that specifically target students with disabilities?

This is a challenge due to limited or constrained resources. Therefore it is difficult to select technology specifically for particular individuals. It is up to the instructor to design what is relevant to the students that you will have identified on your own. It would have been wise to let students with disabilities choose what they need and is most suitable for them.

34. How do you involve students in selecting and setting up mediation technology for students with disabilities?

None, as they are never involved.

35. During your tertiary level education did you have colleagues who had disabilities? **(Describe the nature of disabilities that they had).**

Yes. it was mostly the physical and adjustments were mostly on their accommodation.

36. Compare the way you deal with students with disabilities now, with how colleagues with disabilities were treated then, during your tertiary education?

It is totally different, because I am personally aware of the existence of difficulties and disabilities and I am eager to have them included in the main curriculum and delivery of instruction, So there has been a lot of improvement.

37. Who do you think should select, set-up and operate technology used in sessions? (Give reasons)

There could be an inclusive committee to assist tutors in preparing their work and supervise that tutors have prepared what is relevant and specific to individuals. To ensure everything is designed, selected, and used effectively and efficiently for such kind of students.

38. What role and responsibilities do pre-service teachers with disabilities have in technology mediated teaching and learning which targets them?

None at the moment.

39. How can technology mediated teaching and learning for students with disabilities be improved?

The ministry of Higher Education should procure equipment and other necessary resources that these students may need, it must train tutors to be able to use the technologies for the various students with difficulties. This should be done at ministry level, because it has cost and deployment implications. The college must acquire specific resources that are reserved for the specific students with disabilities especially the college comes up with a committee or department that focuses on the inclusive section.

40. Do you have any other information concerning technology mediated teaching and learning for students with disabilities that you want to share?

The learning environment needs adjustments like developing infrastructure towards meeting standards of inclusive learners including even lecturers themselves, some infrastructure has been there before and needs improvement adjustment to meet requirements of disabled students.

The college should acquire and reserve technologically based modem for people living with disabilities so that they are safe and accessible where they are safe, secure and accessible at any time. So resources should be reserved for a Disability Resource Center.

The college should always interact with all other stakeholders and civic bodies that are interested in the provision of Inclusive Education so that they are staff developed and there is continuous development and growth on the provision of curriculum and instruction that is specified for people with disabilities. Civic bodies like Jairosi, FSN etc. the college should be well connected to such organizations, so that when they are in need, they can always contact them for advice and provision of the relevant resources. The disability resource center at UZ can prepare and assist at all levels. The colleges can also set up their own Disability Resource Centers

Appendix P: Transcription record of interview with Chibwe (a teacher educator)

Teacher educator's assigned pseudonym: Chibwe **Date:** 07-7-2020

Qualification: Masters in Ed.admin **Gender:** Male

Experience in teacher education: 10 years **Venue:** Room A1. **Time:** 12- 1300

Type of interview: Face-to-face /one-on-one

Research Title: Influence of technology-mediated teaching and learning on the preparation of pre-service teachers with disabilities

Instructions to interviewee

- 1. You are kindly asked to provide responses to the following questions.*
- 2. Please take note that the interview proceedings are going to be recorded and subsequently destroyed upon finalization of this research.*
- 3. You are required to sign on a form provided to show your consent before the interview begins.*

Main research question:

How does technology-mediated teaching and learning influence the preparation of pre-service teachers with disabilities?

Sub-Question1

What are the inclusive in the preparation of pre-service teachers with disabilities?

- 1. What do you think about enrolment of students with disabilities in teachers' colleges?
It is a positive measure, it is quite inclusive gone are the days when people with disabilities were put into day care center/ play centers, it removes stigma through integration*
- 2. Upon joining teacher education, did you expect to deal with students with disabilities?
Yes*
- 3. When was the first batch of students with disabilities enrolled at this college?
In 2013 that's when we went to UCE for a workshop on inclusive education*
- 4. What is the nature of disabilities that students have and how many are they?
Mostly physically challenged, Only a few with mentally, those with mental disabilities are always there, they take a long time to finish up their course, whenever we have these lectures we have those that fail to make constructive sentences in assignments, fail to submit work, the root cause is mentally challenged. Hearing they are there some say they complain that I don't hear properly. Yes seeing, I ask them to come and sit in front or sit close to the board*
- 5. How are you as an individual promoting inclusivity for student teachers with disabilities?
From the workshop I attended in UCE I know a lot, I have knowhow about their challenges in*

as far as how they conceptualize ideas they are said to be slow. I am patient about them; I have to be a good listener because their challenges are different from normal people.

6. How does the college make lecturers aware of new students that have disabilities?

From a rough idea they should be less than ten. The college is supposed to give information through the college academic board (CAB) but the only challenge is the cab which does not cascade information to lecturers. So most lecturers will not be aware they will only discover during the teaching process that a-a-ah we have got such -such a learner. But by and large they are supposed to mention that in the staff meeting that we have so many students who are challenged in this- this category disability so please take care. But at times we discover during lectures. Some of them you can see them, the physically challenged. The mentally challenged you can get them through speech when you are discussing about something and you discover that a-ah this one needs a lot of patience. One was mentally challenged; she came to tell me why she had failed to complete her course in the first year. During the repeating period that's when she had to divulge her status so that I could assist her.

7. Comment on the practice of being informed or not informed of new students with disabilities? **(For example teaching methods, motivation). 3**

The college is supposed to inform us but as I told you earlier, we are forced to discover. It is quite an embarrassment imagine when you discover that someone is using his or her legs for writing such that one needs some good space smart place , it quite an embarrassment.

8. What is your understanding of technology mediated teaching and learning?

Technology mediated teaching and learning, I understand it as a new way, an innovative way of delivering lectures where a set of educational accessories are now being used. We are talking for example of the interactive board, the white board.

9 .Cite critical technology gadgets for teaching and learning for students with disabilities?

a. physical impairments

They need first environment, the sit, the set up needs to be adapted to them; obviously they also need the cellphones, the laptops

b. visual impairments

They use of audio-visual equipment, television, overhead projector, interactive boards, there is Java

c. hearing impairments they use

Java

10. What technology equipment do you use to benefit students with specific disabilities?

I vary my teaching methodologies, at times I go to the lecture with overhead projector combined with lap top, audios are also given voice projection itself vary the voice projection to show that they are with you , cell phone - my own cellphone.

11. How does use of such technologies influence your practice, when dealing with students with disabilities?

It has a great impact in the sense that it's a new way of learning and it motivates them because the older face to face learning used by past lecturers was quite boring. They find that it is easy It's easy when if you are doing like research. You send information to a group like Whatts-up group, they give you ideas and they are not shy to give you answers. Like the internet, email address, they communicate without hindrances.

12. How do you rate the extent to which you apply technology with students with disabilities?
To me I will give it say just above 60% because I am doing the best I can with the meagre resources we have here.

13. Who provides the technology gadgets that you use with students with disabilities?
(College/ students or both. Please state the gadgets).

The institution and mine personally, my own laptop combined with their overhead projector. (Never allowed that) Never allowed students to provide their own technologies.

14. Should there be technologies solely meant for students with disabilities during lecture sessions? **(Please explain your line of thinking).**

Must have them. Accessibility to the learner, they can use them at their own spare time. Just imagine if we had a disability center here. Those learners are slow in learning; they need time to practice and research, this sort of thing but without that room the DRC.

15. How does the college empower and encourage lecturer to apply technology mediation for students with disabilities?

We went to workshops last year but one. Workshops outside the college .None of these were held in the college. The administration usually does not talk about that (use of technology) they hear it from staff-members. The situation is like that.

16. How do you rate your capacity to use technology mediated approaches in lectures?

I would give it above 60%, but the challenge is that we do not have enough of this equipment they have been mentioned about in meetings, especially about interactive boards, but the college has not bought even a single one. We are good at using those, but we do not have them.

17. Comment on your willingness and enthusiasm to use technology mediation for students with disabilities?

I would say I am positive, I am pro-students about such that, I have been assisting them I have assisted some of them to gain their diplomas

18. Comment on the capacity of lecturers in this college to use technology mediated teaching and learning approaches with students that have disabilities.

A-a-ah! The general lecturing staff, I think it may be below 30%. Why do I say that, because most did not attend workshops pertaining to these challenged learners, not only that, some really lack knowledge, let alone the technology to use? Even the sense to look after any person who is challenged. I have noted with concern how they have tried to sideline such learners especially when they have challenges. Even in assisting them. It is very difficult I have noted that. There was one incident when I went with them during teaching practice and there was a student who used her legs for writing and they would say you go and assist this one, meaning they are scary. I witnessed that situation. I could appreciate her effort from that point. But they simply brushed her off. I then said to myself lecturers are not serious about this, inclusivity.

19. What support does the college administration give for technology mediated teaching and learning for students with disabilities? **(Modifying infrastructure, learning contexts, availing technology equipment, staff development).**

They have done a lot since 2013. Lots of ramps have been constructed around the college. Accommodation is provided. There are rest rooms meant for them which is quite positive. What is only left is to have a specific room for them for instructional purposes.

20. Which institutional factors influence your implementation of technology mediated teaching and learning? (*Administration, location of college, college culture, class size, session time*).

From that UCE workshop I attended is one source, but I learnt that one when I was teaching in the ministry of primary and secondary that's where we learnt to be very inclusive because I was primary trained. We were handling such situations, were not segregated in primary schools. The ministry of primary and secondary is more inclusive than the ministry of higher education. The issue has to do with the old adage which says teaching is a calling you have to serve the nation and every child deserves the same treatment with others.

21. Which external factors tend to influence the preparation of pre-service teachers with disabilities? (*Policies, department of teacher education, politicians, parents, civic bodies, etc.*).

Ya-ah I think they are there. We are looking at NGOs that are promoting inclusive education like The UN convention on education, government policies. Circular instrument 1 of 2000 and other circulars. A-a-a-ah I remember one UZ-DTE supports, it was part and parcel of the workshops. Parents provide material resources, emotional and social support.

22. Which national and institutional frameworks guide the use of technology mediation for pre-service teachers with disabilities?

Constitution of Zimbabwe the 2013 one. Section p20 it talks about inclusive education. There are various sections in the constitutions that talk about inclusive education. They cascade downwards from the UN to the sectional syllabi. In Professional Studies the module on Educational Management deals with the four types of challenged learners that we have. Everything is drawn from the constitution and everything is drawn from the UN Convention in education to the Constitution of Zimbabwe, government policies and to college policies. I don't know about the college policy, but there should be some aspects of that. That's why we have learners who are challenged and so many new ramps constructed in the college.

23. How would you rate your interactions with pre-service teachers with disabilities versus contemporary trends in education provisioning? (*Traditional, progressive methods, fusion of methods*).

That one depends with when we go out and who you interact with. I have interacted with so many people on inclusive education. I have interacted a lot on people on different platforms on special education

Sub-question 2:

How do teacher educators facilitate technology-mediated teaching for pre-service teachers with disabilities?

24. Does enrolment of students with disabilities influence the way you teach? (**How? Why not?**)

Ya-ah it influences, because whenever you are delivering, you are giving content and instructions, bearing in mind that I have learners who are like this, the way, media you use and pace of delivery is aligned to that.

25. Explain how you apply technology mediated teaching and learning in lecture sessions to benefit students with disabilities?

When it comes to delivery of lectures you must be technological competent to use it, that is the first point of call. You have to choose type of media technology that suits the conditions of the day.

26. At which stage of session delivery do you mostly use technology mediation for students with disabilities? **(Introduction, session development, student activities, conclusion) (Give reasons).**

Ya-ah! I am a kind of lecturer who varies the methodologies. But When I am using the overhead projector, I will introduce the video, and then I have to use face to face, come again to the video and conclude. I vary it, it can be throughout, and again depending again on the topic and content.

27. Explain your frequency in the use of technology mediated teaching and learning approaches with students with disabilities?

A-ah, every week, I make sure that I have something. It depends again with the group.

28. Has there been an instance where you were compelled to adjust your teaching approach to accommodate students with disabilities? **(Please share the experience).**

It was one lecture were I was delivering a lecture and I realized that I was too fast in delivering the lecture. I was told that they were some who are coming from behind, and I was told that sir you are too fast somebody is using legs to write. Was alerted by other students.

29. What challenges do you experience when using technology with students with disabilities?

It has to do with power outage. You plan to go and use an overhead projector and you find there is no power and there is no back up source. The other issue some of them are outdated. The cords used in the lecture theatre do not function properly. The preparation I have to run around and may not have enough time to prepare.

30 At what level do you use technology with students that have disabilities? (SAMR) **(E.g. substituting usual ways of executing a task, making task execution faster, introducing newer features to task execution, enabling students to be innovative and think out of the box).**

It depends with the group that you are tutoring at a particular time. When I am having the final years who now know the corners better than the first years, I just give them the framework of the topic and ask them to go and research on the internet and they come to present.

31. How does technology facilitate redesigning of pedagogical contexts to enable the diversity of students to benefit (UDL)? **(Please explain).**

It has made learning a bit easy. It is quite motivating.

Sub-question 3

How do pre-service teachers with disabilities experience technology - mediated teaching and learning?

32. Do students with disabilities need special technologies for effective learning? **(Explain).**

Yes. Most of these students usually they have their own computers, they operate through the computer, when they have questions especially when they are doing research they ask you, they email you then you answer them

33. Comment on selection, setting-up and use of technologies that specifically target students with disabilities?

U-uh I can say from the preparation you need to be thoroughly prepared. It comes to with use it is quite entertaining. After use, obviously you need to collect the gadgets to the storeroom.

34. How do you involve students in selecting and setting up mediation technology for students with disabilities?

Yes. You are doing the set up. Need to ask them what they are seeing during the preliminary set up especially the projectors, is it visible to everybody right from the back of the class. Have to involve them. Ye-es! No-oh! Ye-es! Other learners, yes I have to, there is no way you can teach them without them knowing. In fact most of them are talented in the use of the computer

35. During your tertiary level education did you have colleagues who had disabilities?

(Describe the nature of disabilities that they had).

Yes

36. Compare the way you deal with students with disabilities now, with how colleagues with disabilities were treated then, during your tertiary education?

There is a difference .Exactly during the past era there was challenge of lack of knowledge on the part of lecturing staff we are now talking of inclusive education.

37. Who chooses sets-up and operates technology gadgets in sessions? *(Give reasons)*

Usually I am assisted by the stores person. But the person who chooses is the lecturer.

38. Who do you think should select, set-up and operate technology used in sessions? *(Give reasons)*

The lecturers should, I choose it myself. Lecturer chooses what they are competent to use.

39. What role and responsibilities do pre-service teachers with disabilities have in technology mediated teaching and learning which targets them?

Students should make sure that all the media is accessible and is available for use, let alone the use.

40. How can technology mediated teaching and learning for students with disabilities be improved?

The staff is inducted, there is need to staff develop the administrators so that they are in the know of challenges the physically, the mentally. Conscientisation of learners and staff, make it a policy, formulate a policy on inclusive education in the college.

41. Do you have any other information concerning technology mediated teaching and learning for students with disabilities that you want to share?

Accessing resource in institutions so that the area can be improved. Some kind of policy, in the college that a certain small amount must be channeled to the challenged.

Appendix Q: Transcription of Focus Group Discussion 1, with pre-service teachers.

Pre-service teachers involved: S8 (Phedie), S9 (Tinny), S10 (Richie), S11 (Gidza)

Venue: Long range building

Date: 01 September 2020

Time: 1100 -12.30

Duration: 1 hr

Research Title: Influence of technology-mediated teaching and learning on the preparation of pre-service teachers with disabilities

Instructions to participants

- 1. You are kindly asked to make unreserved contributions in the discussions.*
- 2. Please take note that discussions are going to be recorded and recordings will be destroyed upon finalization of this research.*
- 3. You are required to sign a form provided to show your consent before discussions begin.*

Main Research Question:

How does technology-mediated teaching and learning influence the reparation of pre-service teachers with disabilities?

Sub-question 1

What are the inclusive practices in the preparation of pre-service teachers with disabilities?

1. Zimbabwe introduced Inclusive Education to accommodate students with disabilities. What do you think about this?

S8 (Phedie): *Level of disability is the main issue because they are some people with disabilities that can be accommodated in normal classrooms, whilst there are others that cannot be accommodated. It could be an advantage to some extent it does not discriminate, it accommodates everyone.*

S9 (Tinny): *As students... there will be no challenges like I am disabled so I don't meet with the able bodied ones. It removes challenges of discrimination and we get a chance for sharing and mixing which makes it easy to participate in every event.*

S10 (Richie): *When students meet they share the problem*

2. What motivated you and other colleagues with disabilities to enroll at the college?

S8 (Phedie): *being a student teacher does not only mean teaching the learners only. It develops yourself, it develops your life, the way you live in the community, the way you interact with others, it enhances your life, and thus socially you live with others peacefully*

S10 (Richie): *teaching profession opens up other avenues in future, by having the teaching diploma you have a chance to learn more in future, to advance your education, I will use it as a stepping stone*

S11 (Gidza): *To earn a better living, as a Zimbabwean I want to contribute, to motivate others, to make a change. Some students with disabilities in the rural areas drop out of school so my going to school would motivate parents to send their children to school as they see that a disabled person can do just like anyone else. Some disabled persons are beggars; I did not want to end up begging. Teaching does not pin me down, and not move to another level I can use it as a stepping stone. In teaching there are many opportunities. First of all, to make a change you have to choose a profession, a stepping stone.*

3. How does teaching and learning at the college show support for Inclusive Education?

S9 (Tinny): *There will be no difference in opportunities availed to students whether disabled or not*

S10 (Richie): *By giving students with disabilities time to interact among themselves. Every Wednesday students with disabilities have a chance to meet for an hour or so.*

S11 (Gidza): *By enrolling disabled students it shows that there is support the mere enrolment of students with disabilities is a testimony disabilities tents with. At the college there is a platform were disabled meet to discuss their challenges and air out their grievances is assign for support*

S11 (Gidza): meeting to discuss challenges they face

4. What disabilities are common among students at this institution?

S8 (Phedie): *There is one student, I am not sure whether he finished the course but he had had mental disabilities.*

S9 (Tinny): *physical, albinism*

S10 (Richie): *Visual*

5. How does the administration know about the nature of student disabilities?

S9 (Tinny): *When students are enrolled there is a part on the registration form on enrolment where they have to fill in those details*

S11 (Gidza): *on the application form& advert it's written that students with disabilities are encouraged to apply, which means they are aware that there are such students.*

6. How do lecturers know about the nature of student disabilities?

S9 (Tinny): *in departments it's where most lecturers know that they are students with such disabilities, since they deal with them on a daily basis.*

S10 (Richie) *after registration lecturers follow the records, from the records they would know that there are people with such challenges. Individual lecturers go through those records.*

7. How does the college manage information on the nature and the number of students with disabilities? How does this affect teaching and learning e.g. technology use in lecture sessions?

S8 (Phedie) the SRC incorporates students with disabilities it has a position that is reserved for students with disabilities. It is one position that is closer to the administration or the principal and that would represent the other persons with disabilities

S10 (Richie) the representative in the SRC has a list of students with disabilities, all their information is listed down

S11 (Gidza) the College set up I don't know if it is a task force or board that represents students with disabilities.it is made up of eh eh

8. Comment on the impact of informing or not informing lecturers about nature of student disabilities? (For example teaching methods, motivation).

S10 (Richie): by informing, the lecturer would know the teaching strategies to use.

9. What do you think about use of technology equipment by lecturers in lecture sessions?

S8 (Phedie): it could be an advantage, have seen one who uses legs to type on the computer; hence she is able to type her assignments.

S9 (Tinny) it is a good idea, especially to the deaf, by looking at the picture or video one gets to know what will going on, it complements with other senses, other than hearing.

S11 (Gidza) they make it difficult for disabled students who may not be able to operate the equipment in the presence of others, hence they feel embarrassed. It depends on the level of disability one without both hands may not be able to operate the power point.

10. How does use of technology affect the fulfillment of your expectations on joining college?

S9 (Tinny): The use of computers, let's say I want to Google or research it helps to do the assignment easily.

S9 (Tinny): If the lecture was supposed to take about 35 minutes, if a person with disability like walking is asked to present something in front, it takes a lot of time it means the lecture would take longer than expected.

11. Which technologies do lecturers use to support learning for students with these disabilities?

a. physical disabilities

S9 (Tinny): projector

b. visual impairments

S8 (Phedie): they are not accommodated

S9 (Tinny) none

S10 (Richie) none

S11 (Gidza) none

c. hearing impairments

S8 (Phedie): microphone

12. Which other gadgets can lecturers use to support learning for students with these disabilities?

a. physical disabilities

S9 (Tinny) projector

S10 (Richie): floor must not be slippery

S11 (Gidza) toilets and hostels must be accessible to wheel chair users

b. visual impairments

S8 (Phedie) audios

c. hearing impairments

S8 (Phedie) microphone, audios, cellphones to deliver notes so that they can read

S11 (Gidza) hearing aids

13. What successes and challenges do you realize by use of technology gadgets in your learning?

S8 (Phedie): lessens the burden of doing some other tasks, if one cannot read using eyes notes can be given through braille and can use fingers to read. One without hands as indicated earlier can use legs for typing, that person can produce something. Off course it will be slow but it's better than not doing it.

S9 (Tinny): technology helps e.g. the projector, if you don't hear, one can access by seeing the coaching points e.g. in. PES

S10 (Richie): never seen the braille commonly used in this college

S11 (Gidza): difficult to operate the laptop, I am slow in operating it.

14. At what stage do you mostly experience use of technology gadgets in lecture sessions? (Introduction, session development, student activities, conclusion). Give possible reasons.

S8 (Phedie): in the body, because that is where content is

S9 (Tinny): depends with the topic which will be done, at times it this stretches from introduction as the lecturer would want the students to know what will happen after up to the conclusion

S10 (Richie): throughout the lesson, because if they don't use it throughout some of the students would miss the concepts.

S11 (Gidza): just after the introduction, because after the introduction there is a lot of content.

15. How often do lecturers use technology equipment that benefits students with disabilities?

S8 (Phedie): In this college people have got different types of disabilities, there are quite a number of people with disabilities at our college I am not sure whether they take that into consideration, some of those with hearing impairments for example you don't find microphones in the Great hall you find someone copying the person sitting next, there are no microphones in the Great hall.

S9 (Tinny): Normally after a month or so depending on the topic, mainly in PE that is where the projector is used. There isn't much use of the gadgets in TOE and PS

S10 (Richie): *The use of these gadgets does happen only when an alarm is raised. Some of the lecturers deliver their lessons without considering those students with disabilities, until alarm is raised by someone like the student concerned.*

S11 (Gidza): *In Maths we don't use technology maybe in mass subjects like TOE and HLSE.*

16. What are the possible reasons for this frequency in use technology in lectures?

S8 (Phedie): *some of the lecturers do not have the knowledge of how to operate the gadgets, at times they get assistance from our colleagues to build up a lesson, they might have their laptops but mounting the projector and that board, and they find it difficult to request it from the IT department, I think that process is a problem as well it is time consuming to build up the system*

S9 (Tinny): *inadequacy of the gadgets at the college you find there are two projectors, yet there are so many classes.*

S10 (Richie): *ignorance on the part of the lecturers*

S11 (Gidza): *it consumes time, so it needs preparation before the lesson, so they end up delivering the lesson without technology.*

Average: N/A

High: N/A

17. Do pre-service teachers with disabilities need special attention in processes of technology mediated teaching and learning? (Give reasons).

S8 (Phedie) *Yes, because technology is being encouraged throughout, whether people have disabilities or not, particularly in this period of COVID.*

18. Comment on administration support for technology use in the learning of students with disabilities. (E.g. modifying infrastructure, learning contexts, availing technology equipment, organizing staff development sessions).

S8 (Phedie): *I am not quite sure whether they support; it depends with individuals you need to go and request for something to get it.*

S9 (Tinny) *It does not support as they do not make any follow up so that they supply the needed equipment.*

S10 (Richie) *No support*

S11 (Gidza) *No support, because they do not follow up on how they are used during delivery of lectures*

Sub-question 2

How do teacher educators facilitate technology - mediated teaching for pre-service teachers with disabilities?

19. Which policy documents guide enrolment of students with disabilities, Inclusive Education and use of technology use in the college?

S8 (Phedie) *at our college the use of ict is encouraged. It is being encouraged I am not sure whether there is a policy, because on enrolment students are asked to have a laptop and a cellphone.*

S9 (Tinny) *I don't know, but there is government policy, I don't know which chapter, they say you must consider those with disabilities, they must be enrolled.*

S10 (Richie) *None*

S11 (Gidza) *I think there is a policy because the government set up a ministerial post there is a minister who represents people with disabilities, I do not know the name of the policy but it's there.*

20. Comment on your lecturers' capacity to use technology gadgets in lecture sessions.

S8 (Phedie) *They do not have the capacity, I think the education system has changed so lecturers still need time to cope with the new technologies.*

S9 (Tinny) *Three quarters of the lecturers do not have the capacity to use the technology*

S11 (Gidza) *most of the lecturers do not have capacity, they don't know how to operate the gadgets or they don't have much knowledge on how to operate the gadgets.*

21. Comment on selection, setting-up and operating of technologies in lecture sessions?

S8 (Phedie) *there isn't much of selection from, the lecturers mainly use the projector, setting up is done by IT staff a few of the lecturers are able to set up on their own*

S9 (Tinny) *setting up is time consuming and delay lectures*

S10 (Richie) *setting up and operating can put the learners off, some of the gadgets can just go off whilst in session.*

S11 (Gidza) *setting up is mostly done by students and it is time consuming setting up is done by students because of the time.*

Question 2. How do pre-service teachers with disabilities experience technology - mediated teaching and learning?

22. Comment on the way lecturers deal with students with disabilities in comparison to how they deal with colleagues without known disabilities in lecture sessions?

S8 (Phedie): *attention is not paid mostly to students with disabilities,, they just deliver the lecture normally without considering that there is a somebody with a with a disability.*

S9 (Tinny) *They don't treat the students equally, in a lecture most of the students who are abled they are known by names, but those who are disabled a lecturer does not know even one name of a student who is disabled.*

S10 (Richie) *If a disability is known, ya-ah special attention is given to a particular student.*

S11 (Gidza) *They are treated equally, to encourage them to perform like normal students.*

23. How have lecturers involved you in selecting or setting up and operating technology equipment in lecture sessions?

S8 (Phedie) *mostly the students are the ones who are asked on where to connect the gadgets and how to connect them gadgets, so they involve students much.*

S9 (Tinny) *Since they do not have the knowhow to operate, they will obviously ask students to operate the machines.*

S10 (Richie) *Only active students will have a chance to operate those gadgets, those who are passive will remain like that.*

S11 (Gidza) *only those students with knowledge on how to operate are asked to come and help.*

24. Comment on technology mediation and your grasp of concepts as students with disabilities.

S8 (Phedie):...no comment was forthcoming

S9 (Tinny):...

S10 (Richie):...

S11 (Gidza): ...

25 Relive instances that you enjoyed/benefitted when technology was used in lectures.

S8 (Phedie): *During workshops on Health and Life Skills it will be very tiresome and everyone will be exhausted, and to refresh there will be video clips plays so that people will refresh their minds.*

S9 (Tinny): *like the use of a projector, pictures they will allow you to know step by step what will be happening rather than reading notes.*

S10 (Richie): *showing of drama clips on topics like HIV and AIDS.*

S11 (Gidza): *I still recall a topic on conditioning, ya-ah it helped us to understand Pavlov's conditioning through pictures, you would see the dog salivating, and it helped us to understand the concept.*

26 Share instances in which technology was used but you did not enjoyed or felt uninspired in the session.

S8 (Phedie): *In an EMT lecture it was a very long lecture and there were lots of notes such that when the projector was being scrolled you could not get the notes on time, and maybe it was a rush for time so people would finish the topic on time and the end we did not get much from that lecture.*

S9 (Tinny): *In bio-mechanics, the use of a projector was done, but I did not even get the sense of where it was coming from, there was too much of big words and I did not understand it.*

S10 (Richie): *some notes that are just shot on the wall, no explanation until the end so I did not enjoy that.*

27. How can use of technology to support learning for students with disabilities be improved?

S8 (Phedie): *specific equipment for students with specific disabilities to be bought to accommodate students with disabilities so that they can regularly.*

S10 (Richie) *having specific schedule for students with disabilities. On a time table for the use of technology.*

S11 (Gidza) *In the library one or two computers should be reserved for the disabled student, some who are physically disabled cannot reach the library very fast, by the moment they reach the library there will be no computers left.*

28. Do you have anything else to share, regarding use of technology to support the learning of students with disabilities?

S8 (Phedie): *Even when we say there should be inclusivity there is need to check on them time and again need to verify whether they are getting along with those that are able, in terms of using the technology. This can be done by the college administration or maybe the LICs who know the specific disabilities that students have.*

S9 (Tinny): *The government must supply the needed equipment for the disabled students.*

S10 (Richie) *College administrators must not use assumptions that lecturers have got knowledge on the gadgets.*

Appendix R: Transcription of focus group discussions 2, with pre-service teachers

Codes for pre-service teachers involved: S1 (Jud), S2 (Jimmy), S3 (Kesie), S12 (Tsitsi).

Venue: Room A4

Date: 28 -10-20

Time: 1430 – 15.30

Duration: 1 hour

Research Title: Influence of technology-mediated teaching and learning on the preparation of pre-service teachers with disabilities

Instructions to -participant

1. *You are kindly asked to make unreserved contributions in the discussions.*
2. *Please take note that discussions are going to be recorded and recordings will be destroyed upon finalization of this research.*
3. *You are required to sign a form provided to show your consent before discussions begin.*

Main Research Question:

How does technology-mediated teaching and learning influence the reparation of pre-service teachers with disabilities?

Sub-question 1

What are the inclusive practices in the preparation of pre-service teachers with disabilities?

1. Zimbabwe introduced Inclusive Education to accommodate students with disabilities. What do you think about this?

S1 (Jud). *Here we have a challenge of water, especially in the toilets we don't have water it is difficult at times to go and fetch water outside when you want to help yourself. It is a good initiative, but people are not implementing it in most tertiary institutions.*

S2 (Jimmy) *It was a very good idea to introduce inclusive education in colleges but I think were to first look at the premises first for people with disabilities.*

S3 (Kesie) *on the ground inclusive education is not functioning, because most schools are not suitable for people with disabilities. For example here we have a lot of problems that we face as people with disability for example we have only one toilet in the whole institution that is conducive to people with disabilities. Even friendship, some people are seeing people with disability as very inferior. Our colleagues segregate us even our studies are making it difficult we have no time to discuss with them, no time to socialize with them, at the end we end up isolated, but it's not our will. For example as people accommodate us we can make our achievement. Most people are not accommodating us either in the class or hostels. For example for me I am not able to do anything, even fetching water even for drinking I am just begging. Some think I am abusing but it is not an abusing but I am looking forward for help from them. To a greater extent I appreciate the policy of the government of inclusive, but I encourage the government to make another step to campaign in different institutions for people to know what disability is and how disabilities come. Disability comes to people in different ways whether accident or illness.*

S12 (Tsitsi) *It is a good idea. It removes discrimination in schools where learners with disabilities are not treated the same way with others.*

2. What motivated you and other colleagues with disabilities to enroll at the college?

S1 (Jud) *I wanted to be self-reliant. The college is close to my home.*

S2 (Jimmy) saw the advert in the newspaper then there was a statement that people with disability were encouraged to apply and had an assurance that I would get a place because I thought people with disability would be given first preference. I thought the place would be very conducive, but to my surprise some places are not accessible, especially the toilets. There are steps only and somebody on wheel chair cannot get into the toilet. There is need to develop on that.

S3 (Kesie) someone motivated me, the principal of Danhiko mai Dekune.

S12 (Tsitsi) Attracted by the services offered here e.g. hostel accommodation provides a conducive environment; it accommodates students on wheel chairs. I did a tour of the college on the day I came to apply and the principal welcomed me very well on that day as well.

3. How does teaching and learning at the college show support for inclusive education?

S1 (Jud) Ya-ah to greater extent, some lecturers are not familiar with people with disabilities they so treat us like the able bodied. For instance a student raised his hand the other day and said sir may you please repeat what you said, I interacted with him later, and said when you were dictating notes you were too fast and he said come to my office. Last week I said to a lecturer you were too fast and he said your bones are strong, you should write just like anyone else (unobva watoneta).

S2 (Jimmy) The lecturers are not that accommodative. They treat like the able bodied, people with disabilities some of them tend to be slow learners. In my department lecturers will be too fast and we don't understand the topic.

S3 (Kesie) To some extent they support, for example in my department most lecturers are friendly and supportive in terms of notes they always provide me with all handouts.

S12 (Tsitsi) Yes, the way lecturers teach, their speed of delivery and giving of notes considers students with disabilities and at times hand outs are provided.

4. What disabilities are common among students at this institution?

S1 (Jud)- club feet physical disability, amputees, visual

S2 (Jimmy) - physical disability I was affected by polio

S3 (Kesie)- multiple disability, no hearing impaired

S12 (Tsitsi) Mobility disability, physical, visual, users of wheel chairs and crutches.

5. How does the administration know about the nature of student disabilities?

S1 (Jud) When I was interviewed they asked me, they wrote somewhere

S2 (Jimmy) During interviews, I don't know whether it was captured I remember my LIC asked me about my disability

S3 (Kesie) They judged physically not exactly to know my disability

S12 (Tsitsi) They saw me on the day I applied as well as on the day that I came to school, on the opening day

6. How do lecturers know about the nature of student disabilities?

S1 (Jud), There was lecturer who asked when taking us photos, I think it was from a directive by the principal.

S2 (Jimmy) Through my department, the LIC

S3 (Kesie) Through seeing .There was no one asking

S12 (Tsitsi) The administration did not say anything. Some knew, as time went on lecturers got to know of my presence. I also had to go and sit in front for them to notice.

7. How does the college manage information on the nature and the number of students with disabilities? How does this affect teaching and learning e.g. technology use in lecture sessions?

S1 (Jud). Don't know. The principal may have the information

S2 (Jimmy) Don't know

S3 (Kesie) Don't know

S12 (Tsitsi) *I have no idea. This was not captured at all, I just filled in a form at enrolment. If lecturers are not informed they may not prepare adequately for such students hence, may even be fast in dictating notes.*

8. Comment on the impact of informing or not informing lecturers about nature of student disabilities? (For example teaching methods, motivation).

S1 (Jud)---

S2 (Jimmy). *It is negative, may be the lecturer would be moving fast and the person with disability will not write quickly to be able to cope.*

S3 (Kesie). *The lecturer will know the student with disability, they won't know how to handle it and how to help.*

S12 (Tsitsi) *The admin needs to inform so that lectures know the nature of challenges that students have. They can do this in their staff meetings or inform the specific departments that such students belong to.*

9. What do you think about use of technology equipment by lecturers in lecture sessions?

S1 (Jud). *It is helpful. Like in Theory of Education if they use a projector you can see what is going on like about Skinner's with his operant conditioning.*

S2 (Jimmy) *It is a good idea to move with technology, it is helpful. at times if a disabled person has a problem with writing maybe he can be good at listening or watching to an advantage.*

S3 (Kesie) *It is helpful, it assists especially with hearing you can see what is beamed.*

S12 (Tsitsi) *It is very important e.g. for use of the projector for everyone to see or the need to dictate notes.*

10. How does use of technology affect the fulfillment of your expectations on joining college?

S1 (Jud). *Especially in these times of COVID we want to see the lecture demonstrating*

S2 (Jimmy) *Get expertise in technology*

S3 (Kesie). *Use of technology is very useful, even the lecturer after the session, I can easily access to download the information, use my computer for writing assignments and printer for printing.*

S12 (Tsitsi) *The absence of a laptop affected me. However when I later had access to a laptop the writing of assignments became easy for me and this helped me to achieve my expectations as I pursued teacher education.*

11. Which technologies do lecturers use to support learning for students with these disabilities?

a. physical disabilities

S1 (Jud). *Projectors*

S2 (Jimmy) *Computers and printers*

S3 (Kesie). *Computers for typing assignments*

S12 (Tsitsi) *Projector, laptop.*

b. visual impairments

S1 (Jud). *..*

S2 (Jimmy) *Recorders and PA system*

S3 (Kesie) *Pa system*

S12 (Tsitsi) *None*

c. hearing impairments

S1 (Jud)...

S2 (Jimmy) *Interactive board*

S3 (Kesie) *Projector*

S12 (Tsitsi) *Video player, video recordings*

12. Which other gadgets can lecturers use to support learning for students with these disabilities?

a. Physical disabilities

S1 (Jud). ...

S2 (Jimmy)...

S3 (Kesie). ...

S12 (Tsitsi)*Video player, video recordings*

b. visual impairments

S1 (Jud). *Braille*

S2 (Jimmy).

S3 (Kesie)....

S12 (Tsitsi)*Audios, specialized tutorials.*

c. hearing impairments

S1 (Jud)......

S2 (Jimmy).....

S3 (Kesie). ...

S12 (Tsitsi)*Audios, videos, resource persons who have knowledge on how to deal with specific disabilities.*

13. What successes and challenges do you realize by use of technology gadgets in your learning?

Successes

S1 (Jud). *Zvinotibatsira ku understander and grasp the concepts*

S2 (Jimmy). 0

S3 (Kesie) *Use of computer helped me to type or store my notes, printers for printing our handouts*

S12 (Tsitsi)*Challenges - did not know how to operate the equipment first e.g. how to use it for typing.*

Challenges

S1 (Jud) *If there is power outage there won't be any progress*

S2 (Jimmy)*some of the gadgets are very difficult to use like some of us are not very computer literate.*

S3 (Kesie) *Plagiarism*

(Introduction, session development, student activities, conclusion).*Give possible reasons.*

S1 (Jud). *Introduction, because they want us to see where the lesson is headed*

S2 (Jimmy) *On introduction, ndipo panenge pachida kuonekwa kuti mabata zvinodiwa.*

S3 (Kesie). *Conclusion, the lecturer will be summarizing the whole concepts of the lecture.*

S12 (Tsitsi)*In the body of the lecture, to enable students to have better understanding and there is adequate time and space for the use of the equipment.*

15. How often do lecturers use technology equipment that benefits students with disabilities?

S1 (Jud) *4 times a month*

S2 (Jimmy) *4 times a month*

S3 (Kesie). *Once a month*

S12 (Tsitsi)*Twice a month.*

16. What are the possible reasons for this frequency in use technology in lectures?

Low

S1 (Jud).

S2 (Jimmy) *Once per week*

S3 (Kesie) *Low due to shortage of resources*

S12 (Tsitsi) *Low; inadequacy of resources and equipment, as a result lecturers tend to share the few available gadgets,*

Average

S1 (Jud)

S2 (Jimmy)

S3 (Kesie)

High

S1 (Jud) *most of the lecturers know how to use the technology*

S2 (Jimmy)

S3 (Kesie)

17. Do pre-service teachers with disabilities need special attention in processes of technology mediated teaching and learning? (Give reasons).

S1 (Jud)...

S2 (Jimmy) *I don't need special attention*

S3 (Kesie) *Some people are able to use technology just like any other person. I do not need special attention*

S12 (Tsitsi) *Yes, as it helps students who take time to grasp concepts, hence they need more time of exposure to the content.*

18. Comment on administration support for technology use in the learning of students with disabilities. (E.g. modifying infrastructure, learning contexts, availing technology equipment, organizing staff development sessions).

S1 (Jud). *It's good.*

S2 (Jimmy) *I think it's good they are supporting us*

S3 (Kesie) *It's good*

S12 (Tsitsi) *It needs to give more support by providing adequate resources as these are inadequate at the moment*

Sub-question 2

How do teacher educators facilitate technology - mediated teaching for pre-service teachers with disabilities?

19. Which policy documents guide enrolment of students with disabilities, Inclusive Education and use of technology use in the college?

S1 (Jud)....

S2 (Jimmy)....

S3 (Kesie)...

S12 (Tsitsi) *I do not know any.*

20. Comment on your lecturers' capacity to use technology gadgets in lecture sessions.

S1 (Jud) *They have capacity.*

S2 (Jimmy) *They are good at using it, by the way they operate the gadgets*

S3 (Kesie) *Some are not, they take a lot of to prepare the lesson and in the end they are assisted by students to make it function*

S12 (Tsitsi) *They are capable, but they lack interest to learn how to use the technology and some have a phobia for technology use in lectures*

21. Comment on selection, setting-up and operating of technologies in lecture sessions?

S1 (Jud) *They are good*

S2 (Jimmy) *They are good, when they use their gadgets we don't encounter any problems*

S3 (Kesie) *Some are good for example the use of the projector it helps everyone to see*

Sub-question 3

How do pre-service teachers with disabilities experience technology - mediated teaching and learning?

22. Comment on the way lecturers deal with students with disabilities in comparison to how they deal with colleagues without known disabilities in lecture sessions?

S1 (Jud)...

S2 (Jimmy) *They don't treat us like people without disabilities, we are given the same chance.*

S3 (Kesie) *Aaah, I think most lecturers are good they treat us as a special group*

S12 (Tsitsi) *When they give notes they invite us to go and get the notes from them later. They at times prepare some work that is specific for us.*

S12 (Tsitsi) *Students with non - visible disabilities are not catered for by the lecturers. Majority of such students would not want people to know about their disabilities for fear of being labeled and stigmatized.*

23. How have lecturers involved you in selecting or setting up and operating technology equipment in lecture sessions?

S1 (Jud) *No involvement*

S2 (Jimmy) *No involvement*

S3 (Kesie). *No involvement*

S12 (Tsitsi) *No. am never involved. I did not have much knowledge about use of a projector, I had to learn this when on teaching practice for me to function in the classroom with learners.*

24. Comment on technology mediation and your grasp of concepts as students with disabilities.

S1 (Jud)....

S2 (Jimmy)....

S3 (Kesie)....

S12 (Tsitsi) *Technology makes acquisition of concepts easier. One is able to see clearly and also write or record the notes correctly*

25 Relive instances that you enjoyed/benefitted when technology was used in lectures.

S1 (Jud) *Watching the video of Skinner, every stage of Skinner. I now know it.*

S2 (Jimmy) *We were being taught how to draft a scheme of work, I did not have an idea how this was done, the lecturer brought a computer and beamed it on the board and we had a chance to see how it is done.*

S3 (Kesie) *Use of a projector makes the lesson more effective as compared to handouts and notes.*

S12 (Tsitsi) *In the first lecture where electronic media was used i.e. where a projector and laptop were used. I also managed to write all the notes for the first time.*

26 Share instances in which technology was used but you did not enjoyed or felt uninspired in the session.

S1 (Jud)....

S2 (Jimmy).

S3 (Kesie)....

27. How can use of technology to support learning for students with disabilities be improved?

S1 (Jud) *It's about the college. To have our own resource center as it will help us people with disabilities, for example in Mutare Teachers' college they have their resource center they go and spend their time doing what they want, unlike going to the computer lab, where you find all computers occupied.*

S2 (Jimmy)....

S3 (Kesie).

S12 (Tsitsi) *Lecturers need to be capacitated through workshops and training*

Involve students in the use of technology during lecture sessions

28. Do you have anything else to share, regarding use of technology to support the learning of students with disabilities?

S1 (Jud) *Put up a resource center and buy more computers.*

S2 (Jimmy). *Setting up the resource center*

S3 (Kesie). *College to purchase more projectors to use in all lectures*

S12 (Tsitsi) *Challenges with electricity/ unavailability of other alternative power sources, plugs and power sources in some lecture rooms have been vandalized, these needs to be fixed. Involve students with disabilities in setting up the equipment so that they can also learn in readiness for the world of work. At times students take time to settle down in readiness for a lecture.*

S12 (Tsitsi) *Involve students with disabilities in all these things*

Some students are afraid or shy to even look at the computer; they need more information on the importance of such technologies.

There is need for a resource room which is specifically for students with disabilities in which they can practice and experiment with technologies without interference and scrambling or competing with colleagues without disabilities.

Appendix S: Transcription record of focus group discussions 3, with pre-service teachers Pre-service teachers involved: S4 (Biala), S5 (Gemu), S6 (Klerk), S7 (Titie)

Venue: D20

Date: 18-11-2020

Time: 11.30

Duration: 53 minutes

Research Title: Influence of technology-mediated teaching and learning on the preparation of pre-service teachers with disabilities

Instructions to -participant

- 1. You are kindly asked to make unreserved contributions in the discussions.*
- 2. Please take note that discussions are going to be recorded and recordings will be destroyed upon finalization of this research.*
- 3. You are required to sign a form provided to show your consent before discussions begin.*

Main Research Question:

How does technology-mediated teaching and learning influence the reparation of pre-service teachers with disabilities?

Sub-question 1

What are the inclusive practices in the preparation of pre-service teachers with disabilities?

1. Zimbabwe introduced Inclusive Education to accommodate students with disabilities. What do you think about this?

S4 (Biala) *It's actually a good initiative by the gvt.in Zimbabwe, as it caters for everyone, everyone will have access to education so that is the main agenda of inclusive education to cater for everyone with disabilities and without disabilities.*

S5 (Gemu) *Yes, they have been saying that they are catering for everyone learner with disability but are they implementing it, start from the infrastructure, the building, are they accommodating learners with physical disabilities. If we are to check we see stairs in the hostels which discriminates those with physical disabilities. The idea is good; it does not leave out those with disabilities from education.*

S6 (Klerk) *The government has tried to include everyone in the education system, but the infrastructure does not allow. For students who are short sighted there are different types of sight problems. There are those who can sit at the front but still can't see, for example me, even if I sit at the front but still may not see. The government needs to provide infrastructure that supports students like us, e.g. provision of a tablet, question paper and the like.*

S7 (Titie) *Infrastructure that we have in the schools cannot promote an inclusive environment Inclusivity itself is something that is difficult to achieve even in a well up economy and in a situation where everything is okay.*

2. What motivated you and other colleagues with disabilities to enroll at the college?

S4 (Biala) *I was motivated by my brothers and sisters like everyone who is a teacher at home they trained here. And it is said to be the best teachers' college in Southern Africa, it produces good teachers.*

S5 (Gemu) *Yes motivation from other people was there, but for me it was the best college for what I wanted to do carrier wise. For what I wanted to do in life, I had to be here I am at the right place, as this college was going to give me the best of what I wanted as foundation for what I wanted to do. From my researches before I joined this college, this was the best for what I wanted.*

S6 (Klerk) *I did look at disability when I applied, I just looked at and included myself among everyone and I have an equal opportunity to apply and capable enough to teach. What is encouraging me now is that I now understand different types of disabilities. A form of disabilities also has different stages of disability. When I go to teach I am motivated to share with other teachers, like even if you put the learner in front of the class, but the learner might not be able to see because of light, so we may think of putting curtains in the classroom.*

S7 (Titie) *At first I did not view my problem as a disability until I lost my contact lenses and faced a lot challenges and got to a point I admitted that I had a disability. It did not any effect on my decision to come to this college. I was surprised when I came here and saw ramps and everything showing that this institution wanted to cater for those who have disabilities.*

3. How does teaching and learning at the college show support for Inclusive Education?

S4 (Biala) - *According to how I have viewed everything since I came here in 2018. I think they are including Inclusive Education in this college, though the infrastructure is low, I think this will progress and develop. They make sure that in each and every year the SRC they include a seat for the disabled. In all subjects and intake they involve everyone, they don't discriminate there are those on wheel chairs and a lot more disabled people are here. In the teaching and learning processes, they are now using power point presentations and the like. They are trying by all means to cater for everyone, though they are still developing gradually.*

S5 (Gemu) *the teaching methods are catering for everyone. I have never seen a blind student here. So we can't talk of braille or what. But those students that are here they are able to cater for them. Sometimes they use videos, audios, written texts which is very good as those with visual impairment, hearing problems can even see if they are showing using the overhead projector and slides etc.*

S6 (Klerk) *we can see ramps when entering the toilets, the dean's office and even when entering the admin it is flat there is no step. It shows that this place is inclusive. Even for those with sight problems, when most lecturers sometimes they use electronic media like projectors to deliver their lectures, say if it is a power point presentation they will give you a soft copy*

S7 (Titie) *on the facilities they have been trying to include those with sight problems. From first-hand perspective I can only talk about sight. If you mention that I cannot see very well they will make sure that a sit is reserved for you in the front, specifically in the main subject. It is difficult to consider you in the mass lecturer whereby someone with very good sight can come and sit in the front. So you have to depend on someone sitting next to you for spellings*

and items being written on the board. I remember one lecturer saying everyone with sight problems come and sit at the front

4. What disabilities are common among students at this institution?

S4 (Biala) *wheel chairs, without legs or hands, with albinism*

S5 (Gemu) *Visual impairment and hearing impairment*

S6 (Klerk) *Those who cannot walk properly, one with one arm and uses one hand, sight problems.*

S7 (Titie) *Physical disability and sight. I am not sure if there is anyone with hearing disabilities at the moment. Those are the only two. You can identify one with hearing disability by his or her use of a hearing aid or someone depends on sign language. I have not yet noticed someone who uses sign language at the moment.*

5. How does the administration know about the nature of student disabilities?

S4 (Biala) *UUUHM I am not sure how they know, since they are not in the enrolment department Maybe those in the enrolment DPT, they see the statistics, somehow they are told, though I am not sure maybe the dean of students follows up on that.*

S5 (Gemu) *on the enrolment forms, I remember there was a section what you have to state if you have disability or not, if you have a special case. The principal does not enroll but she is given he statistics*

S6 (Klerk) *The administration knows, for example like what happened when I was in my first year. It took us for sporting activities in Marondera. What happened was I was on home based TP I was on home based TP, a lecturer gathered everyone with disabilities for sport including me. She came to the school to get me for the Paralympic sporting activities after she had phoned the headmaster who had then refused to release me. It showed me that the administration knows which type of students it has. The strategy that I think the administration used is on registration. If I remember the application ad registration forms specifically asks you to statute the type of disability you have. The forms are in a data base at the college.*

S7 (Titie) *In my admission interview they asked me a question if I had and disability and I told them that I had problems with sight and they took note of that and also in the registration form it required the same information. But how much they refer to those, to check on those with disabilities to try and assist them I don't know how far they go.*

6. How do lecturers know about the nature of student disabilities?

S4 (Biala) *the lecturers get to notice by just interacting with us and seeing us in lectures or maybe from the enrolment the statistics they are told. Lecturers don't know that I have sight problems, unless they ask me to read text from the board so I can tell them that I can't see. This has never happened for the three years that I have been here, so no one knows about my disability.*

S5. *They analyze their learners before engaging them. They should have social records of the students. They are the ones who should tell the principal the number of learners with disabilities, since they are with us on a day to day basis.*

S6 (Klerk) *I think most lecturers know maybe by experience, like you see someone walking with crutches. I can identify that this person has a disability. But when it comes to sight*

problems it's difficult for the lecturers to identify, so they need the student to individually point out that I have. Even with hearing problem if one does not a hearing aid you can't tell that this one has a hearing problem. If they are physical disabilities they can be seen.

S7 (Titie) *I had to mention it that I can't see what you are writing and I maybe want sit at the front. When I started my first year I could not see even if I was sitting at the front. I had to ask others for their notes so that I copy them individually.*

7. How does the college manage information on the nature and the number of students with disabilities? How does this affect teaching and learning e.g. technology use in lecture sessions?

S4 (Biala) *I am not so sure about how they do those things. For most government institutions it is not easy to get that information, it takes time and visiting different offices and stages.*

S5 *It is something like an internal thing. I do not know how it happens. I think they have to keep the records somewhere. It starts from the class, the teacher does not know that I have hearing impairment or visual impairment, so it's hard for me to say they can provide such information.*

S6 (Klerk) *I think since our administration is now using like electronic portals which are very easy, you just type your candidate number, I think they also like, I am not sure of this one, but I think they may have a special separate document, which may be if you go to the administration and say i looking for students with disabilities in first year they may provide you a copy or one page with those names.*

S7 (Titie) *I notice that they maintain a file for each student which has medical records and information about that student. If they want to know more about that student's disability they can refer to that file. This institution is not that computer savvy hence, they have to rely on those files. When disability is talked about, we the ones with disabilities are the ones who have networked to talk to each other about these things as far the administration is concerned no one can.*

8. Comment on the impact of informing or not informing lecturers about nature of student disabilities? (For example teaching methods, motivation).

S4 (Biala) *When they are told it helps as they get to know what methods to use. Whenever there are any activities for instance if one has heart problems it helps to avoid dangers.*

S5 *When you inform that such a student has visual impairment, the teacher will know that this one is a special case and whenever I am having a lecture this one must sit in front because she has to see well what I am writing or whatever is being projected. They can ensure that those with hearing impairments have those devices so that they can hear well, so that the learner can benefit at the end of the day. So if you inform that we have a number of learners with these disabilities, the teacher has to know what methods to use in a particular lesson to benefit all the learners. When the teacher is not informed and because he or she doesn't know the types of learners that he or she is going to meet and will use the methods that he or she is comfortable with. At the end of the day it is not every learner who is going to benefit.*

S6 (Klerk) *If they are informed they help the student, for example like sitting in the front in most lectures difficult, because everyone wants to sit in front because of hearing. So if you*

talk to the lecture she or he can help you to secure a seat in the front. For example I know in our old lecture theatre there is this girl who has physical disability whose seat is always reserved. Even If the lecture room is full and she has not arrived her seat is always reserved because she cannot go up the steps. If they are not informed the student might perform poorly, because may be you can't hear well and you sit at the back you can't hear or you can't see properly.

S7 (Titie) *If you inform them there are actually two responses that I have received. Some consider you in the way they teach and you get specialized treatment. But some actually kind of blame you, you should sit in the front or you have to do extra work whilst you are alone. If you don't inform them you suffer in silence so that you lag behind. I suffered mostly in the first term whereby I would ask a friend of mine to give me their book whilst the lecture was in progress. You end up disturbing someone. I ended up sitting quietly and tried to catch up at the hostels.*

9. What do you think about use of technology equipment by lecturers in lecture sessions?

S4 (Biala) *The use of technology is actually a very good thing which is implemented nowadays in the curriculum. But at times it is not really effective in lectures, for example in this college, they start plugging their projectors during the lesson instead of before the lesson. If there are power cuts like last year, it becomes a challenge. They should set up the equipment way before the lesson as it tends to cut lesson time by up to 30 minutes.*

S5 *Teaching and learning nowadays is based on technology, everyone wants technology. The disadvantage is that the lecturers we have in the system they don't even know how to use the technological gadgets. Now it becomes a problem, because the college is not even teaching or organizing workshops on how to use this projector. They (lecturers) end up looking for a student who is able to do this and it wastes time. We end up going back to the old teaching methods not because we don't have electricity or we don't have the gadgets, but because lecturers don't have the knowledge on how to use the equipment*

S6 (Klerk) *It is fine, it is very good, actually love it. When they use a projector, power point, it is easier for me to later learn, but if they use a hard copy in dictating notes it's difficult to get the copy as someone might also want that copy. Use of technology helps for example like a projector you can easily from the back because it has light, unlike using just a white board, maybe they are using a marker which is not even clear. If they use loud speakers for showing videos, even those with hearing aids can hear.*

S7 (Titie) *When technology is used we benefit a lot. In my main subject we have only one interactive board which is rarely used. The interactive board is rarely used I think because it is the only one in the department and several classes have to use it, some of the lecturers cannot even use it or they just don't like it.*

10. How does use of technology affect the fulfillment of your expectations on joining college?

S4 (Biala) *I expected the best and not to wait for one projector whose beaming is not visible for one seated at the back. It benefits fast learners, for us slow learners we get left behind. We are benefitting, but some lecturers are not good at using the technology, in fact most of*

them really. Some of them don't want to use it. During lockdown there were assignment we were supposed to submit online through internet, email and the like, some lecturers would say I don't have data, computer or smart phone, so I want a hard copy, which shows resistance to technology by such lecturers.

S5 We learners, we seem to judge if a lecturers comes into room with a projector and the like we are actually expecting something better, videos, visuals things where everyone benefits from this lesson, but if after thirty minutes you have not yet projected anything we tend to judge and next time you come with the same projector everyone will be like nothing again. We judge you because of your teaching methods. We have students who are very bright and others who are just in the middle. Those who are bright will be like I won't waste my time here, let me go to the library and read for myself, what is the topic.

S6 (Klerk) my expectations were rather simple, I was expecting that I leave this college I will be science guru. Such when I go out there I will be preaching science. It has helped even if a lecturer makes drawings on the white board and you don't understand you can later play a video from you tube for better understanding.

S7 (Titie)

11. Which technologies do lecturers use to support learning for students with these disabilities?

a. physical disabilities

S4 (Biala) Microphones to cater for those with hearing problems, projectors, charts,

S5. The problem is not with the lecturers, but the institutions they use the technology that is there. They are using projectors every day because that is the only type of technological gadgets available. We don't have computers which can cater for every learner in this institution. Whilst the lecturers are part of the institution, but may be they are not part of the accounts or management system that does procurement. May be the lecturers have to tell the administration that I need this equipment for a particular student with disability.

S6 (Klerk) Am not sure if there is technology that supports them, laptop,

S7 (Titie). ..

b. visual impairments

S4 (Biala)....

S5.....

S6 (Klerk) projector for power point,

S7 (Titie) Projector, handouts, phone laptop

c. hearing impairments

S4 (Biala).....

S5.....

S6 (Klerk) Speakers

S7 (Titie).

12. Which other gadgets can lecturers use to support learning for students with these disabilities?

a. physical disabilities

S4 (Biala).....

S5. *Electronic textbooks*

S6 (Klerk) *Computer that converts voice to text*

S7.text to speech

b. visual impairments

S4 (Biala) *Audios*

S5 *Electronic textbooks*

S6 (Klerk) *Laptop with adapted key board, projector that functions with a camera to bring enlarged content to the learner*

S7 (Titie) *Computer that transmits signals to students' individual tablets*

c. hearing impairments

S4 (Biala) *Hearing aids, emails,*

S5 (Gemu) *Electronic textbooks*

S6 (Klerk) *Projector, microphone, speakers, videos with a sign language interpreter*

S7 (Titie) *Localized radio frequency that a student can adjust to desired volume.*

13. What successes& challenges do you realize by use of technology in your learning?

S4 (Biala) *I didn't know how to use the computer, hence the use of the technology helped to be computer-literate, to be able to also send an email and edit. When I went for TP, I was able to use power point presentations, audios and the like. Failures in use of technology include, it takes time to set up and lack of knowledge by some lecturers.*

S5 (Gemu) *It helps in passing information from student to student, we are doing that on our phones, with our laptops, on email and we are using internet. The use of projectors helps in quick coverage of information. Can pass information from lecturer to students. We can pass assignments and get our marks as feedback and registering online.*

S6 (Klerk) *Use of gadgets help us to see and understand, but the projector at times produces light that irritates one's eyes.*

S7 (Titie) *I missed lessons and I go get tutorials from you tube, I eventually got higher marks than those with good vision.*

14. At what stage do you mostly experience use of technology gadgets in lecture sessions? (Introduction, session development, student activities, conclusion).Give reasons.

S4 (Biala) *from the start, i.e. from the beginning of the lesson to the conclusion*

S5 (Gemu) *They introduce then start using the projector during lesson development, so it is mostly used in the body of the lesson.*

S6 (Klerk) *Use the technology for the whole lecture, at times they used it at introduction.*

S7 (Titie) *mainly in the board where they are sharing their notes.*

15. How often do lecturers use technology equipment that benefits students with disabilities?

S4 (Biala) *Twice a month*

S5 (Gemu) *in the main subject we don't use it, we only used technology with one lecturer who has since left the college*

S6(Klerk). *They use it once a month at times none at all. For example, I remember in my subject area since I was in first year there this lecturer who has only used the projector with us twice. The second time he used it was last week. If lecturers use technology it is not for the benefit of us students with disabilities, but as an alternative method, I remember one lecturer said I could not print the test question papers, therefore I am going to project it.*

S7 (Titie). *In my main subject it has been close to none. In other lectures it is for about 10% per month. They are doing it for us, but they are doing it for themselves, but we actually benefit in the process.*

16. What are the possible reasons for this frequency in use technology in lectures?

Low

S4 (Biala) *It is low, because of lack of knowledge on how to operate it by the lecturers, lack of resources, adaptors are not functioning properly and at times power cuts.*

S5 (Gemu) *We were asked to send questions by email and only about ten did it, it appears we prefer hard copies because that is what we are used to*

Average

High

S4 (Biala)

S5 (Gemu)

17. Do pre-service teachers with disabilities need special attention in processes of technology mediated teaching and learning? (Give reasons).a

S4 (Biala) *Ya-ah, they do, for the reasons that we need assistance since we are not able like the other normal students*

S5 (Gemu) *It depends with the stage or level of disability. Talk about mild or severe where you can see that this student is not hearing anything. You can give special tutorial at a time set for him or her. Considering the large class sizes that exceed 300, the lecturer may not be able to give specialized attention as well as cater for the others.*

18. Comment on administration support for technology use in the learning of students with disabilities. (E.g. modifying infrastructure, learning contexts, availing technology equipment, organizing staff development sessions).

S4 (Biala) *The administration so far, they have to work hard actually. They still need to give more support so that they cater for everyone, that is the abled and the disabled.*

S5 (Gemu)....

S6(Klerk). *They bought those projectors, they see to their maintenance and security.*

S7 (Titie) *They introduced computers, projectors and the internet. Which has really helped us*

Sub-question 2

How do teacher educators facilitate technology - mediated teaching for pre-service teachers with disabilities?

19. Which policy documents guide enrolment of students with disabilities, Inclusive Education and use of technology use in the college?

S4 (Biala) *I don't know of any*

S5 (Gemu). *I don't know of any.*

S6. (Klerk) *I don't know any*

S7.(Titie) *No I don't*

20. Comment on your lecturers' capacity to use technology gadgets in lecture sessions.

S4 (Biala) *some of them they can, but others still need lessons to be computer literate. If the administration can organize workshops to teach the lecturers on how to use the technology, it can help and benefit us. Use of technology as of now is just average.*

S5 (Gemu) *the same as S4*

S6 (Klerk). *Most of our lecturers don't use them, some have their own reasons, whilst others don't know how to use them. Some even if you get into their offices they don't even have computers in their offices, and you can't expect them to try to use a projector. It appears technology was out of their generation.*

S7 (Titie). *I feel that there is a lot of negative attitude towards the use of technology. Since there is lot of preparation that has to be done before the lecture and it increase4s the amount of work they have to do before a lecture, hence they shy away from using technology, because of the amount of preparation needed*

21. Comment on selection, setting-up and operating of technologies in lecture sessions?

S4 (Biala) *normally lecturers choose the technology that they are good at They select using their knowledge of the technology. Selection is done by lecturers, we have never been involved in that, we just see the doing their thing. In setting students we assist and in operating*

S5 (Gemu) *There is no variety in the use of these technology gadgets; we see a projector today we are going to see a projector tomorrow and the day after tomorrow. It is the only thing available in the college. In fact they cannot even use it and they are not even knowledgeable on how to use it or how to operate it. They actually ask for help from students. There should be workshops for the lecturers on how to use the technologies.*

S6. *They use it as an alternative because of lack of resources. They involve students in setting up the technology. In my subject area there is this lecturer who always makes sure that whenever she uses a projector, I am the one who sets it up. Whenever she walks into the lecture room with the projector, I would go up and set it up.*

S7. *Since this is real use, most lecturers would do it themselves. Those who can't ask students to help.*

Sub-question 3

How do pre-service teachers with disabilities experience technology - mediated teaching and learning?

22. Comment on the way lecturers deal with students with disabilities in comparison to how they deal with colleagues without known disabilities in lecture sessions?

S4 (Biala) *we are treated the same during the lesson, because in most cases in mass lectures we will be just seated together.*

S5 (Gemu) *these lecturers don't even know that there is this students with hearing or visual disabilities, well with physical disabilities that they can see, but there is no special treatment.*

23. How have lecturers involved you in selecting or setting up and operating technology equipment in lecture sessions?

S4 (Biala) *By just helping in setting the equipment that's how we are involved, but in selecting the gadgets we are not involved, they just come with their gadgets and we help them in setting up.*

S5 (Gemu)...

24. Comment on technology mediation and your grasp of concepts as students with disabilities.

S4 (Biala)...

S5 (Gemu).....

25 Relive instances that you enjoyed/benefitted when technology was used in lectures.

S4 (Biala) *It was on Health and Life Skills, whereby we were learning about STIs and HIV. The media which they used, like there were pictures and videos of real organs. Different types of STIs being shown on the power point, so I cannot forget that one it stuck in my mind.*

S5 (Gemu). *The same with me it was in 2018 in the Great hall.*

S6 (Klerk). *In a Psychology lecture, the lecturer used a video with a projector in the introduction it was fantastic. For me, she later finished her two hours explaining, but I had already understood everything she was trying to talk about. That video clearly stated out what she was trying to say. The technology on that day it actually helped you to understand even before the lecture had started explaining or writing on the board which we didn't even see clearly.*

S7(Titie). *The same instance narrated by S6.*

26 Share instances in which technology was used but you did not enjoy or felt uninspired in the session.

S4 (Biala)

S5 (Gemu) *It was when the lecturer was teaching about supervision. It was our first time; he didn't know that we had not done anything on management. He brought his equipment and assumed we had done something about management. He was telling us what he knew, there was no learning taking place at all.*

S6 (Klerk). *In my subject area when the lecturer was using a projector, he was beaming a periodic table in Chemistry. The problem with the periodic tables is that they have very small numbers, I was actually even sitting not so far away from the board but I could not even see. I felt left out. The whole lecture was on the periodic table, that's why he even projected it. I had a periodic table on my phone but I could not use it, as I could not relate with what he was saying and explaining. I feel like he misused technology on that day.*

S7 (Titie). *In the lecture theatre, a space where there are supposed to beam the material is taken by another board, where a fixed projector is supposed to be used, but they bring a smaller projector, which gives smaller pictures, the information is skewed it does not appear properly, they tell you to relate to something that is there but the screen is very small that I cannot see, hence I end up relying on the auditory and the visual suffers.*

27. How can use of technology to support learning for students with disabilities be improved?

S4 (Biala) *they should work hard to buy a lot of technological gadgets that cater for everyone and also teach those who are going to deliver the lectures.*

S5 (Gemu) *First they should know that they have so and so who are disabled. If you do not know that you have disabled learners in the institution you won't know what equipment to buy. You would then know whether you are going to buy braille or those electronic books.*

S6 (Klerk). *Most lecturer know that there are students with disabilities, but they tend to ignore it. For example if a lecturer puts up a projector in a lesson, I expect him or her to ask whether the beamed material is visible to everyone. For example in a mass lecture of 5000 and there is only me who cannot see, I cannot keep on saying can you please increase the font. They should even make the font very very big to also benefit us. You can't say you have a projector hat is only seen by those without disabilities excluding us.*

S7 (Titie). *There is need for training to be in a position to sympathize and empathize with students with disabilities. That would improve the quality of teaching.*

28. Do you have anything else to share, regarding use of technology to support the learning of students with disabilities?

S4 (Biala) *Lecturers should be involved in the processes; maybe they should be told that there is so and so who is disabled. When we are seated like this, as students no one can tell that I am disabled, so lecturers should be told. I think they are not told anything; it is only the dean of students and the administration that may know.*

S5 (Gemu) *Recently we had a sign language course, so if we have learners who don't hear we can sign to them. We want these courses more often. This is so discouraging; some of the learners can't even enroll here because they know that we don't have the special lecturers that are conversant with sign language. We do not have a blind or deaf lecturer.*

S6 (Klerk). *The institutions should properly educate its staff on types of disabilities. Some of the staff they know disability but they do not know how to handle it, how to cater for it, how to deal with such a learner. For example I have a sight problem, my sight is affected by light, I should not be exposed to much light that's why I am always wearing a hat. My lecturer in charge said I don't want to see you wearing a hat in class. So even if I sat in front I could not see because a lot of light was reflected onto my eyes. The administration should educate everyone from lecturers to the security officers. They should allow the use our electric gadgets like the smart phones, as for me if I write notes I might have problems reading them later. Some lecturers when they see one using the phone they think we are on whats-app. Before they make their decisions and policies they should actually engage us as students with disabilities. Even the principal should say all those who have disabilities come, what do you*

want us to improve. As for me I know what I want. The principal does not know what I want. There are things that the principal may think we want, but that may not be what I want. Involve us, ask us questions where do you want improvement, what should be done. We know more than they do because we are the people living with the disabilities. The lecturers and admin should not expect a person with disability to perform to the same level with those without disabilities. We should be given more time to carry out tasks and assignments.

S7 (Titie). Lecturers should be trained in helping those with special needs and what affects them in learning. Try to involve the new technologies which are being introduced that help the students to learn. We need special treatment like being given soft copies of notes to beamed beforehand so that we read through them, so that can benefit from the lectures like those without disabilities.

Appendix T: Observation record for Barakasi' lecture session

Nature of Observer: Non-participant

Number of Pre-Service Teachers in the Session: 506

Topic: Management and supervision in Education

Date: 02 - 03 - 2020

Time: 0800 - 10.00

Duration of Session: 2 hours

Title: Influence of technology-mediated teaching and learning on the preparation of pre-service teachers with disabilities

Main Research Question: *How does technology-mediated teaching and learning influence the preparation of pre-service teachers with disabilities?*

Sub-Research Questions:

1. *What are the inclusive practices of in the preparation of pre-service teachers with disabilities?*
2. *How do teacher educators facilitate technology - mediated teaching for pre-service teachers with disabilities?*
3. *How do pre-service teachers with disabilities experience technology - mediated teaching and learning?*

Observation Point	Observations noted
Planning and preparation Learning context (<i>conformity to UDL (representation, action and expression)</i>) Sitting arrangement for students Technology equipment availed. Source materials Original documents, Pictures/drawings Models, Realia Observation Point	Observations noted - Majority of students were accommodated at a lower sitting area facing a screen on a raised platform.- At the back was another raised platform adjacent to the entrance, which accommodated one student with multiple physical disabilities. - Students had liberty to choose where to sit according to personal preferences. -Most students with disabilities sat among colleagues, two with visual challenges inconveniently sat at the back and this was not noticed by the educator. -laptop, projector, smart phones, tablets, student laptops. Power point soft copies of content, flash stick, handouts, realia in the form of student representatives who held posts of responsibility in the institution, although none of them had visible disabilities except spectacles Observations noted

Aims and objectives Embracing students with disabilities. Attainable by students with disabilities. Sensitivity to students with disabilities. Adaptations/alternatives for inclusiveness Varied representation, expression and engagement (UDL). Student settling down/readiness Seating arrangement (UDL) (physical, visual and hearing impairments) Orderliness (inclusiveness) Setting up of technology equipment Students Enthusiasm/Eagerness to learn	These appeared inclusive enough as the educator strived to prepare all the students to be potential leaders & managers in education contexts, regardless of abilities or disabilities. They were achievable by all, regardless of one's disabilities. They were reasonably sensitive as no offensive language was used or any statements that demean students with disabilities were used. A raised platform adjacent to the entrance evidences conformity to UD principles. Although it could have been put in place by default. It however aided access by one with physical disability and made focus and visibility of material screened in the front easier. Varied presentations were noted. Visual, auditory, realia and exemplifications of local and familiar leadership protocols were used effectively. All were free to choose where to sit. Wheel chair users and those with crutches sat at the back for convenience of entry and exiting. Although one with albinism sat at the back row and was straining eyes to read from the screen sadly, the educator did not notice it. This particular student left the room half way into the session to do something else. My later follow up revealed proved that the student had failed to read the screened text and decided to leave. Every student chose where to sit by preference. Students encouraged each other to be quiet and orderly even before the lesson commenced. Student leaders or representatives assisted the educator in setting up the equipment. However none of them was from the group with disabilities. Majority of the students with disabilities were very attentive, apparently not to miss out any aspects in the session. This was probably a way to respond to weakness caused by their impairments, therefore was a way to cope with disability.
Session introduction Technology use: Provision for UDL Application (SAMR) for the <i>physical, visual & hearing impairments</i>.	Among student representatives involved in session introduction there were none with disabilities. Though audibility of educator's voice was favourable, use of speakers could have counteracted effects of poor acoustics in the large room. -the educators made constant reference to the need to uphold inclusiveness in all learning engagements as a reminder to all.

Observation Point	He also loudly lamented the unsuitability of the context of learning and the absence of a suitable screening surface as some equipment could not be located. Some student representatives came in later as they were allegedly trying to locate a suitable portable screen to be used. Observations noted
Inclusiveness Participation by students with : Physical impairment Visual impairment Hearing impairment <i>(Attentiveness, volunteerism for tasks).</i> Session progression Teaching/learning approaches (UDL) Educator presentations Questioning Notes giving/taking Whole group discussions Small group work Pair work Individualized technology based tasks & Other approaches Recall, narration, description Reference books/ original documents. Handouts/models/realia/pictures <i>(UDL for inclusiveness/Depth of technology use (SAMR)</i>	Participation from students with disabilities was minimal. The one sitting at a platform by the entrance raised hands to signal intention to contribute in discussions, but this was not noticed by the educator, which frustrated the student. The student only got the opportunity to contribute towards end of session. The isolated sitting seem to propel exclusiveness which can be stigmatizing. The educator made effort to ensure that explanations were loud enough to be heard by all. He kept shifting positions to enable monitoring i.e. student attentiveness. Questioning techniques were appropriate and well thought out. Statements and phrases used were sensitive to all students and the educator allowed room for synthesis before responses were called for. Whole group discussions were used but did not effectively capture participation of students with disabilities, except the one at the back who was largely ignored by the educator, though not deliberately. This was never used. Pair work was limited and it had not been planned for. Those who did was not by design, however the one sitting alone was deprived of that opportunity and could not share or compare notes with anyone. Students mostly used own laptops, smartphones and tablets in capturing notes. The educator urged all students to read further on the topic from the library and the internet. Power point was used effectively for concept description and recap of main points. Students were referred to some books in the library, but no internet sites were provided to enhance use of technologies.

	Group reps. Were given hard copies of handouts with notes and those interested could access them and photocopy. The educator had a list of students with disabilities and indicated that hard copies for each one of these would be given after the session. The absence of provision of web and internet sites by the lecturer stifled use of technology in research.
Observation Point	Observations note
Session conclusion Technologies used Involvement of students with disabilities to assess accomplishment of objectives Successes of technology mediation noted Challenges of technology mediation noted Overall observance of UDL Overall observance of SAMR	Laptop computer, projector, smartphones, tablets. None of the students with disabilities was evidently actively/evidently involved actively at this phase of the session. The laptop, beamer, smartphones and tablets assisted in clarifying points and helped students to capture notes, Visual presentations and verbal audio narrations from the educator assisted in concept and knowledge acquisition. Handouts catered for students who had failed to cope with note taking due to various impairments and other challenges. The lecturer was able to cover the planned work within the session. Better audibility for every student could have been achieved if the speakers mounted in the room were functional. Students with disabilities were deprived of the opportunity to also learn and practice setting up and use of the available technologies. The venue satisfactorily facilitated suitable sitting for students with disabilities and beaming of content on the screen. However, either students are not supported or empowered to claim appropriate positions as evidenced by those straining to see from the back. The necessary equipment like screening board and speakers are in place but lacks repair, maintenance and easy accessibility by lecturers Basic Substitution and Augmentation were predominant in technology use. There was very little if not none Modification and Redefinition in technology use. Therefore, SAMR stages are still far from being achieved in technology use.

Appendix T: Record of observation in Chimbadzi's lecture session

Nature of Observer: Non-participant

Number of Pre-Service Teachers in the Session: 450

Topic: Child abuse

Date: 04-11-2020

Time: 0800 - 1000

Duration of Session: 2hrs

Title: Influence of technology-mediated teaching and learning on the preparation of pre-service teachers with disabilities

Main Research Question: *How does technology-mediated teaching and learning influence the preparation of pre-service teachers with disabilities?*

Sub-Research Questions:

- 1. What are the inclusive practices in the preparation of pre-service teachers with disabilities?*
- 2. How do teacher educators facilitate technology - mediated teaching for pre-service teachers with disabilities?*
- 3. How do pre-service teachers with disabilities experience technology - mediated teaching and learning?*

Observation Point	Observations made
Planning and preparation Learning context (<i>conformity to UDL (representation, action and expression)</i>) Sitting arrangement for students Technology equipment availed. Source materials Original documents, Pictures/drawings Models, Realia Observation Point	 Majority of students were accommodated at a lower sitting area facing the stage. At the back was another raised platform adjacent to the entrance, which accommodated one student with multiple physical disabilities. -Students had liberty to choose where to sit according to personal preferences. -Most students with disabilities sat among colleagues. . -laptops, projector, smart phones, tablets, student laptops. Handouts, magazines and other periodicals that had articles related to the topic of the day and these were later used for group discussions

	Observations made
Aims and objectives Embracing students with disabilities. Attainable by students with disabilities. Sensitivity to students with disabilities. Adaptations/alternatives for inclusiveness Varied representation, expression and engagement (UDL). Student settling down/readiness Seating arrangement (UDL) (physical, visual and hearing impairments) Orderliness (inclusiveness) Setting up of technology equipment Students Enthusiasm/Eagerness to learn	The educator made effort to make all the students aware of aspects on Child abuse and organizations that promoted children’s rights and helped to manage cases of child abuse at local and national levels. At the start of the session lights were switched off in the room, such the educator had to adjourn the session temporarily as she went to get a technician to switch them on. This was after students had complained of poor visibility. These appeared achievable by all, irrespective of one’s disabilities. Language used by the educator were not in any way demeaning to students with disabilities. There was a raised platform adjacent to the entrance, which evidenced UDL as it accommodated a student with physical disabilities, hence would have found it difficult to use the steps to access the lower seating area where other students were seated. The platform further helped the student to have better view of presentations made from the front stage... Varied presentations were noted. Visual, auditory, and exemplifications of local and familiar organizations. Group work and group presentations were also used. Students chose where to sit freely, however, they kept trickling in as the session progressed... Those with crutches sat at the back for convenience of entry and exiting. Apart from those with crutches, the rest of students with disabilities sat among colleagues. Majority of the students with disabilities were very attentive, apparently not to miss out any aspects in the session. This was probably a way to respond to weakness caused by their impairments; therefore this could have been was a way of coping with personal disabilities. Satisfactory orderliness was noted, though this could have been better. Probably this was exacerbated by the large group size

	The educator was assisted by student representatives in setting up technology equipment. Among them was none with disabilities. Majority of the students with disabilities appeared very attentive and eager to grasp all concepts.
Session introduction Technology use: Provision for UDL, Application (SAMR) for the <i>physical, visual & hearing impairments</i>. Inclusiveness Participation by students with : Physical impairment Visual impairment Hearing impairment (<i>Attentiveness, volunteerism for tasks</i>). Session progression Teaching/learning approaches (UDL) Educator presentations Questioning Notes giving/taking Whole group discussions Small group work Pair work Individualized technology based tasks Other approaches Reference books/ original documents	Though audibility of educator's voice was favorable, use of speakers could have counteracted effects of poor acoustics in the large room. The student with disability who sat on a platform by the entrance raised hands to contribute on several occasions which was not noticed by the educator, which frustrated the student. She was only given chance to contribute towards end of session. The isolated sitting seem to propel exclusiveness which can be stigmatizing. Students with disabilities were actively involved in group work tasks and they used smartphones to seek for information that helped them tackle group tasks. The educator pitched her voice highly as she presented to ensure audibility by all students, regardless of whether one sat at the front or at the back. She kept shifting positions to enable monitoring student attentiveness. Questioning techniques were appropriate and well thought out. Statements and phrases used were sensitive to all students and the educator allowed room for synthesis before responses were called for. Whole group discussions were used but did not effectively capture participation of students with disabilities, except the one at the back who was largely ignored by the educator, though not deliberately. This was not used. Pair work was limited and it had not been planned for. Those who did was not by design, however

	the one sitting alone was deprived of that opportunity and could not share or compare notes with anyone. Students mostly used own laptops, smartphones and tablets in capturing notes. The educator urged all students to research further from the library and the internet to get more information on the topic. Power point was used effectively for concept description and recap of main points. Students were referred to some books in the library, but no internet sites were provided to enhance use of technologies.
Session conclusion Technologies used Involvement of students with disabilities to assess accomplishment of objectives Successes of technology mediation noted Challenges of technology mediation noted Overall observance of UDL Overall observance of SAMR	Laptop computer, projector, smartphones, tablets. The laptop, beamer, smartphones and tablets assisted in clarifying points and helped students to capture notes, Visual presentations and verbal audio narrations from the educator assisted in concept and knowledge acquisition. Students used by the educator as she prepared group tasks The lecturer was able to cover the planned work within the session.no equipment specialized for particular disabilities was noted in this session Better audibility for every student could have been achieved if the speakers mounted in the room were functional. Power had not been switched on at first, such that students with laptop batteries that were defective could not use them initially until power was switched on. The venue satisfactorily facilitated suitable sitting for students with disabilities and beaming of content on the screen. However, either students are not supported or empowered to claim appropriate positions as evidenced by those straining to see from the back. Basic Substitution and Augmentation were predominant in technology use. There was very

	little if not none Modification and Redefinition in technology use. Therefore, SAMR stages were far from being achieved in technology use.
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Appendix V: Record of observation in Chibwe's lecture session

Nature of Observer: Non-participant

Number of Pre-Service Teachers in the Session: 450

Topic: Relationship between the school and community

Date: 03-10-2020

Time: 10.30 -1230

Duration of Session: 2hrs.

Title: Influence of technology-mediated teaching and learning on the preparation of pre-service teachers with disabilities

Main Research Question: *How does technology-mediated teaching and learning influence the preparation of pre-service teachers with disabilities?*

Sub-Research Questions:

- 1. What are the inclusive practices in the preparation of pre-service teachers with disabilities?*
- 2. How do teacher educators facilitate technology - mediated teaching for pre-service teachers with disabilities?*
- 3. How do pre-service teachers with disabilities experience technology - mediated teaching and learning?*

Observation Point	Observations made
Planning and preparation Learning context (<i>conformity to UDL (representation, action and expression)</i>) Sitting arrangement for students Technology equipment availed. Source materials Original documents, Pictures/drawings Models, Realia	The room was spacious, which allowed free movement for the students, even those on wheel chairs or that used crutches. This depicted UDL in that students could decide where to sit depending on one's disabilities and preferences. Students had freedom to choose where to sit , hence that were conscious of personal disabilities like hard of hearing could decide where to sit, but surprisingly some such students decided to sit at the back. The laptop and beamer were used, by the educator, whilst students used their own personal gadgets like smart phones- Prepared hard copy of notes was used.

Aims and objectives Embracing students with disabilities. Attainable by students with disabilities. Sensitivity to students with disabilities. Adaptations/alternatives for inclusiveness Varied representation, expression and engagement (UDL). Student settling down/readiness Seating arrangement (UDL) (physical, visual and hearing impairments) Orderliness (inclusiveness) Setting up of technology equipment Students Enthusiasm/Eagerness to learn	There was satisfactory accommodation as students with disabilities were allowed to use their own gadgets freely. These were attainable by all students irrespective of ability or disabilities. It appears the issue of creating a conducive school climate and culture was an issue that affected or could be affected by all the pre-service teachers. I noted that from time to time the educators would ask whether those seated at the back of the room were getting what he was saying clearly. Although I noted a few adaptations, it appeared the atmosphere was satisfactorily conducive. Dictation, presenting, explaining, question and answer were used. The group was too large, comprising over 400 students, such that audibility was not that good and was compounded by echoes made by the walls. There was calmness and satisfactory orderliness, though a few students kept trickling in well after the session had started. The educator was assisted to set up the equipment by some students who worked together with a technician from the department. This involved the laptop and a projector Students showed eagerness to learn as a sizeable number was already seated before time and awaited arrival of the teacher educator.
Session introduction Technology use: Provision for UDL Application (SAMR) for the <i>physical, visual & hearing impairments</i>. Inclusiveness Participation by students with : Physical impairment	Question and answer was used to introduce the session. Students were asked to reflect on their personal perceptions as they got to the school for teaching practice. Whenever big terminologies were used, I noted students consulting their phones through Google search to verify. Students with physical disabilities were seen capturing the notes by writing and even the ones with visual impairments.

Visual impairment Hearing impairment (<i>Attentiveness, volunteerism for tasks</i>). Session progression Teaching/learning approaches (UDL) Educator presentations Questioning Notes giving/taking Whole group discussions Small group work Pair work Individualized technology based tasks Other approaches	Students with hearing impairment, particularly those sitting at the back frequently asked for the educator to repeat some of his statements as he presented. This was despite the fact that the educator tried to raise the pitch of his voice as he presented. Sequential and easy to follow for most students, even those with that were slow in writing and typing appeared to cope. These appeared to have been well thought out and appropriately structured to solicit for desired responses. Although comprehensive notes were given, it appeared in the end some students with physical and visual disabilities had tired and apparently abandoned note writing and just resorted to listening. Discussions were done as the whole group, particularly when the educator had posed an issue for discussion or a question. None none no specific tasks re given to the students, apart from copying the notes as given and presented by the teacher educator. I noted that after students were given a ten minute mid lecture break, most of those that occupied the back seats did not come back for the second part of the lecture. Only those with visible disabilities remained for the full session amongst those that sat at the back. Probably such students were wary of losing out or they felt their absence would be noticed easily or were afraid of being chastised.
Recall, narration, description Reference books/ original documents.	Students were constantly reminded to reflect on episodes they experienced whilst on teaching practice The educator gave reference texts for students to refer to for further information on the topic.

Handouts/models/realia/pictures <i>(UDL for inclusiveness/Depth of technology use (SAMR))</i> Session conclusion Technologies used Involvement of students with disabilities to assess accomplishment of objectives Successes of technology mediation noted Challenges of technology mediation noted Overall observance of UDL Overall observance of SAMR	No handouts were provided in this particular session Satisfactory compliance to UDL was noted, although it was a bit difficult to evaluate. SAMR was also not easy to assess in this instance as most activities were centered on note giving and note taking. Students with disabilities were not given any priority or considered by the educator. The laptop was used effectively Smart phones were satisfactorily used, though more could have been done in respect of technology use It appears power outlets or plugs that were closer to the stage had no power and some had been vandalized. This forced a change in the set up and sitting arrangement, where students had to face away from the stage so as to take advantage of the functional plugs on the other side of the room Satisfactory, after the mid lecture break some students did not return for the second part of the session, though the educator was trying to cater for students with a shorter concentration span by giving the time to refresh. SAMR was difficult to assess due to the approach used by the educator Students were given questions to go and work on e.g. The school is the head. Discuss. Discuss how a school head can create a conducive climate and culture at the school.
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