

**PREDICTORS OF ONLINE LEARNING RETENTION
OF UNIVERSITY STUDENTS WITH LEARNING DISABILITIES**

by

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Submitted in partial fulfilment of the requirements for the degree

in

PhD Education

in the Faculty of Education

at the

UNIVERSITY OF PRETORIA

May 2025

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Declaration

I, KHLOOD ALMASOUD, hereby declare that this thesis titled "*Predictors of Online Learning Retention of University Students with Learning Disabilities*" is my original work and has not been previously submitted, in part or in full, for any degree or qualification at any other university or institution. All sources used in preparing this thesis have been appropriately acknowledged and referenced. The thesis complies with the university's plagiarism and academic integrity rules. I understand that any form of academic dishonesty, including but not limited to plagiarism or falsification of data, will result in the rejection of this thesis and may lead to disciplinary action.

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PhD
Predictors of online learning retention of
university students with learning disabilities

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APPROVAL TO COMMENCE STUDY

24 November 2022

DATE OF CLEARANCE CERTIFICATE

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In conducting this research, I ensured that:

1. **Informed Consent:** All respondents were provided with clear and comprehensive information about the purpose and nature of the study, and informed consent was obtained from each respondent before their involvement in the study.
2. **Confidentiality and Privacy:** I ensured that all respondent data was treated with the utmost confidentiality. Personal details and responses were anonymised to protect respondents' privacy.
3. **Voluntary Participation:** Participation in the study was completely voluntary, and respondents were informed that they could withdraw at any time without any negative consequences.
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This research was conducted in full compliance with ethical principles, and all procedures followed were designed to ensure the integrity and reliability of the research outcomes.

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Dedication

I dedicate this research to my husband and children for their support throughout my studies. It was not easy, but with their encouragement and support, I am here.

Acknowledgements

Reaching this significant milestone in my life would not have been possible without the support and encouragement of several remarkable individuals. I want to express my deepest gratitude to the following:

- My loving husband and children, whose unwavering support and understanding have been a constant source of strength.
- My friends and relatives in South Africa, Saudi Arabia, and across the globe, for their encouragement and emotional support.
- My supervisor, Prof. M.R. Mampane, and my co-supervisor, Dr. A. Wilson-Fadijifor, for their invaluable advice, guidance, and inspiring motivation, especially during the challenging phases of this research.
- The language editor for her expertise in refining and enhancing the quality of this work.
- Lastly, but certainly not least, I wish to extend my heartfelt thanks to everyone who has contributed to my personal and academic journey, directly or indirectly. Your support has made this achievement possible.

Thank you all for your contributions.

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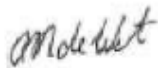
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Abstract

The aim of this study was to determine the predictors of online learning retention among university students with learning disabilities in South Africa. Then it developed a model of predictors of online learning retention among students with learning disabilities. Recognising the challenges faced by this often-overlooked minority group, the study tested a model of relationships between several environmental and personal factors influencing online learning retention. Guided by Bronfenbrenner's ecological systems theory, which explains how individual development is shaped by multiple environmental systems, the study adopted a descriptive study design and a quantitative approach. A total of 256 university students with learning disabilities participated, selected using a random sampling technique. Data collection involved the use of a self-administered instrument, and analysis included Exploratory Factor Analysis, Confirmatory Factor Analysis, and Structural Equation Modelling using the MPLUS software. Findings reveal positive relationships between online retention and factors like family and social support, technological constraints, digital fluency, lecturer understanding, motivational factors, institutional training capacity, and faculty technological proficiency. The model showed good fit, confirming the proposed relationships. This study contributes to the growing body of knowledge on online learning retention, offers a validated model for understanding predictors among students with disabilities, and offers practical strategies for enhancing their academic success in online environments.

Keywords

Online Learning, Online Learning Retention, Learning Disabilities, Ecological Systems Theory, Student Retention

List of abbreviations

ADA	Americans with Disabilities Act
CFA	Confirmatory Factor Analysis
COI	Community of Inquiry
EFA	Exploratory Factor Analysis
ELT	E-Learning Theory
EST	Ecological Systems Theory
HE	Higher Education
HEIs	Higher Education Institutions
LDs	Learning Disabilities
OER	Open Educational Resources
SEM	Structural Equation Modelling
SPSS	Statistical Package of Social Sciences
UDL	Universal Design for Learning
UoPeople	University of the People
USUNCRPD	United States and the United Nations Convention on the Rights of Persons with Disabilities

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CHAPTER ONE: GENERAL ORIENTATION

1.1 INTRODUCTION

This research determines the predictors of online learning retention of university students with learning disabilities (LDs). The chapter provides an overview of the entire study, highlighting the critical and central aspects of the problem statement. The problem statement determines the context in which this chapter should be developed. The research document presents elements such as the introduction and background, the research objectives, the research questions, the value of the research, the literature review, and the methodology. Hence, the research problem is first succinctly stated in this chapter, and other aspects are then discussed to guide the flow of the entire research. An abbreviated literature review is provided in this chapter, while more detailed theoretical perspectives and a review of the literature are presented in Chapters 2 and 3, respectively. Following this, a snapshot of the methodology is provided, followed by detailed methods and techniques in Chapter 4. Having provided an overview of the chapter, the next sections discuss the key concepts to provide the context of this research.

A comprehensive understanding of the cohort with LDs and the higher education (HE) environment is important since it focuses on a minority population that often goes unnoticed. The present study, therefore, examines the predictors of retention among students with learning difficulties studying at the university level and how this information assists in devising learning strategies to enhance the throughput rates of students with disabilities using online platforms. Several key concepts, including disabilities, learning disabilities, online learning, and online learning retention, are defined, which provides the context in which these concepts are applied in the study.

1.2 CONTEXT AND BACKGROUND OF THE STUDY

As stated earlier, this study is conducted among university students with learning disabilities. McGregor et al. (2016) define disability as a concept signifying

“a heterogeneous group of disorders manifested by significant difficulties in the acquisition and use of listening, reading, writing, reasoning, or mathematical abilities. The disorders are intrinsic to an individual, presumed to be due to central nervous system dysfunction, and may occur across the lifespan”.

The extent of the disability determines the level at which individuals experience learning difficulties. Schwartz et al. (2021) and Cook and Rau (2018) note that different LDs have distinctive neurological etiologies. In determining the various levels of disabilities, most institutions use standardised test scores to uncover differences (Cataudella et al., 2021; Lipka et al., 2019). Extant literature has confirmed that students with learning disabilities globally experience several challenges, and this could be worse when the learning process is via the use of online platforms. Learning difficulties refer to challenges or problems a learner experiences in acquiring and using academic skills, such as reading, writing, speaking, listening, reasoning, or mathematics. The difficulties are not due to low intelligence, poor teaching, or lack of motivation, but may result from neurological, cognitive, or emotional factors that affect how the brain processes information.

1.2.1 Online Learning

Several previous researchers agree that the concept of online learning has had multiple conceptualisations, such as inter alia, distance learning, e-learning, and web-based learning (Mpungose, 2020; Wang et al., 2019). The similarity between the learning methods is that there is a physical separation between students and lecturers or instructors. Using distance learning involves providing educational materials that allow students to study independently away from an institution, while seeking additional support from their institutions (Bagarukayo & Kalema, 2015; Dalton et al., 2019). The support provided involves consulting academic professionals and guidance with registration processes.

Online learning, e-learning, and web-based learning are contemporary distance learning methods that utilise technology-based instruction and incorporate face-to-face interactions in virtual environments (Katzouris et al., 2016; Lebenicnik &

Istenic Starcic, 2018). The distinction between the latter concepts and practices lies in the use of interactive technology in virtual environments, which is absent in distance learning. Based on the definition, Gering et al. (2018) and Muljana and Luo (2019) view online learning as involving the use of technology and collaborative software to facilitate meetings in virtual spaces that depict a traditional classroom environment. The latter delineation of the concept of online learning is adopted since it suits the context of this study.

It is important to note that in the characterisation of the concept of online learning in this research, online learning covers three flavours of learning: synchronous, asynchronous, and blended learning (Johnson et al., 2022; Katzouris et al., 2016; Singh & Thurman, 2019). Synchronous learning involves conducting live virtual classes, webinars, and live lectures. The former are conducted over Microsoft Teams, Zoom, and Google Meet, providing an opportunity for students to interact and work simultaneously. The latter involves conducting live seminars or lectures, allowing students to participate and interact. Asynchronous learning involves using pre-recorded instructional videos that students can watch at their convenience, as well as discussion boards and forums, digital assignments and assessments, and online reading materials and resources. Blended learning involves hybrid courses integrating face-to-face and online instruction (Katzouris et al., 2016; Lebenicnik & Istenic Starcic, 2018; Singh & Thurman, 2019).

In contrast, educational activities that rely on something other than internet availability for delivery and instruction are not included in this study's definition of online learning. These activities include traditional in-person learning, such as face-to-face classes and in-person seminars and workshops that do not involve online participation (Hoi et al., 2021; Suhandiah et al., 2022). Also not included in the definition of online learning for this research are correspondence courses, informal online resources (YouTube, blogs, social media), and non-educational online activities such as gaming and social networking (Hoi et al., 2021). This research is conducted in the context of universities in South Africa that offer both contact and online learning (called hybrid learning). Accordingly, the concept of online learning must be clarified and distinguished from that of hybrid learning.

Online learning within a contact university describes those learning programmes delivered using the Internet by those HEIs that predominantly provide traditional, in-person (contact) sessions (Hoi et al., 2021; Singh & Thurman, 2019). This learning mode, offered along with the conventional face-to-face learning within contact universities, leverages digital platforms and tools to allow students to obtain programme materials, participate in discussions, submit assignments, and engage remotely with lecturers and colleagues. In contact universities such as the University of the Witwatersrand (Wits), University of Pretoria (UP), University of Cape Town (UCT), Stellenbosch University (SU), North-West University (NWU), University of Johannesburg (UJ), Tshwane University of Technology (TUT), University of Free State (UFS) and University of KwaZulu-Natal (UKZN), online learning uses learning management systems such as Moodle, Blackboard, or Canvas to host programme tools, manage assessments, and ease communication between students and their lecturers (Singh & Thurman, 2019). Unlike the University of South Africa, which is entirely online in South Africa, a few universities, namely the University of KwaZulu Natal, the University of Pretoria, the University of Western Cape, the University of Witwatersrand, and Stellenbosch University, were forerunners of online learning in addition to contact lecture sessions (Aishwariya & Kang, 2020). The lecturers use synchronous (live, real-time) and asynchronous (pre-recorded, on-demand) systems, incorporating video lectures, live webinars, discussion forums, and interactive activities.

Using the latter tools offers flexibility to students with other commitments and responsibilities, such as work and family. This allows them to finish their projects independently if they are within the deadlines, and actively participate in the programme activities (Meech & Koehler, 2024). With online learning, students can access digital resources such as e-books, journal articles, online libraries, and multimedia content that improve and enrich their learning experiences. This form of learning may be effective because it ensures communication and cooperation among peers and instructors using discussion boards, group projects, and virtual office hours. At the same time, students are subjected to online quizzes, examinations, and projects, and some institutions institute proctoring software to ensure academic integrity during online assessments (Gao

& Liu, 2023; Meech & Koehler, 2024). It is important to note that online learning is also provided in contact universities, and a combination of online learning and face-to-face is called hybrid learning.

1.2.2 Hybrid Learning

Several researchers define the concept of hybrid learning as a didactic model that blends face-to-face classroom instruction and virtual learning methods, where students attend classes remotely (Li et al., 2023; Nørgård, 2021). With this model, instructors use various online tools to share materials and assessments to support face-to-face classroom sessions. When the hybrid model is planned well, it blends the best aspects of in-person and online learning to ensure effective learning (Nørgård, 2021). For instance, it allows the instructors to focus more on supporting small groups or providing one-on-one instruction. Moreover, students in a hybrid learning setting can also control their learning since they can access the online content when it suits them and work at their own pace (Li et al., 2023; Li, 2022). The result is an engaging, motivating, and pleasant learning experience.

While the benefits of hybrid learning are recognised, scholars and educationists have noted its disadvantages. For instance, its reliance on technology, which requires reliable internet and devices, makes it expensive and unpredictable. Instructors and students may require additional resources to support hybrid learning (Sarwendah et al., 2023). Secondly, keeping and ensuring student engagement can be problematic, especially for the online part, if the students involved feel less connected and interested (Raes, 2022). Third, instructors and students may require assistance in managing and incorporating online and in-person factors that consume excessive time and are challenging (Yudaparmita et al., 2023). Fourth, since the interface involves technology, the quality of the interface between instructors and students may be impaired because online platforms sometimes require more proximity and depth of interaction experienced in face-to-face exchanges (Pavlidou et al., 2021). Fifth, using hybrid learning is not problematic in ensuring a constant learning experience for all students involved in the learning process. As different platforms are used to evaluate

students' performance, software and hardware glitches may disrupt learning and result in instability and distress (Wannapiroon et al., 2023). Finally, hybrid learning requires students to be self-restrained and flexible in managing online and in-person elements, which can be challenging for some students.

To address the challenges associated with hybrid learning, the management of HEIs, instructors, and students requires careful planning, enough support, and resources to realise desired learning outcomes (Pavlidou et al., 2021; Raes, 2022; Yudaparmita et al., 2023). A snapshot of the current status quo regarding the adoption and use of online learning in South African universities is crucial. It is vital to note that this study focuses on online learning provided by contact universities in South Africa.

1.2.3 Contact Universities

Contact universities in South Africa refer to HEIs as mainly offering conventional, face-to-face instruction and on-campus learning encounters (Abdullahi, 2021; Butler-Adam, 2016; Higgs, 2016). Such institutions use physical campus facilities where students attend face-to-face lectures, discussions, and practical meetings or conferences. Thus, they own and provide libraries, workshops, residences, research centres, sports facilities, lecture halls, test centres, and other assets needed for a complete on-campus learning experience (Abdullahi, 2021; Wildschut et al., 2020). There are more contact universities in South Africa, inter alia, the UCT, Stellenbosch University, and Wits University, than those offering the hybrid learning model (Abdullahi, 2021; Jooste & Hagenmeier, 2022).

Most HEIs in South Africa depend on direct teaching and learning methods where the teacher and student physically meet at one geographic location. Even if online learning is limited in use, it is increasingly becoming more popular than before (Qayyum & Zawacki-Richter, 2019). Over the years, HE institutions in the country have implemented online learning relatively slowly since face-to-face interactions were perceived as cheap and convenient (Mpungose, 2020). The adoption of online learning has constantly been below 10% of student enrolment figures, and only 36 bachelor's degree programmes are offered online in 26 universities

nationally (Mpungose, 2020). In contrast, recent studies conducted by Mpungose (2020) and Sun et al. (2020) conceded that the COVID-19 pandemic transformed the HE sectors globally, and online learning adoption and uptake by HE institutions have taken an upward trajectory since around mid-2020.

Notwithstanding the benefits of online learning, the success and effectiveness in South Africa are hampered by, inter alia, poor connectivity, high costs of data, offering support to the isolated learner, and the cost of mobile devices (Dalton et al., 2019; Mpungose, 2020). Moreover, the socio-economic status of students using online learning technologies determines the efficacy of this contemporary approach to learning. Online learning was only prevalent in South Africa after the COVID-19 pandemic. However, developed economies such as the USA and European countries had comparatively higher uptake of online learning even in the pre-covid times. The impetus for online learning adoption is its convenience and flexibility of time and space (Muljana & Luo, 2019; Waterhouse et al., 2020). Murphy et al. (2017) stress that online learning allows students to be involved in an opulent, global, and multi-cultural learning situation.

Apart from the benefits of online learning, the extent to which university students with learning disabilities commit to or actively participate in online learning has not received sufficient research attention (Lee & Choi, 2013; Muljana & Luo, 2019; Wang et al., 2019). Also, the predictors of online learning retention of HE students with LDs, which is the focus of this study, have received scant research attention. Since the concept of online learning has been discussed, the following section discusses the predictors of online learning retention.

The predictors of online learning retention are variables used to predict outcomes or actions (Abouhashem et al., 2021; Burgos, 2019), which is online learning retention. Online learning retention denotes student's zeal to continue engaging in virtual and technology-based learning (Lee & Choi, 2013; Wang et al., 2019). According to Shi and Guo (2022), retention is vital to achieving learning goals or constantly partaking in learning programmes facilitated by software and technology.

Students with learning disabilities require that personalised or student-centred learning methods be designed, implemented, and monitored in line with the principles of inclusive education (Goldschmidt, 2020). While using technologies in the provision of higher education is vital to enhance learning, the technologies may be a barrier to the participation of some students with learning disabilities, especially with online learning, since the lecturer and student are not in the same location (Li et al., 2021; Villegas-Ch et al., 2023). This is why some scholars argue that using online learning aids in achieving student retention, although its effectiveness depends on the extent of the student's disability or ability to utilise online technologies (Aishwarya & Kang, 2020; Verdinelli & Kutner, 2016).

Several researchers contend that technology integration in providing learning programs and inclusive education presents numerous challenges, especially to students with learning disabilities who are on the receiving end (Goldschmidt, 2020; Muljana & Luo, 2019). Hashey and Stahl (2014) found that the technologies for online learning and assistive devices are expensive for some students with learning disabilities. Boyle (2012) states that learners with learning disabilities face difficulties understanding complex concepts and abstract vocabulary while learning content. The lecture method, generally used in most higher education environments, is characterised by lecturers delivering the lecture at a breakneck pace, which gives students with learning disabilities little or no time to record or take down notes. Hence, a study on online learning in an HE institution in South Africa conducted by Queiros and de Villiers (2016) argues that paying attention to students' conditions ensures the provision of inclusive education.

1.2.4 Online learning with no contact

Online universities with no contact, like several contemporary online education providers, have appeared predominantly via the development of the Internet and digital learning platforms (Hoi et al., 2021). Examples of such institutions include international institutions, inter alia, Walden University, Western Governors University, Capella University, Ashford University, and Southern New Hampshire University. In South Africa, online institutions with no contact are predominantly found in the private higher education sector, inter alia, the Open Window Institute,

the South African College of Applied Psychology, and Regent Business School. Unlike conventional or even distance learning establishments that might provide intermittent face-to-face meetings, such online institutions perform their activities digitally, including teaching, assessments, and student support (Altowairiki, 2023; Singh & Thurman, 2019).

Universities such as the University of the People (UoPeople) are examples of wholly online institutions (Petherbridge et al., 2021). They offer tuition-free degree qualifications, depending on open educational resources (OER) and peer-to-peer learning (Varachia et al., 2023). Such online-only institutions provide flexibility regarding location, granting students access to education worldwide. Moreover, since the interaction is wholly digital, they commonly use advanced learning forums that support synchronous and asynchronous learning (Varachia et al., 2023). Online universities especially appeal to students wanting absolute flexibility owing to work and family commitments or physical disabilities.

One main distinction of fully online universities is their capacity to function without physical infrastructure. The students who complete their coursework work together with peers and receive instruction via virtual classrooms (Lin et al., 2022; Olivier, 2016). Such a model is particularly valuable in times of crisis, such as the COVID-19 outbreak, which pressed several traditional universities to transform towards online education. On the other hand, online learning with no contact raises concerns regarding the quality of education, accreditation, and the need for self-discipline in a virtual-only setting (Olivier, 2016; Varachia et al., 2023).

1.2.5 A Comparison of Distance Learning and Online Universities

Distance learning and fully online institutions aim to provide flexible, accessible education to large numbers of students (Böck et al., 2021; Lamanuskas et al., 2021). Nevertheless, there are distinctive variations between the two models. For instance, distance learning universities like UNISA provide partial face-to-face lectures and operate regional study centres or examination centres where students must be physically present occasionally. In contrast, online universities

are entirely virtual, with no in-person requirements (Bluteau et al., 2017; Hoi et al., 2021; Rockinson-Szapkiw et al., 2016).

Several scholars contend that the primary benefit of fully online higher education institutions is the ease of having all resources, relations, and examinations online, making it suitable for students to avoid attending physical centres at any point during their studies (Bluteau et al., 2017; Li, 2022). On the other hand, distance learning caters for students who are comfortable with irregular physical attendance for examinations or tutorials but still need flexible programmes (Hoi et al., 2021; Rockinson-Szapkiw et al., 2016).

Notwithstanding the flexibility the two models provide, they are linked with some challenges. Retention rates are lower in the two institutions than in traditional universities, mainly because of the lack of direct supervision, social interface, and support systems readily available in face-to-face learning settings (Abouhashem et al., 2021; Li et al., 2021)The next section discusses online, contact, distance, and hybrid learning concepts and then positions this study.

1.2.6 Contextualising this Study within Online Learning Institutions

This study falls under the two groups of distance and online, with minimal contact involving such institutions as UNISA and the University of Pretoria, respectively. While the study focuses on online learning, retention of students with disabilities is offered, and most interfaces occur via digital forums. Since this research involves university students with learning disabilities engaging in online learning in South African higher education institutions, possibly in a setting with a blend of face-to-face contact and online, it is important to position this study in a model like a blended distance learning model. Although those settings may not strictly require in-person interfaces, there is a possibility for intermittent contact via tutorials and examinations, much like how UNISA operates. The flexibility of the models permits students, specifically those with disabilities, to be involved in learning in ways that fit their requirements. However, it creates retention problems because of the independent nature of the learning environment. By illuminating this position, it is evident that the study is examining predictors of retention in

online and distance learning higher education contexts, where digital learning dominates but intermittent physical encounters may still occur. Based on the background issues raised in this section, the next section presents the problem.

1.3 PROBLEM STATEMENT

Online learning is widely regarded as a flexible and inclusive mode of educational delivery, offering the potential to accommodate the diverse needs of learners, including those with learning difficulties. Ideally, it should enable such students to access content at their own pace, benefit from differentiated support, and overcome traditional barriers often present in conventional face-to-face learning. In a well-functioning system, students with LDs would enjoy equal chances to thrive academically, leading to improved learning outcomes and strong retention rates.

However, the actual experience of online learning often deviates from this ideal. Despite its growth in popularity and use, especially during and after the COVID-19 pandemic, retention in online programmes remains a global concern. Dropout rates have hovered around 20% for nearly two decades (Carr, 2015; Frankola, 2015), with limited improvement reported in subsequent studies (Müller, 2008; Patterson & McFadden, 2009). More recent pre-pandemic studies (Gregori et al., 2018; Simplicio, 2019; W. Wang et al., 2019) affirm that online learning retention has not progressed significantly. Although the pandemic accelerated the adoption of online learning across higher education (Sun et al., 2020), most institutional responses treated it as a one-size-fits-all solution. Therefore, the specific needs of vulnerable student groups, such as those with LDs, were often overlooked. Most existing literature on online learning retention focuses on the general student population, highlighting predictors such as learner readiness, institutional support, and motivation (Hoi et al., 2021; Suhandiah et al., 2022). While the factors may hold true for the broader student body, emerging evidence suggests they may not adequately reflect the experiences of students with LDs, who face unique cognitive, emotional, and systemic challenges in navigating online learning (de Klerk & Palmer, 2022; Fitzpatrick & Trninic, 2023; Goegan et al., 2023).

Although some studies have identified factors such as academic experience, financial constraints, and institutional commitment as relevant to online learning retention (Bowles & Brindle, 2017; Martin, 2010; Gaytan, 2013; Muljana & Luo, 2019), few have examined these in the context of university students with LDs. As a result, no comprehensive or empirically validated model currently exists that explains or predicts online learning retention for this specific group. This presents a significant theoretical and practical gap. In many higher education settings, the unique learning and support needs of students with LDs continue to be marginalised in the planning and implementation of online programmes. Therefore, this study seeks to investigate the specific predictors of online learning retention among university students with LDs and to develop a context-relevant model that can inform institutional strategies and contribute to a more inclusive and effective online learning environment.

1.4 AIMS OF THE RESEARCH

The study tests a model of predictors of online learning retention of university students with learning disabilities. In doing so, it identifies predictors influencing online learning retention rates to understand the unique challenges students with learning disabilities face and develop a model of predictors of online learning retention. Developing and testing a model that predicts retention outcomes enhances educational practices and the support systems of this specific category of students. The study explores the efficacy of various support systems instituted for students with learning disabilities in online courses. Research such as this study evaluates how strategies like adaptive technologies, customised feedback, and peer mentoring assist in identifying best practices for improving retention rates.

1.5 PURPOSE OF THE RESEARCH

The purpose of this study is to investigate the factors that influence online learning retention among university students with learning disabilities and to develop a model that can guide institutional practices toward improving retention outcomes. To achieve this, the study sets out the following specific objectives:

- To identify and examine the key predictors that influence online learning retention among university students with learning disabilities.
- To explore the unique online learning experiences, barriers, and support needs of students with learning disabilities in higher education.
- To assess the extent to which institutional, socio-economic, and academic factors affect the retention of students with learning disabilities in online learning environments.
- To develop a context-specific model that explains online learning retention among university students with learning disabilities.
- To propose strategies and recommendations that universities can adopt to improve retention and support for students with learning disabilities engaged in online learning.

1.6 RESEARCH QUESTIONS

This research answers the following research questions are answered:

- To what extent do social and family factors influence online learning retention among university students with learning disabilities?
- To what extent does the perceived value of using technology influence online learning retention among university students with learning disabilities?
- To what extent does ease of use of the technology influence online learning retention among university students with learning disabilities?
- To what extent does lecturers' support influence online learning retention among university students with learning disabilities?
- To what extent does institutional support of faculty members influence online learning retention among university students with learning disabilities?
- To what extent does the institutional capacity to provide resources influence online learning retention among university students with learning disabilities?

1.7 RESEARCH HYPOTHESES

The hypotheses are discussed in detail in Section 3.5:

H₁ Social and family factors directly positively affect the online retention of university students with learning disabilities.

H₂ Social and family factors mediated by motivational factors indirectly positively affect the online retention of university students with learning disabilities.

H₃ Technological constraints and digital natives directly positively affect the online retention of university students with learning disabilities.

H₄ Technological constraints and digital natives mediated by motivational factors indirectly positively affect the online retention of university students with learning disabilities.

H₅ Lecturer student understanding mediated by motivational factors indirectly positively affects the online retention of university students with learning disabilities.

H₆ Institutional capacity of training factors mediated by motivational factors indirectly positively affects the online retention of university students with learning disabilities.

H₇ Institutional capacity of training factors mediated by motivational factors indirectly positively affects online retention of university students with learning disabilities.

H₈ Faculty affluence in technology access to resources indirectly positively affects online university students with learning disabilities.

H₉ Faculty affluence in technology access to resources directly and positively affects the online retention of university students with learning disabilities.

H₁₀ Student understanding of lectures directly positively affects online retention of university students with learning disabilities.

1.8 KEY THEORETICAL CONCEPTS

The following are the key theoretical concepts that are defined in this section in the context in which they are used in this research:

1.8.1 Online Learning Retention

Online learning retention describes students' persistence in continuing and finishing online courses. It involves understanding those factors contributing to or impeding students from remaining registered and continuing in online learning programmes (Magut & Kihara, 2019).

1.8.2 Disabilities

McGregor et al. (2016:90) define the term disability as 'a heterogeneous group of disorders manifested by significant difficulties in the acquisition and use of listening, reading, writing, reasoning, or mathematical abilities. The disorders are intrinsic to an individual, presumed to be due to central nervous system dysfunction, and may occur across the lifespan'.

1.8.3 Predictors

A predictor is a variable that forecasts an imminent outcome based on given conditions, e.g. the variable influencing or predicting the retention of university students with learning disabilities in online courses. The variables may be demographic, psychological, and environmental (Ružojčić et al., 2018).

1.8.4 Environmental Factors

These are external conditions and contexts that influence students' online learning experiences regarding the user-friendliness and usability of online learning platforms, their preparedness for technical support, and the quality of their relations with faculty members and peers.

1.8.5 Support Services

Support services are institutional resources and accommodations that assist students with learning disabilities in online learning settings. The support services include academic counselling, training, adaptive technologies, and tailored learning strategies.

1.8.6 Adaptive Technologies

Adaptive technologies are tools and resources provided to assist students with learning disabilities overcome learning barriers. Some of the tools and resources required by students with disabilities include inter alia, screen readers, speech-to-text applications, and other assistive technologies used to facilitate (Saad Alessa, 2021).

1.9 VALUE OF THE RESEARCH

This study is significant because it makes theoretical and practical contributions, which are discussed in the following subsections:

1.9.1 Theoretical Contributions

Whereas there is extant literature and increased calls for the inclusion of students with LDs into the mainstream education systems globally, limited research on retention focuses on the contemporary online learning phenomenon. The unique contribution lies in that it tests a model showing the relationship between the predictors of online learning retention of students with LDs at the university level in South Africa. Thus, this study's contribution is to advance the knowledge on online learning retention and predictors of online learning retention of students with LDs.

Moreover, the study contributes to the existing knowledge of e-learning theory by combining some insights specific to students with LDs. The study promotes an understanding of how conventional e-learning principles relate to or require change for this cohort. The literature review examines how the various environmental systems, namely microsystem, macrosystem, and chronosystem, affect the retention of students with LDs in online settings. In this way, the research offers empirical evidence that transcends the ecological systems theory to the specific context of online learning. Apart from applying the current study to the context of the ecological systems theory, it identifies variables like accessibility, institutional support, engagement, self-efficacy, and assistive technologies. The latter variables predict online learning retention for students with LDs. Accordingly, this research contributes to the theoretical understanding of retention used to develop more specific models for future studies. Finally, this research study enhances a sense of retention theories by focusing on a particular class of students. This assists in refining theories on student engagement, motivation, and persistence in online learning for students with LDs.

1.9.2 Practical Contributions

This research enhances essential insights into the factors contributing to the online learning retention of students with LDs in higher education. It provides practical guidance to university management, disability units, and the government on the academic and technical support required to ensure this retention. Also, the predictors of online learning retention of students with LDs direct stakeholders, like management and academic staff, to specific predictors requiring attention.

Moreover, policymakers and the government of South Africa can develop evidence-based policies on the inclusion and needs of higher education students with LDs regarding what students require for adequate online learning provision. The policies support the retention of students with LDS in online learning courses. This assists in establishing inclusive educational practices and ensures effective allocation of resources. Besides, the findings of this study will guide education practitioners in designing and executing more effective online learning settings custom-made to the distinctive needs of students with LDs. This includes generating course materials, interactive and engaging content, and supportive learning communities.

Another practical contribution is enhancing institutional support. This research will emphasise the role of institutional support services in online learning retention. It will prompt HEIs to step up their support services, which include counselling and assistance with the learning technologies used by students with LDs. At the same time, the insights that this study provides may guide the provision of assistive technologies that are effective in supporting the learning needs of students with LDs. This leads to the development of user-friendly and accessible educational tools. Finally, this research will identify the areas for professional development for academic staff and improve the academic outcomes and overall experience of students with LDs. This includes higher retention rates, better academic performance, and increased satisfaction with their learning experiences.

1.10 RESEARCH DESIGN AND APPROACH

Several research designs exist, including descriptive, grounded theory, experimental, correlational, ethnographic, and case study (Dannels, 2018). While the researcher acknowledges the latter types of research designs, the researcher used the descriptive cross-sectional design. In this type of research, the researcher collected data on the variables under investigation at one time, and no follow-ups were performed. Such a research design allows the researcher to complete the research in a short period, a different scenario from longitudinal studies (Sileyew, 2019). The research design is elaborated in Chapter 4.

1.11 TARGET POPULATION AND SAMPLING

This section covers two main aspects: the study's target population and the sampling techniques used in this study.

1.11.1 Population

Population refers to those objects or elements that are eligible for participation in the study (Sileyew, 2019). The target population are university students with LDs at a university in South Africa, totalling 700 students.

1.11.2 Sampling

Sampling is selecting a portion of the population from which data is collected for the study (Sileyew, 2019). In this study, the researcher applied non-probability sampling, using convenience and purposive sampling techniques to identify and select the respondents. This research's minimum sample size was determined using Structural Equation Modelling (SEM). The requirement for performing SEM is a minimum sample of $n=100-200$. While the latter sample size is the minimum, data for this study were collected from $n=256$, the results of which are reported in detail in Chapter 5.

1.12 DATA COLLECTION

This section provides a snapshot of the type of data this study collects to address the research problem.

1.12.1 Primary Data

The primary data for this research was obtained from university students with learning disabilities, specifically those registered at a South African university. The respondents are undergraduate and postgraduate students who formally disclosed learning disabilities and are registered with the university's Disability Unit. These students were identified as individuals with learning disabilities, enabling the research to focus on a specific group facing unique academic challenges. The data collection process used a structured instrument comprising closed-ended questions to generate quantifiable insights into the factors influencing online learning retention among students with learning disabilities. The researcher developed the instrument and employed a dual-mode distribution strategy, administering it in hard copy and electronically via Google Forms. This approach enhanced accessibility and ensured the inclusion of a broad and diverse sample of respondents, thereby improving the robustness and generalisability of the findings. Using the instrument ensured the convenience of participation, as students completed the survey at their pace and from any location, thus maximising the response rate and the breadth of data collected.

1.12.2 Literature

The literature review is crucial in contextualising the research findings by providing a theoretical framework and background against which the primary data is analysed. The information gathered from academic articles, books, and reputable sources in the field of learning disabilities and online education was compared with the data collected from respondents. This comparative analysis helped to identify patterns, similarities, and discrepancies between existing literature and the perspectives shared by the respondents. The results from the literature were synthesised and integrated with the empirical data, with in-text references used to give proper credit to the authors and sources consulted. A comprehensive list of all sources referenced throughout the research is provided at the end of the document to ensure transparency and academic integrity.

1.12.3 The Mono-Method

This research adopted a mono-method approach, using quantitative data as the primary source of evidence. The research was based entirely on data collected through a self-administered questionnaire, with respondents completing the instrument via Google Forms and on hard copies of the instrument. The choice of a mono-method aligns with the research objectives, allowing for the collection of quantifiable data to identify key predictors of online learning retention for students with learning disabilities. No qualitative data, such as interviews or focus groups, were included in this study. By focusing on quantitative data, the study highlights statistical analysis to uncover trends and correlations within the data. The absence of qualitative methods ensures a clear and focused approach to understanding the key factors that influence retention, offering a straightforward view of the academic challenges faced by students with learning disabilities in online learning environments.

1.13 DATA ANALYSIS

Data analysis is a critical step in transforming raw data into meaningful insights. It involves organising, structuring, and interpreting the collected data to extract patterns, relationships, and trends that are relevant to the research questions. In this study, data analysis was performed using statistical techniques due to the exclusively quantitative nature of the data collected. The primary tool for data analysis was the Statistical Package for the Social Sciences (SPSS) software, widely used for conducting robust statistical analyses in social science research.

Initially, descriptive statistics are used to analyse the participants' demographic profiles and summarise key characteristics such as age, gender, educational background, and other relevant factors. This provides a clear understanding of the sample's composition, facilitating the interpretation of subsequent findings in relation to the characteristics of the respondents.

Next, scale validation was conducted using Pearson's Cronbach's Alpha to assess the reliability and internal consistency of the measurement scales. Cronbach's Alpha is a statistical test that evaluates how well a set of items in a

scale measures the same underlying concept, ensuring that the instrument used in the study reliably captures the constructs it intends to measure.

The third step involved Exploratory Factor Analysis (EFA), which was employed to identify the underlying factors or dimensions that could explain the observed relationships between the variables. EFA is particularly useful in studies where the researcher aims to uncover latent variables that are not directly observable but are inferred from observed indicators. This helped determine the structure of the data and simplify the complex relationships into a manageable number of factors.

Following EFA, Confirmatory Factor Analysis (CFA) was performed as part of a broader Structural Equation Modelling (SEM) approach. Confirmatory Factor Analysis is used to confirm whether the hypothesised factor structure, based on theoretical foundations, accurately reflects the relationships between the measured variables and the latent constructs they represent (Wang & Wang, 2020). Confirmatory Factor Analysis enables researchers to test the validity of the measurement model by examining how well the observed variables align with their intended latent variables.

The final phase of the analysis involved using SEM analysis through the MPLUS software. Structural Equation Modelling is a broad statistical technique that allows the researcher to test complex relationships between observed and latent variables simultaneously. It provides a more detailed and nuanced understanding of the interconnection between different constructs (Byrne, 2012). As part of SEM, the researcher tested a model to examine how well the observed variables, such as specific predictors of online learning retention, reflect the overall latent construct of online learning retention. This analysis enabled the testing of theoretical models, providing evidence for or against the hypothesised relationships between variables (Kline, 2023).

Combining these statistical techniques enables robust data analysis, ensuring that the findings are reliable and valid, and providing a comprehensive

understanding of the factors influencing the retention of students with learning disabilities in online learning environments.

1.14 METHODS TAKEN TO ENSURE VALIDITY

In research, validity means the extent to which the research measures what it seeks to measure. The sections below set out several methods for ensuring validity in research.

1.14.1 Sampling

Sampling means a portion of the population representative of the population. In this study, the researcher selected individuals from the population who accurately represent the population's characteristics. An amalgam of convenience and purposive sampling techniques was used to increase the generalisability of the findings of this study to the entire population. By including a sample of undergraduate and postgraduate students of both genders and regardless of age, the researcher was confident the conclusions would reflect the nature of the studied population.

1.14.2 Literature Review

The researcher critically evaluated existing literature. The sources consulted include, inter alia, peer-reviewed journals, academic books, and other scholarly publications. Moreover, the researcher was cautious in identifying any biases or limitations to address the gaps in the literature and support the validity of their work. At the same time, creating diverse viewpoints and substantiating evidence from several sources improves the strength of the literature review and, in the end, contributes to the validity of the findings.

1.14.3 Data Analysis

First, to ensure validity, the researchers ensured that adequate statistical methods were adopted to find patterns, relationships, and trends. The most appropriate statistical techniques were identified with the guidance of supervisors and statisticians at the university where the researcher was studying. Selecting

the correct statistical methods ensures that conclusions made by the researcher from the data are valid and supported by evidence. Second, the researcher looked for errors and identified irregularities and missing variables in the dataset before analysis. They were corrected accordingly. Such data cleaning and preprocessing actions help ensure data analysis is based on correct and full information. It helps to reduce the risks of bias as well as fallacy. The researcher verified whether the data met the assumptions of statistical methods used in the study, which include normality, independence, and homogeneity of variance.

1.15 METHODS TAKEN TO ENSURE RELIABILITY

This section summarises the research methods and techniques used in this research. Detailed research methods and design are provided in Chapter 4. This section discusses the critical aspects of sampling, data collection, and data analysis.

1.15.1 Sampling

Section 1.14.1 defines sampling as a portion of the population representing the target population. To ensure reliability in this quantitative study, which focuses on online student retention, the researcher described the target population and used convenience and purposive sampling techniques. Moreover, the researcher defined the minimum sample size using statistical methods and tools. In addition, the researcher conducted a pilot study and followed standardised procedures to ensure consistency in terms of data collection. The researcher used Pearson's Cronbach's Alpha to assess the instrument's reliability, where a cut-off point of 0.7 was considered acceptable for the study.

1.15.2 Data Collection

The data obtained from the survey regarding the research questions was complete and of excellent quality. This is because the instrument was designed on Google Forms and could not allow the respondent to continue to the next page unless all questions were answered.

1.15.3 Analysing of Data

Apart from cleaning and preprocessing data to ensure reliability during data analysis, the researcher analysed the data several times to ensure consistency. First, the researcher documented the steps for data analysis and analysed the data using the Statistical Package of Social Scientists as a reliable and validated software for quantitative data analysis. Second, the data analysis was reviewed by the statistician and the research supervisors. The next section describes the ethical issues that were taken into account in conducting the research.

1.16 ETHICAL CONSIDERATIONS

Ethical considerations play a critical role in ensuring that research is conducted in a responsible and respectful manner. In this study, several ethical issues are considered and addressed to protect the rights and well-being of the participants, who are university students with learning disabilities. Ethical research practices ensure that the study adheres to principles such as informed consent, confidentiality, voluntary participation, and respect for participants. Table 1.1 outlines the key ethical issues identified in the research and the steps taken to ensure that these issues were properly addressed throughout the study.

Table 1.1: Ethical Issues

Category	Researcher's responsibility
Informed consent	The first page of Google Forms introduced the researcher, the study's purpose, and the respondent's role. Respondents could select YES to show their consent to participate in the research, allowing them access to the questionnaire. Selecting NO meant that the instrument would not open to proceed to the questions.
Confidentiality and privacy	The instrument was designed to ensure that no personal data suggesting the respondent's identity was collected. The introduction letter also explained that respondents' information would be used for research purposes.
Voluntary participation	The introduction letter indicated that respondents' involvement in the study was voluntary; therefore, there were no cash or kind payments for participation. The letter also explained that respondents reserved the right to withdraw at any point in the study should they feel uncomfortable continuing.

Ethics approval	The researcher obtained the ethics approval letter from the institutions where data was collected.
Permission letter	The researcher obtained a permission letter to collect data from students with learning disabilities because students with disabilities constitute a category of vulnerable people whose rights need to be protected and respected.
Free from harm or injury	Given the nature of the study, the instrument did not comprise items that resulted in students requiring counselling, psychological support, and physical harm.
Transparency and beneficence	In the introduction letter, the researcher clearly explained the study's purpose and its benefits to university students with learning disabilities in terms of improving their online learning experiences.

1.17 RESEARCH STRUCTURE

To ensure a well-structured research report in which the content flows in a logical order and in which the research aims and questions are addressed, the chapters were outlined as follows:

Chapter 1: This chapter introduces the study by presenting a comprehensive overview of the research problem, clearly outlining the research questions, aim, and objectives. It stresses the significance of the study and highlights its potential contributions to academic knowledge and practical applications. Furthermore, the chapter provides a structured synopsis of the study, serving as a roadmap to guide the reader through the flow of the subsequent chapters, ensuring clarity and coherence in the study's overall presentation.

Chapter 2: This chapter provides a comprehensive literature review, focusing on the study's theoretical foundations. It examines the existing theories, models, and frameworks relevant to the research topic, identifying key concepts and gaps in the current body of knowledge. The review establishes a solid theoretical basis to contextualise the study's objectives and stresses scholarly contributions that inform the research approach and design.

Chapter 3: This chapter extensively reviews the literature on disabilities, focusing on their implications in educational contexts. It provides a broader spectrum of disabilities before narrowing its scope to the focus of this study. The chapter examines existing studies, frameworks, and best practices to identify gaps in

addressing the needs of students with learning disabilities in online education. This review provides a deep understanding of the connection between disabilities and online learning, laying a foundation for the study's framework.

Chapter 4: This chapter provides a detailed account of methods and techniques used to address the research problem, ensuring a systematic approach to the study. It thoroughly outlines the research design and methodology, emphasising the rationale behind each choice. Guided by the research onion model, the chapter explains the philosophical underpinnings, strategies, time horizons, and data collection methods used. This structured approach ensures coherence and alignment with the study's objectives.

Chapter 5: This chapter analyses and discusses the results derived from primary and secondary data. It organises the findings, aligning them with the objectives and hypotheses. The chapter offers detailed interpretations of the data, highlighting key trends, patterns, and insights. Moreover, it compares the results with existing literature to establish connections, validates the findings, and identifies areas of divergence, thus enriching the study's contribution to the field.

Chapter 6: This chapter blends the study by presenting the key findings from the analysis and drawing meaningful conclusions addressing the research objectives and questions. It offers practical and theoretical recommendations grounded in the study's results, aiming to contribute to the field and inform future research or practice. Also, the chapter summarises the entire study, stressing its significance, limitations, and overall contributions to knowledge. The chapter ties all aspects of the research, offering a cohesive conclusion to the study.

1.18 CHAPTER SUMMARY

This chapter set the foundation for the study. It highlighted the research problem and provided an overview of the entire study. It introduced the study to show the scope of the study and raised several background issues that culminated in the research problem. Based on the research problem, the research questions and hypotheses were formulated. The chapter summarised the methods and techniques for addressing the research problem. Each method suggested was appropriately justified with references, and a detailed description of the methods

and techniques is provided in Chapter 4. Ethical considerations and a structure of the entire research have also been provided. With this foundation, the research proceeds to the literature review in Chapter 2.

CHAPTER TWO: THEORETICAL FOUNDATIONS

2.1 INTRODUCTION

The previous chapter provided a synopsis of the study and stressed the research problem, which guides how the whole study is approached. This chapter examines the theoretical perspectives that underpin an understanding of online learning retention. Theoretical frameworks offer an intellectual frame upon which the research is constructed, guiding scholars in exploring complex phenomena and shaping the lens through which empirical findings are interpreted. A robust literature review of theoretical viewpoints situates the study within the broader scholarly discourse and helps develop hypotheses and research questions. As the researcher embarks on this journey through the academic landscape, online learning retention is a complex and dynamic field that draws upon theories from other disciplines. Thus, this chapter aims to blend and critically examine diverse theoretical perspectives to assist in understanding predictors of online learning retention among students with learning disabilities in the HE environment in South Africa.

The chapter discusses the Ecological Systems Theory (EST), which is seminal in shaping online learning retention discourse (Kitchen et al., 2019; Perron, 2018). The theory provides a broad outline for examining multiple layers of influence on online learning retention. It stresses the interrelation of various environmental factors and how they jointly impact students' ability to retain information, persist, and succeed in an online learning environment. Lecturers and institutions can develop more effective strategies to enhance online learning retention by considering ecological factors (Burns et al., 2015; Perron, 2018). Besides the EST, three other theories are applicable to this study: E-Learning Theory, the Community of Inquiry (COI) Theory, and the Universal Design for Learning (UDL).

The connection between the latter theories lies in their shared focus on the learner's learning setting and the interactions within the learning environment. Ecological Systems Theory emphasises the numerous layers of environmental

influence on an individual's growth and development, extending from direct surroundings to broader social contexts (Guy-Evans, 2020). The latter understanding pertains to understanding how external variables affect learners in online education. At the same time, the E-Learning Theory and UDL outspread this understanding by focusing on how digital settings support various learning needs (Flood & Banks, 2021; Hollingshead et al., 2022). The E-Learning Theory leverages technology to form flexible and collaborative learning practices. The UDL ensures that learning experiences are available to all learners, regardless of their circumstances, by offering various ways of engagement, representation, and expression (Ayuso-Del Puerto & Gutiérrez-Esteban, 2022; Hollingshead et al., 2022).

Moreover, the COL Theory combines the notions by stressing the significance of social and cognitive connections in online learning environments. It highlights the urgency and importance of a strong teaching presence to direct and support learners, promoting a sense of community and engagement that is important for compelling learning experiences (Luo et al., 2019; Padilla, 2023; Wilkinson, 2022). Collectively, the four theories form an inclusive framework for online education. In short, the EST provides a macro-level knowledge of the many influences on learners, the ELT and UDL stress designing inclusive and effective digital learning environments, and the COL Theory ensures that the atmosphere is socially and cognitively engaging (Gudapati, 2021; Shea & Bidjerano, 2010). Therefore, such an all-inclusive approach recognises the intricacy of learners' circumstances and leverages technology to form a collaborative, inclusive, and collective online learning experience.

The theories are examined to offer alternative perspectives and shed more light on the issue under inquiry. Moreover, this chapter explores the connections and divergences between the theories, highlighting areas of consensus and contention. It addresses the evolution of diverse viewpoints and their relevance to contemporary research. By synthesising the theoretical views, the researcher provides a solid foundation for the study, ultimately advancing the knowledge of

online learning retention among students with disabilities. The following section presents EST as one of the theoretical frameworks underpinning the study.

2.2 ECOLOGICAL SYSTEMS THEORY (EST)

Bronfenbrenner's Ecological Systems Theory (1992) asserts that an individual's development is shaped by five interrelated environmental systems: the microsystem, mesosystem, exosystem, macrosystem, and chronosystem. This theory offers a comprehensive framework for examining how various aspects of the social and academic environment impact students with learning disabilities, particularly in the context of online learning. The relevance of EST to this study lies in its ability to systematically analyze the interaction between students and their learning environment—an interaction central to understanding online learning retention.

The microsystem, which encompasses the immediate environment, including peers, instructors, family, and digital platforms, is crucial in shaping the student's daily learning experience and engagement. This system directly influences student motivation, participation, and perception of support, key factors associated with retention. The mesosystem represents the interactions between different microsystems, such as the coordination between home support and institutional support services. For students with LDs, the strength and quality of these interactions often determine how well learning needs are addressed across contexts, impacting their continuity in online programs. The exosystem includes settings that do not directly involve the student but still influence their experience, such as university policy decisions, accessibility of digital learning tools, and training provided to faculty on inclusive practices. These institutional-level influences can either promote or hinder retention by affecting the quality of support provided. The macrosystem encompasses broader societal beliefs, values, and cultural attitudes towards disability and online learning. This layer helps explain systemic factors such as stigma, equity in education, and national inclusion policies, all of which shape how students with LDs are perceived and supported in higher education. The chronosystem refers to changes over time, including the shift to online learning during the COVID-19 pandemic. This system

captures the evolving nature of online learning and how transitional periods, such as sudden digital migration, impact students' ability to adjust and persist in their studies.

Together, these five systems provide a multidimensional framework to explore the specific objectives of this study: identifying predictors of online retention, exploring the lived experiences of students with LDs, assessing institutional and socio-economic influences, and developing a context-specific retention model. EST thus not only frames the environmental and systemic factors influencing online learning retention but also supports a nuanced analysis of how these factors interact and evolve in the lives of students with learning disabilities.

2.2.1 The Micro-System Level

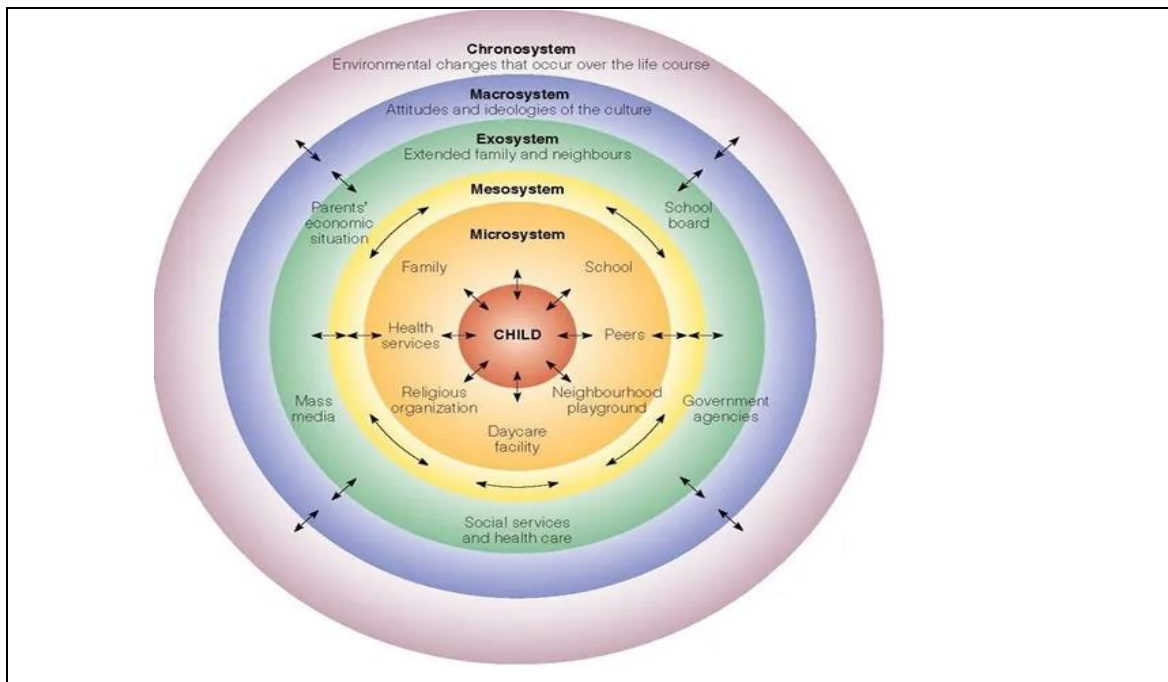
The micro-system level illustrates the immediate, direct environments individuals interact with daily (Perron, 2018; Yang & Sanborn, 2021). In online learning, this could include the students' interactions with teachers, lecturers, peers, and the online learning platform itself. For students with disabilities, the quality of support services provided at this level can significantly impact their retention (Bluteau et al., 2017; Burns et al., 2015; Guy-Evans, 2020). For instance, personalised support from peers, lecturers, other institutional support systems, and accessible online resources enhances retention rates.

Students with disabilities are not empty vessels or blank slates; neither are they passive recipients of processed data (Ward, 2017). In contrast, they are active entities that assemble their learning and the environment in which it occurs to ensure an optimum learning experience (Madhesh, 2023; Ntombela, 2022). Thus, students with disabilities perceive themselves as individuals who determine their academic self-confidence and can use online learning (Mohammed Ali, 2021; Newman et al., 2021; Smith & Juergensen, 2023). This is the most immediate and powerful application of the ecological systems theory.

In concluding the discussion on the microsystem, the debate illustrates the adjacent environment to the individual and involves direct relations with family,

peers, and instructors. In support of students with disabilities in online learning, the role of the family in offering emotional support and technological resources is critical (Guo & Lee, 2023; Sheerin et al., 2023). Several researchers have acknowledged that family support considerably influences academic persistence, particularly for those students with learning disabilities (Bluteau et al., 2017; Kitchen et al., 2019). Similarly, peer support using online communities can provide social inclusion, which is important for sustaining motivation in a virtual environment (de Klerk & Palmer, 2022; Fitzpatrick & Trninic, 2023; Goegan et al., 2023). The second stratum is the mesosystem level, which will be discussed next.

Figure 2.1: The Ecological Systems Theory



Source: Bronfenbrenner (1992, p. 88)

2.2.2 The Mesosystem Stratum

The mesosystem level involves the connections between various microsystems in a person's life (Burns et al., 2015; Guy-Evans, 2020; Yang & Sanborn, 2021). For students with disabilities, the coordination and communication between their institution, family environment, and other support services is vital since it can impact their ability to access and engage in online learning. In contrast, a lack of coordination between the systems results in learning retention problems

(Beckmann & Minnaert, 2018; Moriña & Biagiotti, 2022; Smith & Juergensen, 2023).

In summary, the mesosystem considers relations between different elements of the microsystem. For instance, the relations between a student with disabilities and the family and educational institution can be important. Several researchers (e.g. de Klerk & Palmer, 2022; Schwartz et al., 2021) reveal that the cooperation between families and educational institutions augments the learning experience for students with disabilities. Moreover, the interface between faculty knowledge of disability and institutional support systems can impact how well students with disabilities are included in online learning situations (Fitzpatrick & Trninic, 2023).

2.2.3 The Exosystem Stratum

The third stratum illustrates the exosystem. The level integrates formal and informal social structures, signified as including extended family members, sponsors and their economic standing, university council, government agencies, mass media, social services, and healthcare (Burns et al., 2015; Guy-Evans, 2020). In this case, the sponsors' experiences either motivate or discourage the student's performance. For students with disabilities, this level might include educational policies, government policies, and the availability of assistive devices. Changes in external variables, like lawful mandates for online accessibility or funding for support services, influence the retention experiences of students with disabilities (Lipka et al., 2019; Moriña & Biagiotti, 2022; Smith & Juergensen, 2023).

In short, the exosystem level involves external environmental variables that indirectly influence the individual. For those students with disabilities engaged in online learning, this may include formal policies, the availability of assistive devices, and related infrastructural supports (de Klerk & Palmer, 2022; Fitzpatrick & Trninic, 2023; Goegan et al., 2023). Several research studies have acknowledged that when higher education institutions offer accessible learning materials and adaptive devices, the retention rates for students with disabilities upsurge. Also, a lack of institutional capacity to deal with these challenges and

needs can build difficulties in learning, leading to high dropout rates (Khairul Amali et al., 2023; Kitchen et al., 2019; Perron, 2018).

2.2.4 The Macrosystem Level

The fourth stratum is the macrosystem level. It shows variables like culture, belief systems, and ethnicity impacting the students' performance. Whereas exo- and macro-systems comprise external elements influencing students' performance, the macro-system does not refer to a specific environment for one developing student (Burns et al., 2015; Guy-Evans, 2020; Yang & Sanborn, 2021). Instead, the system refers to the established society and culture in which the student progresses. For instance, a student exposed to third-world experiences differs from one exposed to a developed economy. For students with learning disabilities, their feelings about inclusivity, diversity, and accessibility in the online learning environment significantly impact their learning retention rates (Crawford, 2020; Dobson & Douglas, 2020; Guo & Lee, 2023). A positive macrosystem that values inclusive education is more likely to support higher retention rates.

In summary, the macrosystem encompasses the broader cultural, social, and economic perspectives. The cultural perceptions of disability and online learning are critical in how students with disabilities experience learning (Graves & Sheldon, 2018; Mary & Antony, 2022). In some settings, there is a stigma that is associated with disabilities that impact students' self-esteem as well as their intellectual performance. At the same time, the more expansive social and governmental policies related to ease of access to education can either support or impede the success of students with disabilities in online learning conditions (Epp, 2018; Guo & Lee, 2023).

2.2.5 The Chronosystem Level

The outermost stratum of the model is the chronosystem level. The level accounts for changes and transitions that occur over time in an individual's life (Crawford, 2020; Dobson & Douglas, 2020; Sheerin et al., 2023). In the context of online learning retention among students with disabilities, changes in their disability-related needs, adaptive technologies, and educational practices significantly

impact their learning retention rates (Lipka et al., 2019; Majoko, 2018). For example, advancements in assistive technologies can improve accessibility, positively affecting learning retention rates among students with disabilities.

In short, the chronosystem stratum involves changes in the individual's life and the wider environment over time. In the case of students with disabilities, high-tech developments have transformed the setting of online learning, providing new means for ease of use (Kitchen et al., 2019; Yang & Sanborn, 2021). However, the acceptance of these instruments is not the same across institutions of higher learning, which influences how students with disabilities experience online learning with time (Bluteau et al., 2017; Snyder & Duchscher, 2022). As technology evolves, so do the expectations and opportunities for students, making it key to assess how these changes influence retention continuously.

In concluding the discussion on EST, to apply EST in studying online learning retention among students with disabilities, researchers must examine how different systems interact and influence each other. By reviewing the quality of support and accommodations at the microsystem level, the coordination between many systems, and the impact of external factors and societal attitudes, researchers can better understand factors contributing to retention or attrition in online learning for students with disabilities. This, in turn, informs the development of effective strategies and interventions to enhance retention rates for this specific cohort. The following section discusses the e-learning theory as one of the theories underpinning the study.

2.3 E-LEARNING THEORY

While the Ecological Systems Theory (EST) focuses on how human development is influenced by multiple layers of the environment (Bronfenbrenner, 1992), the E-learning Theory addresses how learners interact with digital platforms, online instructional strategies, and virtual learning environments to construct knowledge (Ismail & Sambanthan, 2021; Wang et al., 2023). The integration of these two theories provides a robust theoretical base for understanding online learning retention among university students with learning disabilities. The connection

between the two theories lies in their shared emphasis on the interaction between the learner and their environment. EST conceptualises this interaction through five nested systems (micro-, meso-, exo, macro, and chronosystems), which shape a learner's cognitive, emotional, and social development. These systems reflect the varying levels of support, challenge, and access that students with learning disabilities encounter in online learning environments. E-learning Theory, in turn, explains how specific digital tools, pedagogical designs, learner engagement strategies, and technological affordances facilitate or hinder the learning process. It focuses on how variables such as learner autonomy, instructional presence, multimedia design, and interactivity affect outcomes, including retention and success, particularly in self-directed online contexts. When combined, these theories help explain the study's objectives in a complementary way. For example, EST helps identify external and systemic predictors of retention, such as institutional support (exosystem), home learning conditions (microsystem), and national policy on inclusive education (macrosystem). E-learning Theory explains internal and pedagogical factors, such as how instructional design, content accessibility, and learner motivation influence student engagement and persistence.

Together, they offer a comprehensive lens through which to examine how environmental context and online instructional dynamics interact to affect the retention of university students with learning disabilities. This dual-theoretical approach ensures that both the social-ecological environment and the digital learning environment are adequately considered, thus enriching the analysis and grounding the development of a context-specific retention model for this underserved student population. The two theories overlap and stress how different layers of influence impact learning experiences in e-learning settings. When the two theories are integrated, instructors assume a broad approach to creating e-learning ecosystems (Ismail & Sambanthan, 2021). Besides technology and pedagogy, this will also involve social and cultural factors affecting the students. Understanding the link promotes the development of supportive e-learning systems that overcome the digital divide and ensure inclusivity. Ultimately, it promotes cooperation among different stakeholders,

thereby fostering a more effective, conducive, and just online learning experience (Madhesh, 2023; Wang et al., 2023). The key issues discussed include the definition of the e-learning theory, previous studies related to it, a graphical presentation of it, and an analysis of concepts and constructs related to it.

2.3.1 Definition of the E-Learning Theory

Educational technology and its design can improve effective learning (Sweller et al., 1998). This is illustrated by the e-learning theory, which depends on cognitive science tenets (David, 2015). In line with Sweller et al. (1998), Cognitive Load Theory (CLT) lays the groundwork for developing e-learning theory. David (2015, p. 2) defines CLT as “the amount of mental effort involved in working memory during a task”. The effort is divided into germane, intrinsic, and extraneous efforts. It is essential to balance the three cognitive loads to foster learning efficacy, as working memory has limited capacity, and the brain suffers overload if students are exposed to too much information, leading to ineffective learning.

Considering the above characterisation, scholars like Mayer and Moreno (2005) developed 11 design principles to control germane and intrinsic loads at an acceptable level for learners using technology while reducing the disused cognitive load (Mayer., 2014). The 11 principles are: multimedia, modality, coherence, contiguity, segmenting, signalling, learner control, personalisation, pre-training, redundancy, and expertise effect.

The latter principles are acknowledged as relevant to e-learning theory, as they provide the basis for formulating effective, comprehensive, and accessible online learning settings that accommodate the diverse needs of students, including those with learning disabilities (Ismail & Sambanthan, 2021). For this specific cohort of students, the principles reduce barriers to online learning, ensure the inclusion of students with diverse learning needs, and enhance students' learning experiences and outcomes (Wang et al., 2023). Aligning the e-learning practices with the principles assists instructors in developing a more inclusive, supportive, and effective online setting (Madhesh, 2023). The e-learning theory includes cognitive load, which differs from design concepts and technology. Given that the

theory acknowledges how technology is used and adapted to provide new learning opportunities and support successful learning, it becomes relevant for this study, which focuses on online learning retention.

2.3.2 Previous Research on E-Learning Theory

As stated in the preceding section, one of the principles of e-learning theory is that multimedia learning holds that two formats, audio, as well as visual and text, as opposed to one or three, increase learning and understanding (Mayer & Moreno, 2005). In line with several previous studies on the e-learning theory (e.g., Mayer & Moreno, 2005), multimedia design principles were found to be effective in promoting successful learning. For example, after conducting several reviews, Mayer (1997) found that multimedia training was advantageous. Mayer (1997) explored eight studies to evaluate the efficacy of multimedia instruction and discovered that students who received a presentation that included verbal and visual explanations scored 75% higher on problem-solving transfer tests for creative solutions than those who received only verbal accounts. In the same study, Mayer (1997) reviewed ten studies and found that students surpassed the median by more than 50% on tests of creative solution transfer.

The theory behind online learning accentuates the importance of personalisation. Consistent with this principle, informal and conversational word presentation can aid in more effective understanding (Mayer & Moreno, 2005). Several scholars contend that personalisation has proven to be helpful in learning. By testing their computerised instructional content in a personalised informal style, a personalised formal style, and a neutral-formal style, a total of 89 college students from an Istanbul university in Turkey participated in Kartal's 2010 study to examine the effectiveness of the design principle of personalisation (Çelik & Kartal, 2023). The findings suggest that formal and conversational language styles result in enhanced learning.

Another survey by Kurt (2011) produced similar findings. It investigated the impact of multimedia personalisation on formal instruction with 22 students and informal instruction with 23 students. The study found that students' cognitive

load scores in a personalised group were significantly different from and better than those in the non-personalised group using an achievement test, a cognitive load scale for both groups and a questionnaire for the personalised group. Moreover, the customised group's students reported that the conversational tone used in the multimedia software motivated them to learn and gave them the impression that a natural person was speaking to them. Students specified their preference for multimedia content due to the latter research findings.

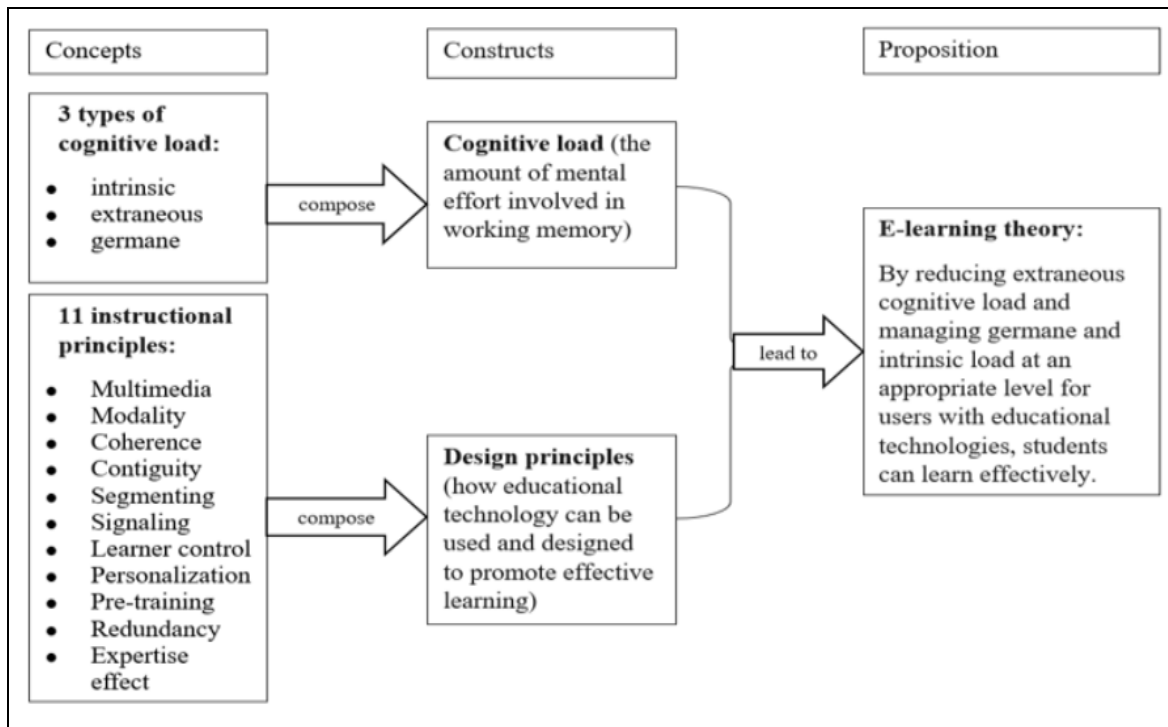
Further research has demonstrated the usefulness of other e-learning theory design principles. According to the modality principle studied by researchers such as Mayer and Moreno (2005), using visuals and audio narration is preferable to using on-screen text for learning purposes. For instance, Moreno (2010) performed a meta-analysis on the effects of modality. The results showed that the modality principle across various media has a significant positive impact on learning.

This section discussed how implementing e-learning theory's design principles can encourage effective learning. Instructors can benefit from e-learning theory when creating effective courses, and scholars can use it to better understand how effective learning using technology can occur. The following section illustrates the model of e-learning theory.

2.3.3 The Model of E-Learning Theory

The model in Figure 2.2 shows how cognitive load and design principles comprise concepts signifying three different types of cognitive load and eleven empirical principles. The theory is proposed owing to the combination of the two constructs.

Figure 2.2: E-learning Theory



Source: Mayer and Moreno (2005), Mayer (2014)

2.3.4 Definitions of Concepts and Constructs in the E-Learning Theory

As stated in the previous section, there are three cognitive loads: intrinsic, germane, and extraneous loads, depending on the amount of mental effort. Along with Clark et al. (2005, p. 9), intrinsic load is defined as "the mental work imposed by the complexity of the content in your lessons and is primarily determined by your instructional goals". The latter researchers define germane load as "mental work imposed by instructional activities that benefit the instructional goal". Lastly, the researchers define the extraneous load as "the mental work that is irrelevant to the learning goal and thereby wastes limited mental resources". Collectively, the three concepts constitute the concept of cognitive load, as shown in the model.

There are principles of e-learning theory that are relevant to instructional design. The principles demonstrate "how educational technology can be used and designed to promote effective learning" (Wang, 2012:346). The 11 principles constitute the term design principles. In general, the concepts of cognitive load and design principles are combined to lessen the extraneous cognitive load and

manage germane and intrinsic loads by streamlining it so that learners' brains digest the information and data they are expected to process during instructional tasks.

2.3.5 The Application of the E-Learning Theory

The application of the e-learning theory to research and practice has many potential applications. For instance, researchers can apply this model to learn more about successfully incorporating design principles into instruction to enhance learning. Scientists use the model to conduct studies that outline sound design principles in learning contexts (Mohammed Ali, 2021; Wang et al., 2023). Academics can address the following tasks using the model:

- Designing a practical e-learning course using research-based methodologies
- Managing intrinsic workload and reducing unnecessary workload so that students can learn effectively
- Identifying the design principles that majorly impact how well students learn

Instructors can also use the model to design successful student e-learning courses. Clark et al. (2005) note that by breaking up the content so that students can learn new information incrementally, instructors can assist students in managing their intrinsic cognitive load. In a self-paced online learning setting, instructors frame and support students' learning by progressively introducing small amounts of new material (Clark et al., 2005). Also, instructors can demonstrate lesson content using simple digital tools for text, audio, and visual communication to lessen the intrinsic cognitive load on students (Cronje, 2020; Wang et al., 2023). At the same time, the instructors use appealing graphics, audio, and text to reduce redundant material, focus on crucial material, and provide performance support to increase external memory (Mohammed Ali, 2021). Other examples include:

- Reducing extraneous cognitive load by staying away from complicated visuals and unrelated audio when describing inexplicable text (the coherence principle);

- Use of the segmenting principle by instructors to reduce intrinsic cognitive load by breaking up large amounts of content into small quantities and teaching concepts and facts separately through pre-training (the segmenting principle); and
- Promoting germane cognitive load by including practice exercises and appropriate visuals (the modality principle) (Clark & Mayer, 2023).

In concluding this section, some principles of the e-learning theory can be applied to improve the students' learning in the HE spaces. Depending on the instructor's and students' learning objectives, particular design principles are applicable in various contexts. In line with the principles of e-learning theory, educational technology should be used to reduce unnecessary cognitive load, manage germane and intrinsic limitations, and adapt learning activities to the abilities of individual students. The model helps instructors better understand how mental load is categorised and linked to design principles, facilitating successful learning with technology. Thus, it is essential to note that instructors often struggle to create tasks that are appropriate for students' levels. The following section reviews the Community of Inquiry Theory.

2.4 COMMUNITY OF INQUIRY (COI) THEORY

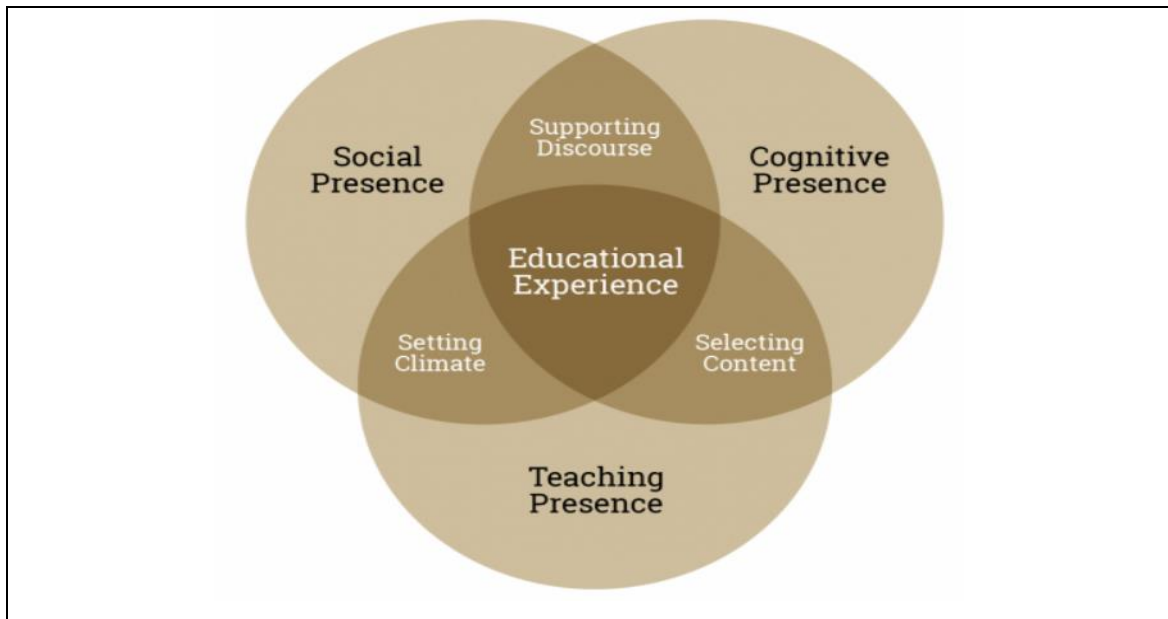
This section describes the COI theory and its significance to people with disabilities. The COI theory enhances meaningful educational practices by bridging the interface between social, mental, and instructional aspects, complementing and connecting with the EST and e-learning theories (Luo et al., 2019; Stewart, 2019). The EST provides a broader framework for understanding the diverse ecological effects on students, highlighting the importance of supportive and collaborative settings that form the core of the COI framework (Gudapati, 2021; Padilla & Kreider, 2018). The e-learning theory, discussed in the preceding section, focuses on the principles of effective online education and supports the COI theory by developing strategies that enhance engagement, collaboration, and cognitive presence in digital learning settings (Brennan et al., 2022; Stewart, 2019). The COOI and e-learning theories emphasise the importance of an inclusive, supportive, and well-designed online learning

environment that fosters profound learning and communal engagement (Rockinson-Szapkiw et al., 2016; Zou & Zhang, 2022).

2.4.1 A Characterisation of the Community of Inquiry Theory

Shields (1999) states that Peirce, John Dewey, and Jane Addams are credited with coining the concept of Community of Inquiry (COI). However, Garrison et al. (1999) proposed the COI model, as shown in Figure 2.3. Shields (1999) states that the COI signifies “any group of people committed to addressing a common issue, problem, or interest using techniques similar to scientific inquiry”. In line with the definition, Dumitru (2012) emphasises that the COI model facilitates the formation of knowledge.

Figure 2.3: Community of Inquiry Model



Source: Garrison et al. (1999)

The basis for developing the model was to assist stakeholders such as educational developers in organising online and blended learning experiences (Zou & Zhang, 2022). The originators of the COI model for e-learning collaborated for five years, ending in 2021, at the University of Alberta in the Faculty of Extension Department to provide a heuristic understanding and a straightforward method for reviewing the prospects and efficacy of computer conferencing (Swan, 2021). The research was based on a graduate programme provided partially online. The model represents a theoretical framework to design online

learning platforms optimally for supporting students' and instructors' critical thinking, analysis, and debate (Garrison et al., 1999). Using educational models such as the COI theory, the instructors can contextualise education research results to the practical curriculum design, development, and sequencing of educational experiences that enhance learning (Cooper & Scriven, 2017).

The COI framework suggests that a successful online learning experience is built on three overlapping components, namely cognitive presence, social presence, and teaching presence (Biondo et al., 2017; Swan, 2021). The scholars describe the components: Firstly, cognitive presence is a component that describes how learners construct meaning through sustained reflection and discourse. It involves critical thinking, problem-solving, and active engagement with course content. Secondly, social presence clarifies the degree to which students in an online course perceive each other as real people. It includes interpersonal interaction, emotional expression, and collaboration, creating a sense of community among students. The final component, teaching experience, involves the design, facilitation, and direction of the educational experience. This component presents instructors as pivotal in guiding the learning process and experiences, and developing effective online learning settings (Biondo et al., 2017; Swan, 2021).

2.4.2 The Significance of COI to Students with Disabilities

The COI framework holds significant relevance for students with disabilities in online learning (Zhang & Zhu, 2023). Researchers contend that three crucial points support the significance of the COI framework. First, cognitive presence underscores critical thinking and knowledge creation. By using clear course objectives, well-structured content, and accessible materials, instructors can provide cognitive support that benefits students, including students with disabilities (Vaughan et al., 2013). Second, social presence is essential for creating an inclusive and supportive online community. Students with disabilities may benefit from increased opportunities for social interaction and collaboration, which can foster a sense of belonging and motivation (Shea et al., 2010). Finally, instructors may adapt their teaching presence to assist students with disabilities

by providing alternative formats for materials, offering additional support, and ensuring accessibility (Baker et al., 2009). However, the literature identifies some challenges and opportunities in the COI model described in the following section.

2.4.3 Challenges and Opportunities

Whereas the COI framework offers promise for enhancing online learning retention for students with disabilities, several challenges and opportunities exist. First, there are accessibility barriers. Ensuring all course materials and interfaces are accessible to students with disabilities is crucial. This includes providing alternative formats, captioned content, and accessible learning management systems (Brown & Green, 2021). Second, instructors must be trained to facilitate inclusive discussions and accommodate diverse needs in the online community of inquiry (Anderson et al., 2011). Finally, advancements in assistive technologies can support the involvement and engagement of students with disabilities in online dialogues (Bawa & Spector, 2019).

In concluding the discussion on the COI framework, emphasising cognitive, social, and teaching presence provides a valuable lens to enhance online learning retention for students with disabilities. Instructors and institutions must actively embrace this framework, addressing accessibility barriers, promoting inclusive facilitation, and leveraging technological solutions to create a supportive and engaging online community of inquiry. Befus (2017) stresses that the COI framework has served as the foundation on which several studies have been designed and conducted in recent years. Issues relating to student satisfaction with e-learning or methods and gauging communicative action are at the core of recent and current studies. Several researchers are altering or including more interaction to enhance the framework. The following section provides empirical studies that involve the COI framework.

2.4.4 Empirical Studies on the COI Model and Online Learning

Several studies were conducted on the COI model and online learning. For instance, Garrison et al. (1999) conducted a critical inquiry in a text-based

environment. In this foundational study, the researchers presented the COI model and examined its applicability in online learning environments. The study examined how cognitive, social, and teaching presence interrelate to foster meaningful learning experiences in text-based computer conferencing. The study results confirm that the COI is a helpful model for analysing and improving online learning.

Shea et al. (2005) explored the concept of teaching presence in the COI framework. The study adopted a quantitative approach. The researchers examined the impact of teaching presence on student satisfaction and perceived learning in online courses. The results reveal the significance of teaching presence in creating a sense of community and enhancing the online learning experience. Arbaugh et al. (2010) studied how the COI model changes across subject areas in online courses. The latter scholars relied on analysing primary data from various courses and explored how cognitive, social, and teaching presence manifest in disciplines like mathematics, business, and humanities. The study's results contribute to a deeper understanding of the adaptability of the COI framework across diverse academic contexts.

Cleveland-Innes and Campbell (2012) explored the concept of emotional presence within the COI framework. The study employed qualitative methods to investigate how emotional expression and support influenced the online learning experiences of graduate students. The research underscored the importance of emotional presence in creating a supportive online community conducive to deep learning. Finally, Garrison and Arbaugh (2007) reviewed empirical studies on the COI model up to that point. The study fused the findings, identified research gaps, and provided insights into future research directions on the COI framework and online learning.

In concluding this section, this snapshot of empirical studies represents a subset of the research conducted on the COI framework in the context of online learning. The studies validate the framework's usefulness in understanding and improving the quality of online education by accenting the importance of cognitive, social,

and teaching presence in creating meaningful and engaging online learning experiences. Another snapshot of the literature review on the COI model and online learning retention is provided.

2.4.5 Empirical Studies on the COI Model and Online Learning Retention

Arbaugh et al. (2008) examined the predictive validity of the COI framework in the context of online MBA courses. The results suggest a positive relationship between the COI elements (cognitive, social, and teaching presence) and student satisfaction and perceived learning, signifying that a strong COI impacts higher retention rates.

Shea and Bidjerano (2010) explored the role of learning presence within the COI framework. The study results indicate that learners' self-efficacy and self-regulation significantly contribute to developing a community of inquiry, which, in the end, influences retention and learning outcomes. In a related study, Akyol and Garrison (2011) explored cognitive presence as a critical element of the COI frame and its impact on deep learning approaches. The results found a robust cognitive presence associated with increased student retention and a deeper understanding of course content.

Using the COI framework, Rovai and Jordan (2004) compared the sense of community and retention rates in blended, entirely online, and traditional graduate courses. The study found that a strong sense of community, facilitated by a well-developed COI, positively influenced student retention in blended and online courses. Finally, Shea et al. (2005) conducted a study focusing on teaching presence in the COI framework in online courses. The findings reveal that effective teaching presence positively impacts community and student satisfaction and increases retention rates.

In concluding this section, the empirical studies provide valuable insights into the relationship between the COI framework and online learning retention rate. The studies have highlighted the significance of cognitive, social, and teaching presence in fostering a sense of community and facilitating positive learning

outcomes, which, in turn, can influence student retention in online learning environments. The following section describes the Universal Design for Learning as a theoretical viewpoint that assists in understanding online learning retention.

2.5 UNIVERSAL DESIGN FOR LEARNING (UDL)

The UDL is an educational framework that aims to provide students with equitable learning opportunities, notwithstanding their diverse abilities (Garrad & Nolan, 2023; Roski et al., 2021). The theoretical viewpoint is engrained in accessibility, flexibility, and inclusivity. It seeks to create inclusive learning environments that accommodate diverse individual learner needs and preferences (Altowairiki, 2023; Flood & Banks, 2021; Kelly et al., 2022). This literature review section provides an overview of UDL, its theoretical rudiments, fundamental principles, and its impact on teaching and learning.

The theoretical foundations of the UDL are rooted in several theoretical contexts that inform its design and implementation, namely the Principles of Universal Design, Multiple Intelligences Theory, and Constructivism (Altowairiki, 2023; Edyburn, 2021; Garrad & Nolan, 2023). First, the Principle of Universal Design is based on architecture and applies its initial principles to education. The principle emphasises equitable access, flexibility, simplicity, and user-friendly design (Coffman & Draper, 2022). Second, Howard Gardner's theory of multiple intelligences increases the UDL's recognition of diverse learner strengths and preferences (Böck et al., 2021; Gardner, 1983). The UDL helps academics consider multiple intelligences when designing learning experiences. Finally, the theory aligns with constructivist theories, stressing active engagement, knowledge construction, and the value of learners' previous knowledge. Moreover, the principle urges flexible and adaptable instructional approaches to support tailored learning pathways (Almeqdad et al., 2023; Böck et al., 2021; Espada-Chavarria et al., 2023).

The literature identifies several key principles of UDL. The first principle of Universal Design for Learning, according to Dickinson and Gronseth (2020), presents information and content in multiple ways to cater to diverse learner

needs. The principle includes offering text, audio, video, graphics, and interactive materials to accommodate different learning styles and preferences (Garrad & Nolan, 2023; Roski et al., 2021). The second principle is the multiple means of engagement. It encourages the use of multiple strategies to engage learners' interests, motivations, and self-regulation skills. It promotes incorporating choices and relevant, authentic tasks to foster engagement (Davis et al., 2022; Roski et al., 2021). The third principle is the multiple means of expression and action. Universal Design for Learning (UDL) supports diverse ways for students to demonstrate their understanding and skills. The principle involves offering options for students to express themselves in writing, speech, multimedia, or other means (Edyburn, 2021; Hollingshead et al., 2022).

Several studies explored the impact of UDL on teaching and learning. First, Rose and Meyer (2002) found that UDL improves access and engagement. It is linked with increased access to content and higher levels of student engagement. Second, it leads to enhanced learning outcomes. Dalton et al. (2016) state that research suggests that UDL can improve learning outcomes for all students, including students with disabilities. Third, it leads to positive student perceptions. Students often report greater satisfaction and a sense of autonomy in UDL-based learning environments (Burgstahler & Cory, 2008). Finally, it leads to inclusive classrooms. Universal Design for Learning promotes inclusive classrooms where students with diverse abilities can learn side by side, reducing the need for separate accommodations (Burgstahler, 2015).

Figure 2.4: Universal Design for Learning



Source: Center for Applied Special Technology (1998)

Several studies examined online learning retention and students with disabilities. Dalton et al. (2016) conducted a qualitative study exploring faculty execution of UDL in higher education. The results of their research revealed that UDL principles positively influence the engagement and success of students with disabilities. Faculty reported that greater flexibility in instructional methods improves satisfaction among students. Edyburn (2010) reviewed UDL research and identified several studies showcasing its benefits for students with disabilities. The review records improved participation, increased motivation, and enhanced learning as outcomes of UDL implementation.

Burgstahler and Cory (2008) conducted a study that examined the impact of UDL practices on student retention in tertiary education. The findings indicated that UDL strategies reduced barriers for students with disabilities, leading to increased persistence and retention rates. Spooner et al. (2017) conducted a meta-analysis of UDL interventions and their effects on the academic performance of students with disabilities. The results indicate a moderate to significant positive impact of UDL on academic achievement, tenacity, and retention rates. Spooner et al. (2017) conducted a meta-analysis of UDL interventions and their effects on the academic performance of students with disabilities. The results indicate a moderate to significant positive impact of UDL on academic success, particularly in reading and mathematics.

Roberts et al. (2016) conducted a study examining the perceptions of students with disabilities regarding using UDL in higher education. The study found that students perceived UDL as highly beneficial, enhancing their access to course materials and fostering a more inclusive learning environment. Rose et al. (2013) conducted a longitudinal study examining the impact of UDL on the performance of students with disabilities over multiple academic years. The study found constant increases in academic results and reduced achievement gaps among students with disabilities.

In concluding this subsection, the Universal Design for Learning is a robust educational framework prioritising inclusivity, flexibility, and equitable access to learning opportunities. Its theoretical foundations, fundamental principles, and demonstrated impact on teaching and learning underscore its significance in contemporary education. As academics continue to embrace UDL, it promises to create more inclusive, engaging, and effective learning situations for all students.

2.6 HOW THE THEORIES RELATE TO E-LEARNING AND DISABILITIES

In the preceding section, the Ecological Systems Theory (EST), Community of Inquiry (COI), and Universal Design for Learning (UDL) were discussed, stressing their relevance to understanding the difficulties of online learning and disabilities. In this section, the researcher admits that these three frameworks have significant

interrelationships with the E-Learning Theory, as they collectively deal with the structural, interactive, and inclusive dimensions of e-learning for students with disabilities.

The EST, COI, and UDL are related in addressing several factors that model and define online learning experiences for students with disabilities. Although each theory has its focus, it jointly provides an inclusive framework to understand and improve online education by integrating contextual, interactional, and inclusive dimensions. EST stresses the influence of environmental systems, like family, peers, institutional policies, and societal norms, on learning. It highlights the need for supportive microsystems and macrosystems to create an impartial learning experience, which is specifically relevant for students with disabilities in traversing e-learning environments (Guy-Evans, 2020; Kitchen et al., 2019).

At the same time, the COI framework complements EST by focusing on the cognitive, social, and teaching interactions that define online learning communities. Although EST provides the broader environmental context, COI focuses on the quality of engagement within these contexts, accentuating the role of support, communication, and instructor presence in promoting profound learning experiences. The Community of Inquiry (COI) integrates technological tools and strategies, aligning with the EST's micro- and mesosystems in fostering active student engagement in supportive environments (Khairul Amali et al., 2023; Snyder & Duchschere, 2022).

The UDL framework ensures inclusivity by advocating for flexible teaching methods and accessible learning materials that accommodate diverse learner needs. Universal Design for Learning (UDL) aligns with EST's macro and exosystems by accenting institutional and societal changes to promote accessibility. The framework also intersects with COI by ensuring that teaching strategies and materials encourage equitable participation and engagement for all students, particularly those with disabilities (Ayuso-Del Puerto & Gutiérrez-Esteban, 2022; Dalton et al., 2019).

Collectively, the theories form a solid foundation for understanding the intricacies of online learning for students with disabilities. The EST offers the contextual scene of environmental influences (Khairul Amali et al., 2023). The COI theory stresses the quality of interactions within the learning community, (Gudapati, 2021) and UDL ensures that the design and delivery of e-learning environments are inclusive and adaptive (Cook et al., 2018). By integrating these perspectives, academics/instructors and institutions create online learning systems that are accessible, engaging, and responsive to the diverse needs of students with disabilities.

2.7 GAPS IN THE LITERATURE REGARDING THE FOUR THEORIES

An appreciation and understanding of online learning retention is important in this contemporary educational landscape, particularly at this time when higher education institutions are transforming towards digital platforms (Bulić & Blažević, 2022; Caton & Landman, 2022; Ziadat, 2021). Retention presents additional challenges because of user-friendliness, technology use, and social support with specific reference to students with disabilities. Whereas this study has explored online learning and retention extensively, the distinct experiences of students with disabilities have not been sufficiently investigated. Students with disabilities continue to encounter different barriers, unlike their peers (Caton & Landman, 2022; Ziadat, 2021) This makes it critical to examine how the four theories—Bronfenbrenner's Ecological Systems Theory, the Community of Inquiry (COI) framework, E-learning Theory, and Universal Design for Learning (UDL)—can address their specific needs in online learning environments.

The four theories offer important insights into learning situations. Nevertheless, their pertinence to online learning retention for students with disabilities is poorly understood. In the next subsections, the gaps in the literature about the use of each of the theories are discussed, accenting where further research is required to generate a more inclusive and effective online learning experience for this specific cohort. The gaps for each of the theories are presented.

2.7.1 Bronfenbrenner's Ecological Systems Theory

There are two gaps in the literature on this theory. First, while Bronfenbrenner's theory is extensively applied to understand environmental effects on human development, there is scant literature on its specific application to online learning situations for students with disabilities. Most of the research focuses on physical classroom sceneries, leaving a shortage of literature on how the layers of influence (microsystem, mesosystem, exosystem, and macrosystem) function in virtual environments (Khairul Amali et al., 2023; Kitchen et al., 2019; Perron, 2018). Second, the theory does not appropriately deal with the technological ecosystem in which online learning occurs. In line with the reality that technology plays a vital role in online education, the existing literature is deficient in that it lacks insights into how technology fits into Bronfenbrenner's systems as well as how technology relates to other environmental variables in the context of online learning (Bluteau et al., 2017). The next section identifies the gaps in the COI.

2.7.2 Community of Inquiry (COI) Framework

There are two gaps in the literature relating to this theory. First, although the COI framework is extensively applied in online learning research, most of the research focuses on the general population of students (Luo et al., 2019). Given the literature review in the preceding sections, there is a notable lack in the application of the COI framework, particularly to students with disabilities, exploring the way the three elements (social, cognitive, and teaching presence) are altered to support well their distinct requirements and enhance their retention in online learning (Meech & Koehler, 2024). Second, the mental presence aspect of COI has not been satisfactorily explored in the context of students with disabilities, who may encounter a higher cognitive load when dealing with online learning platforms. Thus, the existing literature needs to be systematic in research that analyses how cognitive presence can be enhanced for this specific cohort of students (Meech & Koehler, 2024; Swan, 2021). The next section reviews the literature relating to the E-Learning Theory.

2.7.3 E-Learning Theory

There are two gaps in the literature relating to the theory. First, although the e-learning theory examines the application of technology in educational contexts, much of the literature focuses on the general role of technology instead of its specific influence on students with disabilities (Janelli, 2018). Therefore, there exists a lack of understanding of how technological differences and assistive technologies influence online retention for students with disabilities, as well as how these tools can be better integrated into the e-learning framework. Second, the e-learning theory emphasises the student-technology interface while paying less attention to the function of faculty affluence in technology use and its influence on student retention (Kibuku et al., 2021; Kibuku & Ochieng, 2018). Thus, scant research has been done on how faculty members use technology to meet the requirements of students with disabilities and how this influences retention.

2.7.4 Universal Design for Learning

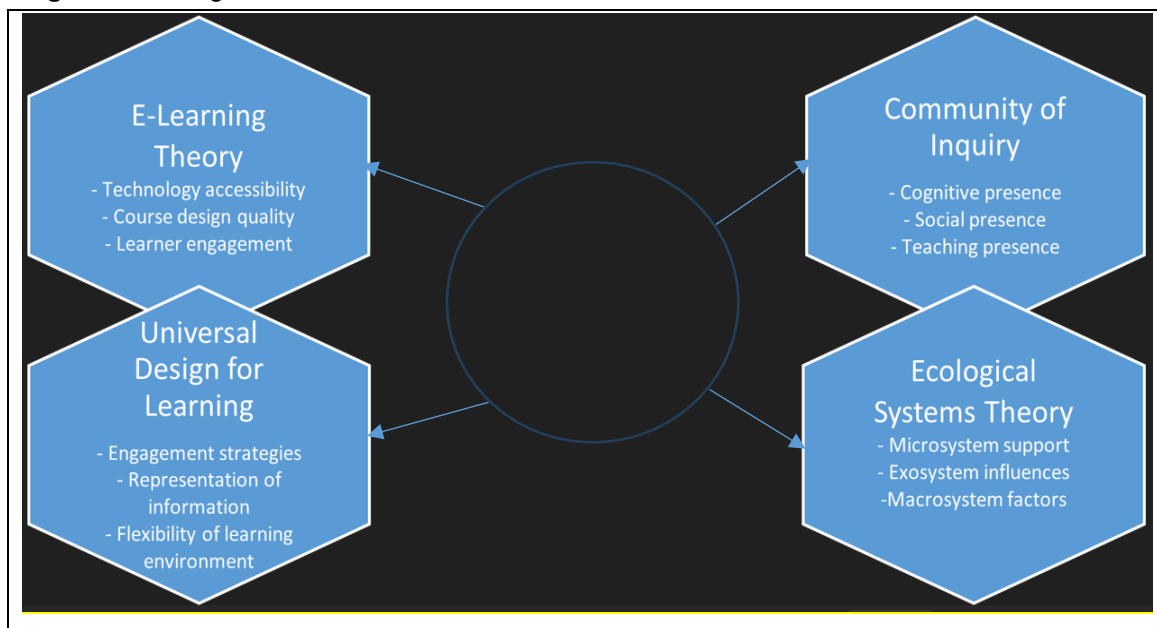
There are two gaps in the literature relating to this theory. First, even though UDL is a conventional framework for inclusive education, much of the literature that uses this theory focuses predominantly on K-12 education (Coffman & Draper, 2022; Garrad & Nolan, 2023). Very few empirical studies evaluate UDL's efficacy in higher education, particularly in online learning environments for students with disabilities. Such a scenario limits understanding of how UDL assumptions impact online learning retention in higher education. Second, while UDL advocates for ease of access and inclusion, more studies are needed that are mainly related to UDL principles for online learning retention. Hence, the relationship between UDL application and long-term retention, notably for students with learning disabilities, is yet to be studied. The next section looks at the integration of the theories that were discussed in the preceding sections.

2.7.5 Integration of Theories

Notwithstanding that the four theories provide valuable insights, there is a scarcity of research that has attempted to combine the theories into an interconnected

and unified framework for understanding the retention of students with disabilities in online learning. The four theories (Bronfenbrenner’s theory, the COI framework, the e-learning theory and UDL) are mostly used separately, leaving little research that explores how the theoretical frameworks link to provide a broad understanding of online learning retention. At the same time, several studies depend on one theoretical framework and, thus, do not acknowledge that multiple theories may be crucial to expansively explain the intricacies of online retention for students with disabilities. For example, the focus of UDL on inclusive design can be integrated with COI’s accent on social presence and cognitive support to provide a deeper understanding of the phenomenon, but limited research attempted this cross-theoretical application.

Figure 2.5: Integration of the Four Theories



Summary by researcher

To combine the theories with online learning at the core, the researcher examines how each theory contributes to understanding and advancing the online retention of university students with learning disabilities. The amalgam of the four theories offers a complete lens to deal with many factors, from environmental influences on instructional design to online learning success.

The e-learning theory is important as it deals directly with the online learning environment itself in terms of how the content is presented, how the students engage with the material, and how technology can increase learning. The theory clearly defines interaction types (student-content, student-instructor, and student-student), feedback mechanisms, and adaptability of online platforms. Moreover, the theory assists in conceptualising the technological setting in which the students with disabilities interact. The key variables are identified as follows:

- Technological Constraints (H_2, H_3)
- Learning Platform Usability
- Instructor-Student Interaction (H_2, H_4)
- Support Services Availability (H_5)

Although the E-Learning Theory expounds the online environment, EST provides depth into how external influences (family, peers, policies) affect students' capacity to participate and succeed in online learning. The EST places students in the larger social and environmental contexts that influence their learning retention. Also, it justifies the microsystem (direct interactions with family and instructors), mesosystem (relationships between family, university, and technology), and exosystem (institutional policies on e-learning). The main variables under the EST theory are identified as follows:

- Family and Social Support (H_1)
- Institutional Policies and Technological Resources (H_5)
- Instructor Understanding and Support (H_2, H_4)

The COI theory brings a social and cognitive dimension to online learning. It stresses the significance of social presence (the sense of being part of a learning community), cognitive presence (engagement with the content), and teaching presence (the instructor's role in facilitating learning). The COI is vital in understanding how students interact with content, instructors, and peers in online settings, promoting engagement and retention. The key variables characterising this theory are identified as follows:

- Social Presence (Peer Interaction)
- Cognitive Engagement with Content (H_4)

- Teaching Presence (Instructor Facilitation) (H_2, H_3)

The UDL framework assures that online learning is available and comprehensive for the student population, including students with disabilities. The framework encourages flexibility in the presentation of content, student engagement, and assessment methods, confirming that learning settings serve the diverse needs of students. Moreover, it precisely links into offering tailored learning experiences and adaptive technology to support students with disabilities. The main variables under the COI framework are stated as follows:

- Inclusive Learning Design (Multiple Means of Engagement) (H_5)
- Accessibility of E-Learning Platforms (H_6)
- Instructor Training on UDL Practices (H_7, H_8)

Regarding how the theories interact, the e-learning theory is at the core. It forms the foundation, explaining the way in which online platforms are organised and the way in which the content is delivered. In terms of contextualisation, the interaction is contextualised by the EST. The student's external environment (family, university policies, social support) impacts their access to and success in online learning. The EST stresses that students' ability to succeed online is influenced by their surrounding social, institutional, and technological ecosystems. Consistent with the description of the interaction of the theories, the interaction is enhanced by the COI. The latter framework includes layers of interaction, revealing how students engage with their peers, content, and instructors in an online learning setting. It stresses the cognitive, social, and teaching presences that are necessary for student retention. The interaction of the theories is guided by the UDL, which offers the blueprint for designing inclusive and adaptable learning experiences. The UDL framework guarantees that online learning is available to all students, particularly students with disabilities, by customising learning materials and support mechanisms.

In short, the gaps in the literature on the four theories suggest that more focused research is required, focusing on the way in which the theoretical frameworks can be remodelled and then used for the online learning retention of students with

disabilities. Specifically, research should investigate how the theories interact and complement one another and how they can be adapted to deal with the distinctive problems experienced by students with disabilities in online settings. Dealing with these gaps enhances the theoretical foundations for future research and provides a clearer understanding of advancing online retention for this vulnerable student cohort.

2.8 CHAPTER SUMMARY

This chapter emphasised the interrelation of various theoretical perspectives and their collective potential to shape effective strategies to improve online learning retention, specifically for students with disabilities. By integrating key frameworks such as the e-learning theory, the community of inquiry (COI) framework, ecological systems theory, and universal design for learning (UDL), faculty and researchers develop more inclusive approaches to tackling retention challenges. The theoretical insights offer a strong basis for creating inclusive and engaging online learning settings where all students, including those with disabilities, thrive.

The chapter explored how the theories inform practical applications that enhance retention in online learning. It also critically analysed empirical studies, shedding light on the real-world effectiveness of these frameworks in supporting students with disabilities. The findings from the studies clarify how well-structured online learning environments, underpinned by these theoretical approaches, significantly improve the retention rates and academic success of students with disabilities.

As the research progresses, the chapter sets the stage for a deeper examination of the concept of disabilities and its impact on online learning retention. The next chapter will focus on a detailed review of disabilities in the context of online education, drawing on empirical studies to further investigate how different disabilities affect learning and retention. This exploration will provide valuable insights into the challenges and opportunities faced by students with disabilities in the evolving landscape of online education.

CHAPTER THREE: DISABILITIES AND ONLINE LEARNING

3.1 INTRODUCTION

In recent years, integrating online learning into the HE environment has ushered in a new age of convenience and flexibility. This recent transformation allows different student populations to participate in academic activities, notwithstanding geographic limits or physical disabilities. Even though the literature is clear about the various challenges relating to online education, it is essential to study the distinct problems students with disabilities encounter in this digital learning age.

This chapter explores the existing literature on the intersection of disabilities and online learning. It starts by describing the multifaceted concept of disabilities and sheds light on the various impairments, which include learning disabilities, physical impairments, and mobility constraints. At the same time, it reflects on the evolving and progressing nature of online learning, exposing the transformative ability of digital education and its prospects for students with disabilities.

As the chapter develops, it explores the essential aspect of online learning retention. Online learning retention is a crucial aspect to explore in the context of digital transformation in the HE environment. It includes students' capacity to endure, connect, and make accomplishments in the digital learning environment. Though retention remains a concern for all groups of students, it requires more effort, proficiency, and resources when considering the distinctive challenges that students with disabilities encounter. Researchers contend that access to course materials, technical constraints, faculty support, and institutional accommodations significantly impact the online retention rates of students with disabilities. Thus, this chapter uncovers the complex relationship between the latter factors and their collective impact on the academic experiences of students with disabilities in online higher education. The final segment of this chapter develops a conceptual framework that provides the literature review findings and offers a structured lens through which different strategies to boost the online learning experience for this important student cohort can be viewed. The following

section reviews the literature on the connection between disabilities and online learning.

3.2 THE CONCEPT OF DISABILITIES

Over the years, the concept of disabilities has been progressing, exhibiting changes in societal attitudes, legislation, and academic discourse (Aquino & Scott, 2023; Moriña & Biagiotti, 2022). This section analyses the different definitions and perspectives that researchers, organisations, and global bodies provide to understand this concept. It explores some definitions of disabilities, accenting the themes and shifts in the conceptualisation of disabilities.

The medical model of disabilities considers impairments to be medical conditions. Consistent with this view, proponents of the model argue that the impairment must be diagnosed, cured, and managed (Shakespeare, 2006). Although this model emphasises the importance of medical interventions for persons with disabilities, it is critiqued for pathologising disability. Furthermore, it is blamed for concentrating on a person's constraints instead of addressing societal barriers. This contrasts the social barriers and stresses the continuing discourse around disabilities and its propositions for how society must perceive and accommodate people with disabilities.

Another critical view on disabilities is the social model. The model posits that disability is not a person's inherent trait. Instead, it is the outcome of an interface between an individual and their environment (Oliver, 1990). In line with the model, society plays a pivotal part in creating obstacles that restrain the involvement and prospects of persons with disabilities. This view has led to significant progress in disability rights and advocacy, highlighting the value of accessibility, inclusion, and social acceptance. It strongly emphasises the need for accessible settings, inclusive policies, and social acceptance to empower individuals with disabilities.

Besides the medical and social models, legislation, such as the Americans with Disabilities Act (ADA) in the United States and the United Nations Convention on the Rights of Persons with Disabilities (CRPD) globally, has provided legal

definitions of disabilities. The definitions combine medical and social elements, recognising the individual's impairment and the importance of eliminating discrimination and ensuring equal chances (Americans with Disabilities Act, 1990; United Nations, 2006). The identity and culture perspective has also sought to describe the concept of disabilities. Some scholars and activists within the disability rights movement argue that disability can also be a source of identity and culture. This view challenges traditional medical definitions and celebrates the diversity and resilience of individuals with disabilities (Brown & Brown, 2014).

At the same time, recent discussions on disabilities are increasingly considering intersectionality. This perspective accepts that individuals may face multiple forms of prejudice based on race, gender, socioeconomic status, and disability (Crenshaw, 1989). In contrast to intersectionality, a more holistic approach to disability considers the interaction of biological, psychological, and social factors in shaping an individual's experience. The model recognises that disabilities are not solely defined by medical conditions but also by psychological and societal characteristics (Engel, 1977).

In concluding this section, the concept of disabilities is multifaceted, with varying definitions and perspectives. The shift from the medical to the social model has been particularly transformative, accenting society's role in creating disability and the need for inclusive and accessible settings. Legal definitions and discussions on identity, culture, intersectionality, and the biopsychosocial model further enrich our understanding of disabilities, highlighting the complexity and diversity of experiences among individuals with disabilities. The following section discusses online learning, online retention, and disabilities.

3.3 ONLINE LEARNING, ONLINE RETENTION, AND DISABILITIES

The merging of online learning in higher education has brought about transformative shifts in the educational landscape. While it offers unprecedented opportunities for flexibility and accessibility, its impact on student retention, particularly among those with disabilities, is a growing concern (Burgstahler, 2015; Burgstahler & Chang, 2015). This literature review explores the

interconnected dynamics of online learning, online retention, and disabilities, shedding light on factors influencing the educational outcomes of students with disabilities in digital learning environments.

3.3.1 Online Learning and Accessibility for Students with Disabilities

Online learning platforms can potentially address some of the barriers faced by students with disabilities in traditional classroom settings (Burgstahler & Chang, 2015). Digital learning materials can be made more accessible through features such as screen readers, captioning, and alternative formats, ensuring that students with disabilities have equal access to course content (Burgstahler, 2015). Yet the extent to which online courses are designed with accessibility in mind varies widely, impacting the learning experience for students with disabilities (Gentry et al., 2019).

3.3.2 Online Retention Challenges for Students with Disabilities

Online retention, the ability of students to persist and succeed in online courses, presents unique challenges for students with disabilities. Research indicates that students with disabilities may face technological constraints, such as inaccessible learning management systems or digital content (Cullen et al., 2019). These constraints can impede their engagement and hinder their progress. Moreover, self-efficacy and intrinsic motivation are crucial in online retention (Kim & Kim, 2018). Students with disabilities may grapple with motivation-related challenges that impact their ability to persist in online courses.

3.3.3 The Role of Faculty and Institutional Support

Faculty understanding and support are pivotal in addressing the online retention challenges faced by students with disabilities. Faculty members knowledgeable about accessible design and inclusive teaching practices can create more accommodating online learning situations (McMahon et al., 2019; Rodriguez et al., 2020). Moreover, institutional capacity, including the availability of disability support services, is critical in fostering an inclusive online learning experience (Mullins et al., 2020). However, the extent to which institutions invest in faculty

training and support services can vary, impacting the overall retention rates of students with disabilities.

3.3.4 The Nexus and the Way Forward

The nexus between online learning, online retention, and disabilities is complex and multifaceted. Online learning promises greater accessibility, but the extent to which this potential is realised depends on factors such as the accessibility of digital materials and the support provided by faculty and institutions. It is essential to consider the intersection of these factors and adopt a holistic approach that ensures accessible course design, faculty training, and institutional support to enhance online retention for students with disabilities.

In concluding this subsection, the nexus between online learning, online retention, and disabilities is a critical study area with implications for educational policy and practice. Understanding the challenges and opportunities within this nexus can inform strategies to enhance the educational experiences and outcomes of students with disabilities in the digital age.

3.4 FACTORS AFFECTING ONLINE LEARNING RETENTION

According to Lee and Choi (2013), retention is the students' determination to persist in achieving learning goals or continue participating in their learning programmes. Several studies have examined issues relating to online learning retention of students and employees. Students create delusions of a cognitive load that influences online learning retention. Schaarsmith (2012) found that students engage in online learning because it is economical, cuts transport costs and allows them to pursue their studies while working. Moreover, the study found that online learning offers convenience and flexibility to students and teachers because they meet virtually in their homes. The cost of the Internet to facilitate online learning is low in developed economies, even if this is not the same in developing economies like South Africa (Mpungose, 2020). Thus, affordability becomes an essential factor in explaining the online learning retention of students.

Bawa (2016) states that online learning is driven, requires self-imposed academic discipline, and largely relies on students' capacity to manage their duties. In the latter's absence, students experience dissuasion, forcing them to quit. Another critical factor is that online learning depends on constructivist models of teaching. Consistent with this model, students are given aid to support their learning and left to themselves to solve complex problems. Online learning retention becomes limited if the students lack self-learning and cannot construct knowledge through their initiatives (Murphy et al., 2017; Rice & Dykman, 2018). In that case, students find online learning threatening, and the chances of online learning become low.

Online learning retention is also subject to the student's familiarity with the delivery system. Some students are more likely to be irritated with the disparities between long-term memories of contact sessions and the new online learning experiences they are required to be part of. A study by McQuaid (2009) examined the influence of cognitive load on online students. The study stresses the importance of adapting to the online learning environment on the part of the student for meaningful learning. In line with this view, instructional designers need to adjust to learners' expectations regarding the completion of the learning programme (Simplicio, 2019; Sun et al., 2020).

Some students are uncomfortable because online learning has limited student-lecturer interaction compared to traditional face-to-face situations (Muljana & Luo, 2019). They communicate less and need guidance that simplifies understanding. The online learning environment is less guidance-oriented and is non-conducive to retention (Pirani et al., 2013).

Emerging research strongly underscores the critical role cognitive load plays in shaping student satisfaction with online learning experiences. Bradford's (2011) seminal study using factor analysis revealed a significant relationship between cognitive load and student satisfaction. Remarkably, the findings indicated that cognitive load accounts for about 25% of the variance in student satisfaction with the quality and provision of online learning. This implies that the cognitive demands placed on students during online learning significantly influence their

engagement, understanding, and overall perception of the learning environment. By highlighting this connection, Bradford's research underscores that educators and instructional designers must carefully balance the cognitive load to optimise student satisfaction and enhance learning outcomes in online settings.

Notwithstanding the above studies on misconceptions about cognitive load, several studies identified social and family factors influencing online learning retention (Bagarukayo & Kalema, 2015; Moodley, 2017). Social factors, attitudes, aptitude, and motivational threshold of students account for the high attrition rates in online learning (Rice & Dykman, 2018). Conversely, family commitment and social obligations contributed to low online learning retention (Patterson & McFadden, 2009). Simplicio (2019) found that online learners' obligations to their families often cause them to drop out of an online learning programme. Evans (2009) discussed Tinto's and Summers's work on retention in the traditional classroom context but noted that some findings hold for online learning. A study by Summers (2003, as cited in Evans, 2009) found that students with value judgments that differ from the norm cannot socialise with other students. Therefore, students who feel mismatched with an institution's social system will likely drop out. Finally, the Composite Persistence Model (CPM) was intended to determine the factors contributing to online student retention (Bawa, 2016). The model offers a framework for guiding institutional decisions about programme features that adversely interact with other students' attributable variables. Moreover, it delineates factors affecting retention before and after admission and includes social integration and family roles as part of the retention equation.

In addition to family and social factors highlighted by Muljana and Luo (2019), motivation plays a pivotal role in influencing high attrition rates in online learning. Online education demands that learners remain focused and self-motivated, making motivation—or its absence—a critical determinant of student persistence. Heyman (2010) emphasised the significant interplay between motivation and accountability, demonstrating their combined impact on student retention in online learning environments. The key factors affecting retention include the complexity of course materials, alongside the student's aptitude and attitude

toward learning. Moreover, logistical challenges like the time required to complete modules and difficulties in accessing essential resources and support systems exacerbate motivational constraints, finally leading to higher attrition rates (Bawa, 2016; Gaytan, 2013). These challenges stress the importance of addressing motivational barriers and providing ample support tools to boost retention in online education.

High attrition rates have been linked to technological constraints (Erickson & Larwin, 2016). Student satisfaction with course delivery impacts the decision to continue with or withdraw from online learning programmes. The student's technical knowledge of the course design also affects retention (Erickson & Larwin, 2016). Nowadays, students have specialised social media and digital theatre skills, which motivate online retention. Lecturers misjudge students' enthusiasm and readiness to use online technologies as they assume all students, including students with disabilities, have the skills, can afford, and are keen to use the technologies (Chen et al., 2020; Erickson & Larwin, 2016). As said by the latter researchers, such assumptions are made without considering students with disabilities who may not be technologically savvy in using mobile devices for learning, information, entertainment, and socialising.

Besides the challenges with technology, lecturers and course designers experience challenges in their interactions online. Several scholars (e.g., Bawa, 2016; Bowles & Brindle, 2017) concur that online lecturers need help maintaining a cohesive learning atmosphere like face-to-face interaction. They are challenged to develop a concerted online learning atmosphere that supports meaningful learning. In online delivery, lecturers find recognising student emotions and feelings difficult. Thus, having more courses and being aware of the psychological factors that influence students' learning is essential. This is particularly important when dealing with different categories of students. Such an understanding raises insights into how instructors can moderate interactions and create collaborative prospects that make learning programmes flexible and user-friendly (Bawa, 2016; Lee & Choi, 2013; Murphy et al., 2017).

Bawa (2016) characterises what has been termed digital immigrant lecturers. They need to catch up with the digital transformation and use outdated language that belongs to the pre-digital period. Such a scenario discourages students from online learning since these lecturers are less likely to self-explore or consider using modern educational technologies. To ensure student retention in online learning, lecturers must be cognisant of the benefits and opportunities the various educational tools offer to address students' learning needs. The lecturers involved in online presentations must be technologically affluent to ensure satisfaction that students obtain new knowledge. Since students are technologically affluent and require guidance to apply what they already know to a learning scenario, retention is low when the lecturer offers nothing new to the students.

According to Gering et al. (2018), the faculty staff must keep up to date with the constantly changing and ever-emerging technologies required for creating effective online designs. Some online programmes comprise practical and theoretical components. Students become dispirited when there is no correlation between practical and theoretical aspects, leading to attrition. Another technology-related factor is that faculty staff have negative perceptions of the efficacy of technology in providing online learning (Gaytan, 2013). Hence, their involvement in online education does not motivate the students since they need more confidence in online teaching as a medium of instruction. Alqurashi's (2019) findings indicate that some students feel that academics perform poorly using educational technology than traditional ones and are better off using the classic chalkboard.

3.5 PROPOSED CONCEPTUAL FRAMEWORK

The conceptual framework in Figure 2.1 identifies six factors from the literature that significantly contribute to online learning retention. Thus, they predict online learning retention. When handled in a manner that ensures satisfaction with online learning, each predictor ensures online retention of university students with LDs. In this section, a review of the literature is conducted to formulate the hypotheses.

3.5.1 Social and Family Factors

Several studies highlight the significant role of social support systems and family involvement in students' academic success and persistence with LDs (Hill et al., 2015; Gerber & Reiff, 2014; Lindstrom & Gray, 2016). The latter factors are relevant in online education because the virtual learning environment presents distinctive challenges for students with LDs. Researchers such as Allen and Seaman (2017) underscore the importance of external support networks in online higher education. They also state that students receiving active support from their families and peers are more likely to reveal higher engagement, motivation, and retention levels. In a related study, J. C. Smith et al. (2018) underline the influence of familial understanding and encouragement in nurturing a positive learning experience for students with LDs, improving online retention rates. Consequently, examining the direct relationship between social and family factors and online retention among students with LDs is vital for formulating effective support strategies in inclusive higher education.

One significant gap in the literature on predictors of online learning retention is the limited inquiry into how social and family factors influence the retention of students with disabilities in online learning settings. Even though family support and social networks have been acknowledged as critical in traditional educational environments, there is inadequate inquiry into how social and family factors affect online learning retention for university students with learning disabilities. Considering this, there is a need for more targeted research that specifically investigates the influence of family support and encouragement, peer relationships, and social integration on the persistence of university students with learning disabilities in online courses. Accordingly, the hypothesis that considers this is formulated as follows:

H1: Social and family factors directly affect the online retention of university students with learning disabilities.

3.5.2 Various Predictors of Online Learning Retention

The hypothesis that a lecturer's understanding of students, technological constraints, motivational factors, and institutional capacity positively influences

online retention of university-level students with learning disabilities has been supported by modern-day writings. Several researchers contend that lecturer support and understanding students' wide-ranging needs, especially those with LDs, are critical factors in improving online retention (O'Dwyer et al., 2017; E. Zhang & Espinoza, 2019). Researchers contend that one of the under-researched areas is seeking the understanding and empathy of lecturers towards students with disabilities. Limited studies examined how lecturers' knowledge and sensitivity to the needs of students with disabilities affect their retention rates. Moreover, research on the efficacy of definite approaches that lecturers can use to assist university students with learning disabilities is scarce. Hence, the gap in the literature is research that focuses on how lecturers' understanding and adaptive teaching approaches influence students' engagement and retention in online learning settings.

On the other hand, technological constraints, including inaccessible digital content or tools, have been found to significantly impede the learning experience for students with learning disabilities (Burgstahler, 2015; Gentry et al., 2019). Technological constraints and the digital proficiency of university students with learning disabilities constitute another research focus area where the literature is lacking. Although general technological blocks have been well-documented, the literature lacks comprehensive research on how specific technological challenges specifically affect university students with learning disabilities. At the same time, the experiences of digital natives (those students who are quite familiar with certain technologies because they grew up with them) appear not to have been systematically researched in the specific context of online learning retention for university students with learning disabilities. Hence, the gap in the literature is that there is a need for research exploring how technological barriers and the familiarity of digital natives with technology influence the online learning experiences and retention of university students with learning disabilities.

At the same time, self-efficacy and intrinsic motivation impact students' determination with LDs in online learning settings (C. J. Johnson et al., 2017; S. Lee et al., 2018). The literature identifies motivational factors as a predictor that

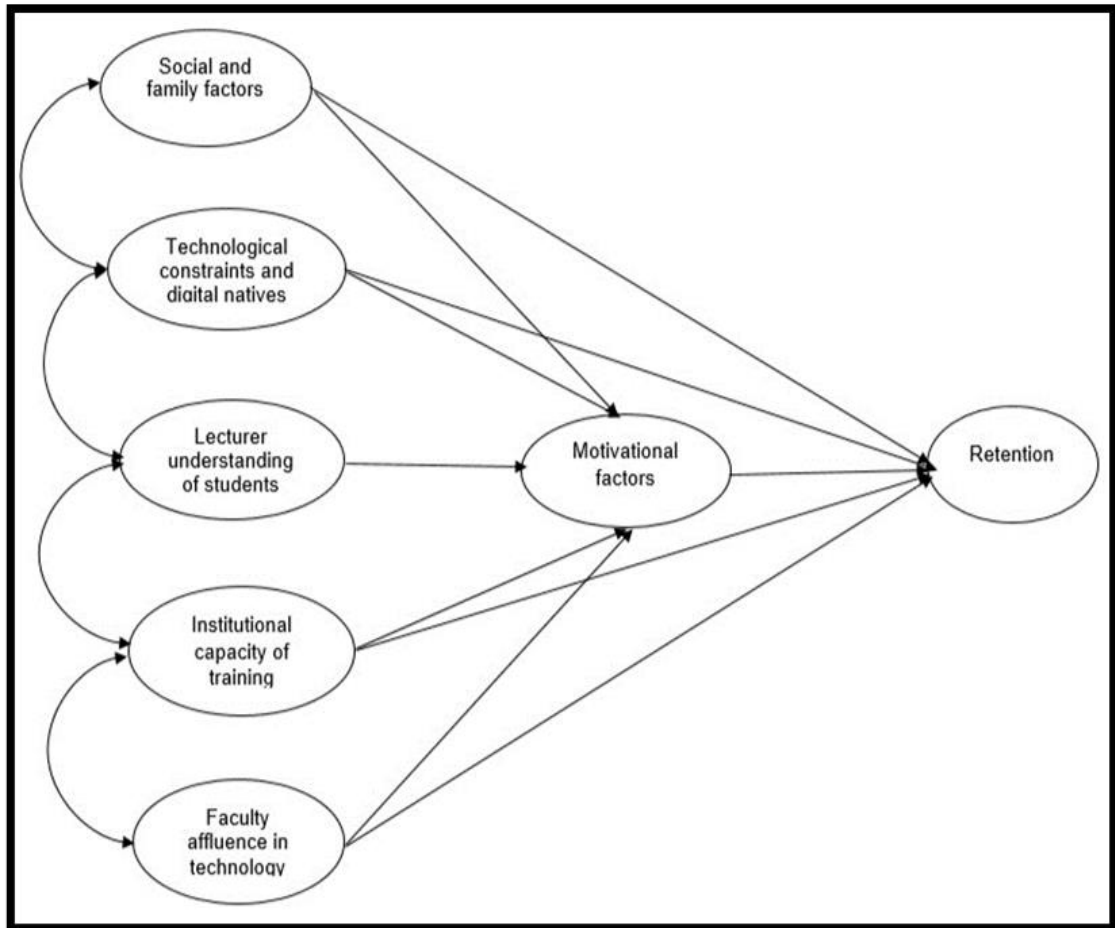
warrants further enquiry. Although motivational factors have been extensively researched, there is scarce investigation on how specific motivational drivers influence the retention of university students with learning disabilities in online learning retention. The gap that exists in the literature requires in-depth research that examines intrinsic and extrinsic drives to understand their influence on online student retention. The research needs to explore how tailored feedback, rewards, and inherent interests impact the retention of students with disabilities in online learning settings.

Finally, institutional capacity, such as the availability of support services and spaces, is essential when considering the extraordinary needs of students with LDs in online education (Burgstahler & Chang, 2015; Mullins et al., 2020). Examining the factors' collective impact on online retention among this cohort is crucial for informing policy and practice in inclusive higher education. There needs to be more literature on institutional capacity for training and resource allocation. For instance, studies on the efficacy of institutional training programmes designed to equip staff with the skills to support students with disabilities in online learning are limited. There is also a need for more data on how resource availability affects the online learning outcomes of these students. Studies evaluating the impact of institutional training programmes and resource availability on the support provided to students with disabilities are necessary to address this gap. Therefore, the hypothesis is formulated as:

H2: Lecturer understanding of students, technological constraints, motivational factors, and institutional capacity has a positive effect on online retention of university students with learning disabilities.

Figure 3.1 illustrates the factors influencing the retention of disabled students in online teaching environments.

Figure 3.1: Conceptual Framework



3.5.3 Lecturer Understanding of Students Moderated by Technology Constraints

The hypothesis that lecturer understanding of students indirectly and positively affects online retention, moderated by technological constraints experienced by students with Learning Disabilities (LDs) at the university level, supports the growing research in inclusive online education. Several researchers have found that lecturer understanding and support are critical in assisting students with LDs to succeed in online courses (McMahon et al., 2019; Rodriguez et al., 2020). Such supportive behaviours may involve offering other formats for course materials, providing extra guidance, and nurturing a receptive and all-inclusive learning environment.

At the same time, technological constraints, including remote online content and tools, were identified in several recent studies as significant hurdles for students with LDs in the online learning milieu (Burgstahler, 2015; Cullen et al., 2019). Hence, if lecturers have a high level of understanding of students with LDs, they may modify their teaching methods to alleviate the technological constraints. Such skills result in enhanced online retention rates among students with LDs. Probing the relationship between lecturer understanding, technological constraints, and online retention is essential for designing effective strategies for supporting the academic success of students with LDs in this modern-day era. Thus, the hypothesis is formulated as:

H3: Lecturer understanding of students has an indirect, positive effect on online retention moderated by technological constraints faced by university students with learning disabilities.

3.5.4 Lecturer Understanding of Students Moderated by Motivational Factors

The hypothesis that the lecturer understanding of students applies an indirect, positive influence on online retention, moderated by the motivational factors of university-level students with Learning Disabilities (LDs), is ingrained in the present literature focusing on inclusive online education. Recent studies have found that lecturer understanding, characterised by empathetic teaching methods and custom-made support for students with LDs, is pivotal in improving academic results for this student cohort in digital learning milieus (McMahon et al., 2019; Rodriguez et al., 2020). At the same time, self-efficacy and intrinsic motivation are acknowledged as essential determinants of continuity and success among students with LDs in online learning (Kim & Kim, 2018). The literature supports the view that the relationship between lecturer understanding and the motivational dynamics of students with LDs remains an understudied but hypothetically important area of study. Accordingly, examining how lecturer support, including empathetic teaching practices and customised assistance, interrelates with the motivation of students with LDs may yield essential insights into strategies for enhancing online retention in this educational context.

Considering the issues raised in this section, the hypothesis is formulated as follows:

H₄: Lecturer's understanding of students has an indirect, positive effect on online retention, moderated by motivational factors of university students with learning disabilities.

3.5.5 Faculty Proficiency in Technology Use

The hypothesis that faculty proficiency in technology use, technological constraints, motivational factors, and institutional capacity positively impact the online retention of university-level students with Learning Disabilities (LDs) has received significant support from a growing body of literature. Several studies have found that a faculty's ability to use technology to create inclusive learning environments is linked to better-quality learning outcomes for students with LDs in online courses (Bower et al., 2018; Królak & Zajac, 2018). Also, technical constraints, including inaccessible course tools or scarce assistive technology provision, may deter the success of students with LDs in online learning (Burgstahler & Chang, 2015; O'Dwyer et al., 2017).

At the same time, motivational factors, including self-efficacy and intrinsic motivation, are critical for supporting engagement and determination among students with LDs in online education (Kim & Kim, 2018). In recent years, institutional capacity, encompassing the availability of disability support services and accommodations, has been crucial in fostering an inclusive online learning experience for this cohort (S. Lee et al., 2020; Mullins et al., 2020). Exploring the joint impact of the latter factors on online retention among students with LDs is essential for guiding policies and practices that promote student success in higher education's transforming and digital landscape. Thus, the hypothesis is formulated as follows:

H₅: Faculty affluence in technology use, technological constraints, motivational factors, and institutional capacity positively affect the online retention of university students with learning disabilities.

3.5.6 Faculty Proficiency in Technology Use Moderated by Technology Constraints

The hypothesis that faculty skills in using technology indirectly and positively impact online retention, moderated by technological constraints experienced by students with Learning Disabilities (LDs) at the university level, is validated by several researchers who have focused on online education. Several studies have found a strong correlation between faculty's expertise in using technology and their skills in establishing accessible and inclusive online learning conditions and better-quality student results (Ali & Leeds, 2009; Kitchen et al., 2018). At the same time, technical constraints, which include inaccessible course resources or inadequate assistive technology support, significantly hinder the success of students with LDs in online learning (Burgstahler & Chang, 2015; Cullen et al., 2019). Examining how faculty's technological ability interrelates with the technical barriers that students with LDs face is essential for understanding the deeper dynamics that affect online retention in this cohort and guiding efforts to improve inclusive online education.

H6: Faculty affluence in technology use has an indirect, positive effect on online retention, moderated by technological constraints faced by university students with learning disabilities.

3.5.7 Faculty Proficiency in Technology Use Moderated by Motivational Factors

The hypothesis that faculty ability in technology use indirectly and positively impacts online retention, moderated by the motivational factors of university-level students with Learning Disabilities (LDs), is reinforced by the connection between the existing research on technology-enhanced teaching and motivational dynamics in online education. Research has found that faculty members who effectively utilise technology tools and engage students in interactive online learning experiences are likely to foster a positive motivational environment (Anderson & Dron, 2011; Keller, 2010).

In contrast, motivational factors, including self-efficacy and intrinsic motivation, have been acknowledged as essential determinants of student commitment and continuity in online learning, especially for students with LDs (Kim & Kim, 2018). The hypothesis submits that a faculty's proficiency in using technology may indirectly influence online retention through its impact on student motivation, creating a way to boost the academic success of students with LDs in digital learning settings. Therefore, the hypothesis is formulated as follows:

H7: Faculty affluence in technology use has an indirect, positive effect on online retention, moderated by motivational factors of university students with learning disabilities.

3.5.8 Faculty Affluence in Technology Moderated by the Institutional Capacity to Train

The literature on integrating technology in higher education environments validates the hypothesis that faculty's use of technology indirectly and positively impacts online retention, moderated by the institutional capacity to offer training to university staff. Some researchers found that faculty members employing technology tools and techniques create more engaging and effective online learning environments (Bates & Poole, 2003; Keengwe & Kidd, 2010). Conversely, providing institutional training and support for faculty in technology integration is crucial in ensuring that lecturers can effectively connect these tools (Ertmer et al., 2012; Mishra & Koehler, 2006). Institutions that invest in staff training benefit from enhanced technology adoption and improved online retention rates. Conducting research that focuses on the relationship between faculty technology ability and institutional capacity to provide staff training is important to understanding how universities can augment their online learning environments to promote student success. Thus, the hypothesis is stated as:

H8: Faculty affluence in technology use has an indirect, positive effect on online retention moderated by the institutional capacity to train university staff.

3.6 CHAPTER SUMMARY

In recent years, integrating online learning into the higher education environment marked a transformative shift, offering unprecedented flexibility and convenience. This digital evolution created opportunities for diverse student populations to engage in academic pursuits, regardless of geographic limitations or physical disabilities. Although the literature broadly addressed the general challenges of online education, it was critical to focus specifically on the unique barriers faced by students with disabilities in this rapidly advancing digital learning landscape.

This chapter also reviewed the literature on the intersection of disabilities and online learning, beginning with exploring the complex and varied nature of disabilities. It highlighted the different types of impairments that students may experience, such as learning disabilities, physical disabilities, and mobility constraints. Moreover, the chapter reflected on the dynamic nature of online learning and its potential for changing educational access, particularly for students with disabilities. By recognising the evolving nature of digital education, the chapter underscored its ability to break down traditional barriers, offering students with disabilities new avenues for engagement and academic success.

As the chapter progressed, it examined the critical issue of online learning retention, which was central to understanding student success in the digital age. Retention in online learning is important for students with disabilities, as they often face additional challenges that hinder their ability to persist and succeed in a digital learning environment. Factors such as access to course materials, technological limitations, faculty support, and institutional accommodations all significantly influenced retention rates among students with disabilities. The chapter explored how these elements interact and contribute to the academic experiences of this student group. The final segment of the chapter synthesised the findings from the literature, presenting a conceptual framework that offered a structured approach to improving the online learning experience for students with disabilities. This framework guided further exploration, as reflected in the subsequent chapters, where the literature on disabilities and online learning was examined in greater detail.

CHAPTER FOUR: RESEARCH METHODS AND RESEARCH DESIGN

4.1 INTRODUCTION

The purpose of this chapter is to provide a detailed methodological framework that outlines the research study's methodology. Unlike the general overview presented in Chapter 1, this chapter focuses on the systematic processes and techniques used to address the research questions, test the hypotheses, and attain the research objectives. It states the researcher's strategies for investigating the research questions, testing the hypotheses, and fulfilling the study's goals. The chapter provides a comprehensive overview of the research design, data collection methods, data analysis techniques, and statistical approaches employed throughout the study. A rigorous and structured approach is adopted to ensure the reliability, generalisability, and validity of the research findings. It will also allow replication of the study.

Quantitative research is characterised by its accent on empirical data, statistical analysis, and the quantification of variables. The researcher used a quantitative approach to gather, analyse, and interpret numerical data to uncover patterns and relationships between variables in this study. Such an approach allows for logical and objective exploration of the research questions and testing specific hypotheses. Using a well-defined methodology, the researcher reduced bias, enhanced the study's replicability, and contributed to the growing knowledge in the field. In the following sections, the researcher provides a detailed account of the research design, the population and sample, data collection instruments, procedures and techniques, as well as ethical considerations. Moreover, the researcher discusses the rationale behind the chosen methods and techniques and their alignment with the research questions. Throughout the chapter, the researcher stresses transparency and rigour to ensure the credibility and trustworthiness of the study's results and findings. The research onion model guides the chapter. Accordingly, the research philosophies are discussed, and the philosophy relating to this study is identified and justified.

4.2 RESEARCH PHILOSOPHY

The research onion model propounded by Saunders et al. (2015) proposes several research philosophies, including positivism, interpretivism, subjectivism, objectivism, realism, pragmatism, and phenomenology. These perspectives are distinct paradigmatic viewpoints regarding ontology, epistemology, and methodology (Otoo, 2020). Ontology is the examination and acceptance of social reality's fundamental nature and structure. At the same time, epistemology examines the connection between the observer and the reality being observed (Bonache & Festing, 2020). Methodological assumption describes how information regarding social reality is gathered (Otoo, 2020).

The proponents of the interpretivism paradigm are critical of positivism because it applies the natural sciences to practice on people (Lawani, 2021). This paradigm posits that the nature of reality is shaped and determined by social processes and interactions (Khatri, 2020). The study of reality entails the meticulous observation of individuals in their natural environments, enabling the comprehension and interpretation of how people establish and maintain their social realities (Williams, 2020). Individuals actively construct their social environment, and researchers should study the social world in its unaltered state without any interference or manipulation. Human beings occupy a prominent position and possess the ability to shape their reality. Therefore, interpretive researchers aim to comprehend, understand, and interpret social existence from the respondents' perspective (Khatri, 2020).

Critical realist academics have sought to merge positivism and interpretivism in their work (Bogna et al., 2020). While the social sciences can draw on positivism and other scientific approaches to explain causes and effects, they can also depart from these approaches by embracing an interpretative stance. According to Bogna et al. (2020), critical realism offers a foundation for a critical social science approach that challenges the very social practices it examines. As a result, taking a realist position in social research could help realise its liberating potential and offer a compromise between positivism and interpretivism. It is a multi-layered methodological illustration that characterises the fundamental

elements constituting a research methodology that ensures completeness and profundity of the methods and techniques for data collection and analysis. This study relies on collecting and analysing quantitative primary data and thus relates to the positivism philosophy.

Positivism is a research paradigm that advocates adopting quantitative methods and considers reality objective and unitary. According to the positivist philosophy, knowledge is seen as having an infallible source in observation (Saunders et al., 2019). Post-positivism shows that comment is theory-laden, and knowledge is fallible. However, psychologists and psychometrists regard quantification as the hallmark of science (Michell, 2001). The ontology of this study's paradigm was based on the reality of a community of university students with learning disabilities in various faculties. The thesis' epistemological assumptions involved collecting primary data without social interaction with students. The data was collected objectively and non-manipulatively (Saunders et al., 2019). The data collected was used to measure the predictive power of online learning factors on online learning retention. This thesis employs the positivist philosophy of using quantitative methods to collect and analyse the primary data objectively. The collection of data was conducted using a structured questionnaire with closed-ended questions.

4.3 RESEARCH GOAL AND RESEARCH QUESTIONS

Chapter 1 stated the research problem. The study aimed to develop a model of predictors on online learning retention of university students with learning disabilities. The research questions for this study were:

- To what extent do social and family factors influence online learning retention among university students with learning disabilities?
- To what extent does the perceived value of using technology influence online learning retention among university students with learning disabilities?
- To what extent does ease of use of the technology influence online learning retention among university students with learning disabilities?

- To what extent does lecturers' support influence online learning retention among university students with learning disabilities?
- To what extent does institutional support of faculty members influence online learning retention among university students with learning disabilities?
- To what extent does the institutional capacity to provide resources influence online learning retention among university students with learning disabilities?

4.4 RESEARCH DESIGN

Several researchers concur that various research designs exist depending on the research approach the researcher will use. Saunders et al. (2015) mention four research designs deployed in quantitative research: descriptive, correlational, comparative, quasi-experimental, and experimental. Saunders et al. (2019) suggest that research design comprises the research strategy, time horizon, data collection, and data analysis. The different possible research strategies postulated by Saunders et al. (2019) include a case study, ethnography, survey, action research, archival research, narrative, and grounded theory. Leedy and Ormrod (2015) suggest phenomenology and content analysis as additional possible research strategies.

Many researchers believe that grounded theory exemplifies the inductive approach, but this would need to be more concise (Stubley, 2021). It is more advantageous to conceptualise it as the process of constructing theories by employing both inductive and deductive reasoning (Pearse, 2021). The focus on theory development and construction makes a grounded theory approach, as stated by Tarozzi (2020), ideal for studies that aim to explain and predict behaviour. Many management and business concerns revolve around human behaviours involving customers or workers; using grounded theory is appropriate for many of these fields. Grounded theory begins with data collection before any kind of theoretical framework is formed. Data gathered from several observations is used to develop theories. The process involves generating predictions that are subsequently tested through additional observations, which may either confirm or refute the predictions (Saunders et al., 2015).

Saunders et al. (2019) contend that an ethnographical study provides detailed, contextualised explanations of behaviour, how people understand the settings in which they live and work, and why people feel the way they do. In an ethnographic study, interviewers use strategies to extract details that students thought significant and reveal understandings that lie beneath any formal discourse. Gertner et al. (2021) highlight six benefits of using ethnographic methods: (a) It encompasses the researcher's endeavour to gain a comprehensive understanding of phenomena that are exclusive to specific contexts, (b) it acquire insights from local perspectives, (c) it investigates intricate social interactions, (d) it examines sociocultural influences, (e) it enhances the reliability of findings through triangulation with multiple sources, and (f) it integrates theoretical models. Thus, an ethnographic strategy is broadly applied when conducting qualitative research.

Lavarda and Bellucci (2022) assert that a case strategy suits qualitative and quantitative research. Meanwhile, Robson (2024) describes a case study as an approach to research that uses multiple sources of evidence to examine a particular phenomenon in its actual setting. It is not always easy to distinguish between the phenomenon under study and its surrounding environment in a case study. The case study strategy is particularly relevant to comprehensively understanding a research context and the processes involved. This strategy starkly contrasts the experimental approach, where the research is conducted in a meticulously controlled environment.

According to Saunders et al. (2015), an experimental design is a traditional research method heavily influenced by the natural sciences. However, it is also widely used in social science research, especially psychology. The primary objective of an experiment is to investigate causal relationships, specifically whether a modification in one independent variable results in a corresponding alteration in another dependent variable (Grace & Irvine, 2020). Experiments are commonly employed in exploratory and explanatory research to address inquiries related to the methods and reasons behind phenomena. In a traditional experimental design, two groups are formed, and respondents are randomly

assigned to each group (Saunders et al., 2015). This implies that the two groups will be identical and pertinent to the research, except that an intervention influences the control group.

Surveys are a prevalent research strategy used in business and management research, primarily to address inquiries regarding individuals, objects, locations, quantities, and amounts (Grace & Irvine, 2020). This approach is associated with deductive research (Love & Corr, 2022). Consequently, it is commonly employed to conduct exploratory and descriptive research. Surveys are widely used because they enable the gathering of a substantial amount of data from a sizable population in a cost-effective manner (Taherdoost, 2022). This data is typically collected using a structured questionnaire distributed to a representative group, and the instrument is standardised to facilitate straightforward comparison. In a survey study, the quantitative data collected is analysed using descriptive and inferential statistics. Accordingly, this study deployed a survey strategy to collect and analyse the primary data. This thesis evaluated the effect of online learning factors on the research design associated with the causal-effect design. Therefore, the causal-effect research design was deemed suitable for the current study. According to Bryman and Bell (2015), research design is classified in terms of time, which includes longitudinal and cross-sectional research. The time horizon design for this thesis focused on the cross-sectional design. Seita (2016) describes a cross-sectional design as a study involving a cross-section of the target population studied over time. The cross-sectional study was conducted as a snapshot of eight months before the data analysis process commenced.

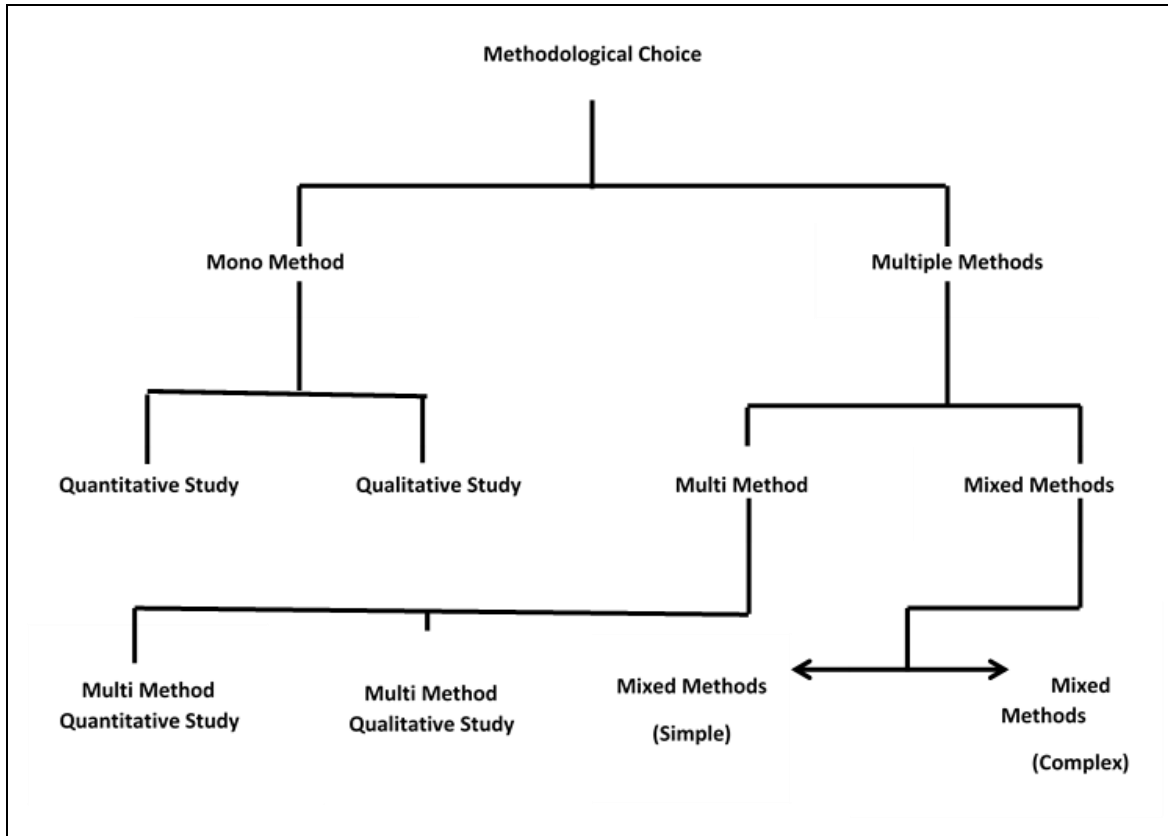
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representative group, and the instrument is standardised to facilitate straightforward comparison. In a survey study, the quantitative data collected is analysed using descriptive and inferential statistics. Thus, this study deployed a survey strategy to collect and analyse the primary data.

This thesis evaluated the effect of online learning factors on the research design associated with the causal-effect design. Therefore, the causal-effect research design was deemed suitable for the current study.

4.5 METHODOLOGICAL CHOICES

Figure 4.1 shows two main methodological choices, namely, mono-method and multiple methods. The methodological choice that the researcher makes depends on the research questions and objectives that the researcher intends to address (Ganzevles et al., 2022; Zhuravska, 2022). The two choices are dissected to explain and justify the appropriateness of the choice taken for this study.



Source: (Saunders et al., 2016)

4.5.1 The Mono-Method as the Choice for This Study

The mono-method uses a single research method, technique, or data collection strategy to examine a particular phenomenon or address a research question or hypothesis (Ganzevles et al., 2022; Howell Smith & Shanahan Bazis, 2021). As illustrated in Figure 4.1, the approach can be either quantitative or qualitative, but not a combination of the two. Researchers generally use the mono-method for several reasons. First, they use it because it allows them to focus on just one method, culminating in a more candid and focused study. This makes the entire research process more straightforward and data analysis more manageable. Second, using a single method reduces the complexity of mixing different methodologies and ensures consistency in data collection and analysis. Third, using a monomethod ensures an in-depth exploration of the phenomenon, leading to detailed statistical analyses (Dieteren et al., 2023; Harrison et al., 2020; Stern et al., 2020). Thus, this study does not adopt the multi-methods approach.

The advantages of using the mono-method include inter alia, ease of execution, more precise and more readily logical results since there is no need to compare results from different sources or methods, and cost-effectiveness (Chen et al., 2023; Haydam & Steenkamp, 2020; van der Waldt, 2020). However, the mono-method has limitations. For instance, the results provide a limited viewpoint of the phenomenon under investigation. Moreover, potential bias is inherent in using a single method, and the results may need to be more readily generalisable across different contexts (Ganzevles et al., 2022; Lytras & Visvizi, 2020). Given the time and resource constraints of conducting this research, the researcher adopted the quantitative approach.

4.5.2 Quantitative Approach

The approach involves scientifically examining phenomena by collecting and analysing numerical data to understand patterns, relationships, or trends (Chen et al., 2023; van der Waldt, 2020). The use of the quantitative approach starts with a clear, testable hypothesis taken from existing beliefs, assumptions, and previous research. In using the quantitative approach, researchers use structured methods like surveys, questionnaires, and secondary data analysis to collect data

(Howell Smith & Shanahan Bazis, 2021; Lytras & Visvizi, 2020). The raw data is subsequently subjected to statistical analysis, applying different statistical techniques. For instance, researchers use descriptive statistics to summarise data; inferential statistics are applied to draw conclusions and test hypotheses; t-tests, ANOVA, and regression analysis assist in defining the significance and strength of relationships between variables (Dieteren et al., 2023).

Proponents of the positivist research paradigm hold that quantitative research is structured and objective, ensuring reliability and replicability. In terms of generalisability, the research findings are generalisable to broader populations. Nevertheless, the quantitative approach does not capture the full intricacies of human experiences because it primarily focuses on quantifiable features and usually ignores contextual factors. Notwithstanding the constraints, several researchers contend that quantitative studies are instrumental in many fields and provide sound, evidence-based insights that inform policy, practice, and further study.

4.6 POPULATION AND SAMPLING

The whole set of cases from which a sample is drawn is called the target population (Coolican, 2017). In most cases, researchers have insufficient resources, such as time, money, and personnel, to involve the entire population in the study (Creswell & Creswell, 2017). The target population is students with LDs at a university in South Africa, totalling 700 students. Researchers apply sampling techniques to cut down the number of cases. In recruiting students, researchers employ two primary sampling methods: probability and non-probability sampling (Jackson, 2018).

A sample is a portion of a target population with similar characteristics, and its responses represent the entire population (Bell et al., 2018). The sample for this study is determined by Structural Equation Modelling (SEM). Structural Equation Modelling is a set of statistical techniques used when measuring and analysing the relationships of observed and latent variables. Although it is similar to regression analyses, the decision to use it was because it is more powerful,

examines linear causal relationships among variables and accounts for measurement error. Kline (2023) recommends that the typical sample size in studies using SEM should be a minimum of 200 cases. However, Kline (2023) suggests that a sample size of 200 respondents could be considered small when performing complex models with a non-normal distribution dataset. Therefore, the researcher targeted the recruitment of 200 students from a university in South Africa. Three hundred students were issued the instrument, of which 256 completed it.

The survey questionnaires completed and submitted by 256 students were deemed an adequate sample for conducting SEM to assess the relationships among constructs affecting online learning retention of students with LDs. Hair et al. (2010) state that a minimum study sample size is required to conduct SEM when the model characteristics constitute specific latent constructs and items. A study with five or fewer constructs, each with more than three items, should have at least 100 students, while a study with seven or fewer latent constructs, each with three or more items, should have a sample size of at least 150. Thus, a sample size of 250 students for the study was adequate and acceptable for conducting SEM.

The random sampling technique, a type of probability sampling, was employed in this study. The convenience technique saves time and cost, and students are selected based on availability (Coolican, 2017; Kline, 2023). However, the researcher chose the random sampling technique because it was the best suited for collecting data from a large target population (Daniel & Cross, 2018). Moreover, the random sampling technique paints a better picture of the variables in the target population and thus eliminates the researcher's bias (Jackson, 2018).

4.7 THE RESEARCH INSTRUMENT, PILOTING AND DATA COLLECTION

Primary data is collected using an online instrument comprising closed items plotted on a 5-point Likert Scale. University students with LDs are asked the extent of their agreement with items plotted from 1 (Strongly Agree) to 5 (Strongly

Disagree). The development of the research instrument for data collection was guided by Lee and Choi (2013) and other related studies (Bawa, 2016; Heyman, 2010; Osika et al., 2009). The instrument comprises six dimensions: motivational factors, technological constraints and digital natives, social and family factors, lecturer-student understanding of students, faculty skills in using the technology, and institutional capacity to train staff.

4.7.1 Social and Family Factors

Social obligations and family commitment are two dimensions of social and family factors that predict online learning retention. Evans (2009) describes how students cite family responsibilities as a predominant and recurring reason for dropping out of online learning courses. Social integration and family obligations were important factors in the retention equation, with questions such as “I depend on my family for online learning finance.”

4.7.2 Motivational Factors

Smart and Cappell (2006) note that motivational constraints are created by a lack of real-world learning contexts and limited accessibility and availability of resources and support systems. The three dimensions identified to measure motivational construct include *learning content*, *performance*, and *work avoidance orientation*. Examples of motivation and accountability items include the following students' comments: “Online learning improves my problem-solving skills”, and “I have always been scoring good in academic performance.”

4.7.3 Technological Constraints and Digital Natives

Weber and Farmer (2012) posit that students regard course delivery satisfaction as critical for continuing or withdrawing from online classes. Three dimensions for measuring technological constraints and digital natives are *overall course design*, *course delivery*, and *ability to use learning technology*. Prensky (2001) describes digital natives as students familiar with comprehensive technology but unable to adapt it to educational technology. This construct centres on the

students' technical knowledge concerning the course design, with responses to items formulated such as: "I appreciate different digital instructional methods."

4.7.4 Lecturer Student Understanding

This construct entails a facet that Garrison and Anderson (2003) describe as *facilitating learning* for students through the online learning process. According to Swan et al. (2009), the facilitating learning dimension involves shaping the meaningful learning-teaching exchange. The lecturer's attitudes and beliefs about students' learning disorders, educational technology, and pedagogy in general ultimately influence technology implementation for online learning (Lowther et al., 2008). The success of online learning depends on the lecturer's ability to understand the learning and behaviour disorders of the students. *Technology choices* for content delivery by the lecturer are informed by the lecturer's understanding of the students. Ice et al. (2007) concluded that audio feedback was associated with students' perceptions that the instructor cared more about them and that students were three times more likely to apply subject matter. Therefore, the two dimensions used to measure the lecturer's understanding of students are facilitating discourse and technology choices. This construct includes the comments: "Lecturers consider my learning disabilities" and "I feel most lecturers who deliver online lessons are learner-centred."

4.7.5 Faculty Affluence in Using Technology

Faculty affluence on using technology construct is measured by three dimensions: instructors' technology understanding, level of confidence, and technical support. Ng (2012) contends that instructors who conduct online classes are not technically literate to the extent required. Bawa (2016) suggests that another critical aspect contributing to the effectiveness of online course designs is the faculty's level of confidence and comfort with online classes. Osika et al. (2009) show that many faculty students expressed concern that the institution's lack of support made online courses unappealing. Typical questions for this construct are: "The ICT infrastructure for e-learning is sufficient for me", and "There are adequate digital technology resources for the faculty."

4.7.6 Institutional Capacity to Train Staff

The poor faculty contribution in online courses is due to educational institutions' lack of good faculty development programmes. According to Young (2005), while schools spend much money to add digital components to classes, significantly less funds are allocated to training academics to use these devices. *Staff training programmes and budgets are essential* for institutional capacity to train university instructors and lecturers (Bawa, 2016). The practical application of technology for online learning is enhanced when staff receive ongoing training for online learning technology use and design of online learning materials. The construct's questions include: "My lecturers have online facilitation competencies." The research instrument used a 5-point Likert scale measuring students' level of agreement with the 72 statements in the six research constructs. Each construct had 12 items measured on a scale of 1 – 5, where 1 = strongly disagree, 2 = disagree, 3 = neither agree nor disagree, 4 = agree, and 5 = strongly agree.

4.8 PILOTING THE INSTRUMENT

A pilot test was conducted to ensure the validity and reliability of the instrument of measurement. The instrument was piloted on 50 university students with LDs who were not part of the sample at a university in South Africa. The Google Forms link was shared with the disability unit, which distributed it online to students with learning disabilities at the university. The Survey Monkey platform, initially intended to be used was replaced by Google Forms because of low comparative costs. The reasons for piloting were, inter alia, to determine if the student quickly understood the instrument statements, to assess the feasibility of the study, and to deal with any ambiguous items. An online Google form was developed and shared with the university's disability unit. The unit helped to identify students from databases and provided email addresses to distribute the instrument to the students.

The variables of each predictor construct in the instrument were further measured for scale reliability using Cronbach's Alpha coefficients. Cronbach's Alpha (α) is a generally used metric for evaluating the internal consistency of scales in quantitative research. For this study, a reliability test was conducted to assess

the consistency of the scales measuring key constructs, including social and family factors, motivational factors, lecturer-student understanding, faculty affluence in using technology, and institutional capacity. The Cronbach's Alpha values obtained for each construct fell within acceptable thresholds, signifying the reliability of the scales. This suggests that the measurement instruments used in the study were robust and capable of capturing consistent respondent responses.

Table 4.1: Reliability Test Interpretation

Cronbach's alpha	Criteria
$\alpha \geq 0.9$	Excellent
$0.9 > \alpha \geq 0.8$	Good
$0.8 > \alpha \geq 0.7$	Acceptable
$0.7 > \alpha \geq 0.6$	Questionable
$0.6 > \alpha \geq 0.5$	Poor
$0.5 > \alpha$	Unacceptable

Exploratory Factor Analysis (EFA) could not be conducted for items in each construct to ensure the instrument had reliable variables before data collection (Field, 2005) because the sample size ($n = 50$) was small for factor analysis. The interpretation of reliability test results followed Tavakol and Dennick's (2011) 6-level reliability test criteria (see Table 4.1).

4.9 DATA COLLECTION

Data collection was undertaken from March to July 2023 after the pilot testing of the instrument. The researcher used two techniques to ensure that targeted students were included. The researcher directly contacted the students with LDs with the assistance of the Disability Unit, personally administering the instrument to ensure all students with LDs were included in the study. This approach allowed the researcher to assist students in completing the instrument where needed. The researcher sent links randomly to students with LDs using the secured emails for students with disabilities. The researcher ensured that a letter of introduction and consent were attached to the designed Google form. To proceed with completing

the questionnaire, every respondent had to click “yes”; when “no” was clicked, there was no further action to complete the questionnaire. Other recruitment strategies included the following:

- Approaching disability centres in the participating university helped recruit the respondents.
- Sending flyers to request the university's participation via disability centres to share with prospective students.
- Setting a date for information sessions through the university's disability centres to meet and address students about the study.

Besides face-to-face contact with the student, the researcher shared the introduction letter and a Google Forms link with the disability unit at the university. This approach encouraged them to participate since the documents originated from an office supporting them. Students clicked the link to the webpage where they completed the questionnaire. The reason for using Google Forms was that it was cost-effective and convenient during the COVID-19 pandemic, where physical or face-to-face meetings were risky. Therefore, the technique provided a faster way of accessing students than face-to-face meetings.

4.10 DATA ANALYSIS

Data analysis involves statistical techniques since only quantitative data is collected (Saunders et al., 2019). The Statistical Package for Social Sciences (SPSS) software was used to generate various statistical data outputs for analysis. First, descriptive statistical analysis was performed to summarise the profiles of students, inter alia, age, gender, age range, year of studies, type of LDs, and their programmes of study. The purpose of reporting on the profiles of students was to clarify to whom the findings apply, shed light on the generalisability of the results, and determine any possible limitations. Second, scale validation was determined using Pearson's Cronbach's Alpha. Third, the Exploratory Factor Analysis (EFA) was done to determine the factor loadings that affect online retention. The factorability and sampling adequacy are tested using the Kaiser-Meyer-Olkein (KMO) Test and Barlett's Test of Sphericity. A principal

component analysis (PCA) was used to extract initial factors (Field, 2005). Cross-loadings were dealt with by using Varimax rotation to refine the factors. The Varimax orthogonal rotation was applied since the study constructs were expected to be independent (Field, 2005).

Finally, the factors were subjected to SEM analysis using the AMOS software (Byrne, 2012). The SEM technique is a multivariate statistical technique for analysing structural relationships across variables between measured variables and latent constructs (Bollen & Long, 1993; Byrne, 2012). Then, the confirmatory factor analysis (CFA), part of SEM was performed to determine the extent to which indicators of each variable measure the intended latent variable (Wang & Wang, 2020). As part of SEM, we tested a measurement model examining how observed variables reflected the overall construct being measured (Kline, 2005). The observed variables were used to create latent variables to depict the relationships across the variables. Using the ultimate structural model, we tested the association of the influence of social and family factors, motivational factors, lecturer understanding of learners, overcoming technological constraints and digital natives, faculty affluence in using technology, and institutional capacity. The mediation analysis results were used to test the indirect effects of the thesis hypothesis formulated.

4.11 RIGOUR OF THE RESEARCH

The construct rigour in a research study is attributed primarily to the quantitative paradigm. A few criteria are required to ensure the rigour of the proposed study: internal validity, reliability, and objectivity (Bryman, 2016). The researcher received training for quantitative data analysis using Statistical Software for Social Scientists (SPSS) and determining the reliability of the results. Moreover, the instrument was validated by supervisors and statisticians who know the scale validation. The findings were compared with those from previous related studies to ensure the study's rigour. The reliability and validity of measurement models in SEM are assessed using techniques outlined in Table 4.2.

Table 4.2: Reliability and Validity of SEM Data

Reliability & Validity Evaluation Technique	Defined Threshold
Indicator reliability	factor loading ≥ 0.7
Composite Reliability (CR)	CR > 0.7
Convergent Validity	Average Variance Extracted (AVE) > 0.5
Discriminant Validity	The square root of AVE should be higher than the inter-construct correlation.

NB: Items with lower than 0.5 (AVE) in the loading factor had to be deleted, or more students had to be found to improve model performance (Kline, 2023; Wang & Wang, 2020).

Following the confirmation of reliability and validity, the structural equation modelling (SEM) results were analysed using key evaluation metrics, including the goodness-of-fit index (GFI) and standardised coefficient estimates based on the maximum likelihood estimation method (Raykov & Marcoulides, 2006). These criteria provided a robust framework to assess the appropriateness of the SEM and ensure the alignment of the hypothesised model with the observed data. Although the exogenous latent variables were not directly evaluated, their covariance was examined to determine whether the relationships among these variables were appropriately captured in the final SEM. This approach allowed the researcher to account for potential interrelationships and ensure the model's comprehensiveness. For a detailed evaluation of the SEM model fit, refer to Table 4.3.

Table 4.3: Structural Equation Modelling Model Fit Evaluation Criteria

SEM Evaluation Technique	Defined Thresh-hold
Chi-Square	$p \geq 0.05$
GFI (goodness-of-fit index)	GFI ≥ 0.95
AGFI (adjusted goodness-of-fit index)	AGFI ≥ 0.90
CFI (comparative fit index) and TLI	CFI ≥ 0.90
PRATIO (parsimony ratio)	PRATIO higher is a better fit
RMSEA (RMSE of approximation)	RMSEA < 0.08

Source: (Kline, 2023; Wang & Wang, 2020)

The chi-square test assessed the overall model fit, aiming for a non-significant result ($p \geq 0.05$) to confirm that the data align well with the proposed model. Other indices, such as GFI and AGFI, were employed to evaluate the proportion of variance explained by the model, with thresholds of ≥ 0.95 and ≥ 0.90 , respectively. The comparative fit index (CFI) and Tucker-Lewis index (TLI) provided comparative measures of fit, highlighting model improvements over baseline assumptions, both requiring values of ≥ 0.90 for acceptable fit.

The parsimony ratio (PRATIO) ensured that model simplicity was prioritised while maintaining explanatory power, where higher values indicated a more efficient model. Lastly, the RMSEA assessed error approximation, with values below 0.08 indicating an acceptable error level in the model's fit. These combined criteria reinforced the rigour of the SEM evaluation process, ensuring the final model was both statistically sound and theoretically meaningful.

4.12 ETHICAL CONSIDERATIONS

In conducting this study, several ethical issues were addressed, which is consistent with the requirements of the university's disability unit, where data was collected. The researcher applied ethical considerations in the data collection process to ensure that the rights of the students were not violated. Before proceeding with the research process, the primary ethical issue was the research ethics clearance of the thesis proposal. The researcher applied for ethical clearance from the university research ethics committee to conduct the study involving students with LDs. The researcher completed and submitted the ethical clearance forms and all the relevant documents to the ethics committee for approval (Coolican, 2017).

4.13 RESULTS OF THE PILOT STUDY

The primary purpose of the pilot test was to assess the accuracy of the original instrument, which included 70 items focused on applying digital learning to e-learning among students with disabilities. The pilot study involved 50 students with disabilities who shared similar characteristics with the target population. To

analyse the pilot data, the researcher used the Statistical Package for Social Sciences (SPSS) to generate descriptive statistics for demographic data and perform scale reduction for reliability testing across six dimensions of the research instrument. The tested factors included social and family characteristics, motivational factors, technological constraints and digital natives, lecturer-student understanding, and institutional capacity for staff training. Cronbach's Alpha coefficients were employed to validate the internal consistency of the instrument's constructs.

4.14 PILOT TEST

The primary goal of the pilot test is to validate the accuracy of the original instrument, designed with 70 items related to the application of digital learning to electronic learning by students with disabilities. The 50 students in the pilot study were students with disabilities with characteristics like those of the sampled population. To conduct pilot data analysis, the researcher used the Statistical Package for Social Sciences (SPSS) computer software to generate descriptive statistics for demographic data and scale reduction for reliability testing of the six dimensions of the research instrument. The factors tested include social and family characteristics, motivational factors, technological constraints and digital natives, lecturer-student understanding, and institutional capacity to train staff. Cronbach's Alpha coefficients assist in validating the internal consistency of the instrument constructs.

4.15 DEMOGRAPHIC PROFILE OF PARTICIPANTS OF THE PILOT STUDY

In this section, the results of the pilot test are presented. The demographic profile of the students analysed included gender, age group, programmes, duration, siblings in students' families, family income, nature of disability, and study space.

4.15.1 Students' Gender

Table 4 reveals that male students comprised a substantial majority of the pilot study sample, representing 68%, while female students accounted for about half of their male counterparts. This gender disparity underscores that the findings

predominantly reflect the perspectives of male students with disabilities. Also, a substantial portion of the students (66%) were under 35, representing a technologically adept generation referred to as digital natives. This age group is inherently familiar with and capable of evaluating e-learning technologies, particularly in the context of accessibility and usability for individuals with disabilities. This provides a meaningful basis for interpreting the results and understanding the technological engagement of students with disabilities.

Table 4.4: Pilot Study Respondents' Demographic Profile

	Variable	Frequency (f)	Percentage (%)
Gender	Male	34	68
	Female	15	30
	Other	1	2
Age	18-25	20	40
	26-35	13	26
	36-45	15	30
	46-55	2	4
Programme of study	BA	11	22
	BCom	8	16
	BSc	16	32
	Honours	2	4
	Masters	7	14
	PhD	6	12
Duration of study	1	2	4
	2	6	6
	3	28	56
	4	13	26
	5	1	2
Number of siblings	1	3	6
	2	3	6
	3	10	20
	4	17	34
	5	8	16
	6	6	12
	7	2	4
	8	1	2
Monthly income	<10000	15	30
	10001-20000	13	26
	20001-30000	5	10
	30001-40000	7	14
	40001<	10	20
Nature of disability	Hearing impairment	10	20
	Visual impairment	13	26

	Learning/psychiatric	11	22
	Physical impairments	14	28
	Speech impairments	2	4
Study space	Private	22	44
	Library	7	7
	Private and library	15	30
	Sharing/common	6	12

Note: Refers to the pilot study respondents' demographic profile

The study indicates that students enrolled in BSc programmes dominated the sample, comprising 32% of the respondents. In contrast, relatively few students pursued honours degrees, typically requiring shorter study periods. Notably, 74% of the students (42 students) were enrolled in programmes that lasted three or more years. This extended duration allowed these students to provide more informed and broad perspectives on the application and impact of digital technology in facilitating online learning. Such prolonged exposure to academic environments enables them to evaluate the adoption and integration of technology within their respective faculties better, offering valuable insights into its effectiveness and challenges (see Table 4.4).

Few of the respondents' families had more than four children (17; 34%). The number of siblings in a family could affect the distribution of family incomes to purchase data and digital devices for online learning. Most students' families had a monthly family income below the R10 001 bracket. The third highest frame of family monthly income was R40 001 or above. The results show that the students comprised families from the lowest and highest ends of the monthly income groups. This implies that some families had sufficient income to afford digital devices while others struggled to finance e-learning (see Table 4.4).

The data reveals the diverse range of disabilities among students participating in the pilot study. Most students have physical impairments (28%), followed by visual impairments (26%) and learning or psychiatric disabilities (22%). Hearing impairments totalled 20% of the group, while students with speech impairments represented the smallest proportion at 4%. These findings underscore the variety of challenges faced by students with disabilities in adapting to digital learning

settings and stress the need for inclusive and accommodating e-learning strategies. Regarding study spaces used during e-learning, most students (44%) preferred private spaces, making it the most common choice. Another 30% confirmed flexibility by alternating between private and library spaces. A smaller proportion (7%) relied exclusively on library spaces, while 12% used shared or common areas. This distribution stresses the importance of providing accessible, adaptable, and private study environments to support the unique needs of students with disabilities in online learning contexts. The demographic characteristics of the actual sample are provided in Section 5.2.

4.16 RELIABILITY ANALYSIS OF RESEARCH CONSTRUCTS

Cronbach's alpha test confirms the instrument's construct results, including social and family factors, motivational factors, technological constraints and digital natives, lecturer-student understanding, and institutional capacity to train staff. Table 4.5 shows high reliability across all the factors, with Cronbach's Alpha values ranging from 0.743 to 0.919, indicating that the research instrument is consistent and suitable for measuring the constructs.

Table 4.5: Reliability Statistics of the Research Instrument for the Pilot Study

Factor	Cronbach's Alpha	N of Items	Item mean
Social and family factors	.743	12	3.082
Motivational factor	.851	12	3.638
Technological constraints and digital natives	.839	12	3.592
Lecturer-student understanding	.907	12	3.592
Faculty affluence using technology	.868	12	3.483
Institutional capacity to train staff	.919	12	3.505

Note: Cronbach's Alpha of the research constructs

4.16.1 Social and Family Factors

In Table 4.5, the social and family factors exhibit an acceptable Cronbach's Alpha value of 0.725, confirming the construct's reliability and internal consistency. This

coefficient demonstrates that the 12 items effectively capture and describe the influence of social and family factors as predictors of e-learning adoption and retention for students with disabilities. The results suggest that variables within this construct, such as familial support, financial capacity, and social dynamics, are adequately measured and play a significant role in shaping the e-learning experiences of students with disabilities. This level of reliability underscores the importance of these factors in understanding the broader implications of e-learning for this demographic.

4.16.2 Motivational Factors

In Table 4.5, the motivational factor demonstrates an acceptable Cronbach's Alpha value of 0.847, revealing strong reliability and internal consistency within the construct. This coefficient confirms that the 12 items effectively capture the essence of motivational factors as predictors of e-learning retention for students with disabilities. The findings suggest that elements such as self-determination, goal orientation, and perseverance are adequately represented, highlighting their critical role in influencing the engagement and success of students with disabilities in online learning settings. The strong reliability of this factor stresses its importance in understanding the dynamics of e-learning for this population.

4.16.3 Technological Constraints and Digital Natives

Table 4.5 reveals that the factor encompassing technological constraints and digital natives exhibits a strong Cronbach's Alpha value of 0.815, indicating excellent reliability and internal consistency. This coefficient validates that the 12 items effectively capture the subtleties of this factor as predictors of e-learning retention for students with disabilities. The results imply that aspects such as access to technology, digital literacy, and adaptability to digital tools are represented, stressing their significant role in shaping e-learning experiences. The reliability of this factor highlights its critical importance in addressing barriers and leveraging opportunities in online learning for students with disabilities.

4.16.4 Lecturer-Student Understanding

Table 4.5 reveals that the lecturer-student understanding factor achieved an excellent Cronbach's Alpha of 0.907, reflecting exceptional internal consistency and reliability. This high coefficient confirms that the 12 items within this factor effectively capture the dynamics of lecturer-student understanding as a predictor of e-learning retention for students with disabilities. The findings accentuate the importance of mutual comprehension, clear communication, and adaptive teaching strategies in enhancing the online learning experience for students with unique needs. The strength of this factor highlights its pivotal role in promoting inclusivity and effectiveness in e-learning environments.

4.16.5 Faculty Affluence in Using Technology

As shown in Table 4.5, the faculty's affluence in using technology achieved a significant Cronbach's Alpha of 0.857, indicating strong internal consistency and reliability. This coefficient suggests that the 12 items within this factor adequately capture the role of faculty proficiency and resource availability in technology as key predictors of e-learning success for students. The high reliability stresses the importance of well-equipped and technologically adept faculty members in inspiring a supportive and effective e-learning environment for students, including those with disabilities.

4.16.6 Institutional Capacity to Train Staff

Table 4.5 presents an excellent Cronbach's Alpha of 0.917 for the institutional capacity to train staff. This high coefficient demonstrates outstanding internal consistency, indicating that the 12 items within this factor effectively describe the institution's ability to provide staff training as a crucial predictor of e-learning success for students with disabilities. The reliability of this factor highlights the importance of equipping staff with the necessary skills and knowledge to support an inclusive and accessible e-learning environment for all students.

Based on a representative pilot study sample with a fairly balanced demographic profile, the findings affirm the internal consistency of the research instrument

designed to collect primary data for a thesis measuring the factors influencing online learning for university students with learning disabilities. Adjustments were made to certain research questions to enhance their clarity and interpretability. It is important to note that the pilot study involved 50 students. Moreover, the exploratory factor analysis was not conducted at the pilot stage because the sample size was below the minimum threshold of 100 students required for EFA analysis. Consequently, the EFA was carried out during the full-scale study, which involved 256 respondents, and the results of this analysis are presented in Chapter 5. The next section provides a summary of the methodology covering the key aspects of this chapter.

4.17 CHAPTER SUMMARY

In conclusion, the methodology employed in this quantitative research study has been carefully designed to address the research objectives and test the hypotheses. The chapter has outlined the research design, data collection methods, sampling procedures, and data analysis techniques systematically and rigorously. By adopting a descriptive research design and cross-sectional survey, the researcher ensured that the study was well-suited to answer the research questions and contribute valuable insights to the field. A questionnaire allowed the researcher to gather reliable and valid data from the target population. The researcher has also taken measures to ensure the sample's representativeness through the random sampling technique, thus enhancing the generalisability of the findings to the larger population. Furthermore, the data analysis techniques, including the SEM, have been chosen to analyse the collected data and test the research hypotheses appropriately. The researcher followed the best practices in quantitative research to minimise bias and ensure the robustness of our results.

In the next chapter, the researcher presents the study's findings and discusses their implications in detail. The methodology presented here forms the foundation for the results and conclusions. Overall, this methodology chapter underscores the rigorous and systematic approach taken in this research, and the researcher is confident that the results obtained will significantly contribute to the existing body of knowledge in the field.

CHAPTER FIVE: PRESENTATION OF THE RESULTS AND FINDINGS

5.1 INTRODUCTION

This chapter presents a comprehensive analysis of the primary data collected from sampled students using a structured research instrument designed to explore the factors influencing online learning retention among students with learning disabilities (LDs). The study's primary objective was to identify these factors and assess their impact on retention rates for students with LDs. To achieve this, the study used advanced statistical techniques, including Structural Equation Modelling (SEM), to rigorously test the proposed hypotheses and draw meaningful conclusions.

The primary data for the study was gathered through an online survey distributed via the Google Forms platform. Three hundred students were invited to participate, with 256 completing the survey and submitting their responses, yielding a response rate of 85%. Such a response rate reflects a substantial level of engagement, providing a robust dataset for analysis. The survey responses were exported to Microsoft Excel for initial coding and preparation after the data collection. Statistical analysis was conducted using the Statistical Package for Social Sciences (SPSS), ensuring the application of advanced analytical techniques to test the relationships between variables and validate the hypotheses rigorously. This systematic approach to data collection and analysis stresses the rigour and reliability of the findings, providing important insights into the predictors of online learning retention for students with LDs.

5.2 DEMOGRAPHIC PROFILES

This section presents the distribution of students' characteristics, including age group, monthly income, gender, study program, disability, program duration, and the number of siblings.

5.2.1 Students' Age Group and Monthly Income

The students' profile data was analysed using the SPSS descriptive statistical analysis software. The descriptive statistics presented include the mean,

standard deviation, variance, frequencies and percentages of age groups, and monthly income of students. The mean age group of students was the 26-35 age group, and the mean monthly income was in the R20001–R30000 bracket. The averages of the two variables in Table 5.1 provide the centrality of the students regarding dominant age and the family income that financed their tertiary education. The mean of the age group is influenced by the outlier of the 56 or higher age group with the lowest percentage (7.4%) because the age group with the highest percentage representation (37.9%) is the 25 or lower age group (See Table 5.1). The standard deviation and variance of age group and monthly income (1.323; 1.538) and (1.751; 2.366), respectively, supported the fact that the observations of the variables are widely dispersed.

Table 5.1: Statistics of Students' Demographic Attributes

	Statistics							
	Age group	Monthly income	Gender	Programme	Disability	Study space	Duration	Siblings
Mean	2.29	3.12						
Median			2.00	3.00	2.00	3.00	3.18	3.56
Mode			1	3	2	3	3.00	4.00
Std. Deviation	1.323	1.538	.693	1.644	1.334	.855	.759	1.306

Table 5.2 details the distribution of age groups and monthly income among the students. The 18–25 age group represents the largest segment of the sample, accounting for 37.9%, followed by the 26–35 age group with 27%. The 56+ age group, in contrast, has the smallest representation at 7.4%, highlighting a relatively low number of older respondents in the study.

Table 5.2: Demographic Profile of Students

	Variable	Frequency (f)	Percentage (%)
Gender	Male	113	44.1
	Female	109	42.6
	Other	34	13.3
Age	18-25	97	37.9
	26-35	69	27
	36-45	28	10.9
	46-55	43	16.8
	56+	19	7.4
Programme of study	BA	48	18.8
	BCom	52	20.3
	BSc	54	21.1
	Honours	34	13.3
	Masters	38	14.4
	PhD	30	11.7
Duration of study	1	7	2.7
	2	22	8.6
	3	156	60.9
	4	63	24.6
	5	6	2.3
	6	2	0.8
Number of siblings	1	4	1.6
	2	8	3.1
	3	31	12.1
	4	82	32.0
	5	88	34.4
	6	20	7.8
	7	17	6.6
	8	6	2.3
Monthly income	<10000	47	18.4
	10001-20000	49	19.1
	20001-30000	64	25
	30001-40000	38	14.8
	40001-50000	38	14.8
	50001	20	7.8
Nature of disability	Hearing impairment	35	13.7
	Visual impairment	62	24.2
	Learning/psychiatric	55	21.5
	Physical impairments	54	21.1
	Speech impairments	50	19.5
Study space	Private	71	27.7
	Library	82	32.0
	Private and library	97	37.9
	Sharing/common	6	2.3

The prominence of younger students, particularly those in the 18–25 and 26–35 age brackets, suggests that the sample predominantly comprises individuals who are more likely to be digitally literate and familiar with modern technologies. These age groups are generally characterised by a higher level of technological savviness, which is a critical factor in online learning. Understanding the views and experiences of students with learning disabilities (LDs) from these dominant age groups is crucial in identifying the key factors that impact sustainable online learning. This demographic insight can help to tailor strategies that address the unique challenges faced by students with LDs in online educational environments, ensuring a more inclusive and effective learning experience.

The distribution of students' family incomes shows a fairly balanced spread across various income brackets, reflecting a wide range of socioeconomic backgrounds within the sample. The largest proportion of students (25%) falls within the R20,001 – R30,000 income category, indicating that a significant number of families possess a moderate level of financial capacity. This suggests that most students are likely to have the necessary resources to support their education. On the other hand, the R50,001+ category represents the smallest segment (20%) of students, indicating that this group consists of families with comparatively higher financial resources, making it a more exclusive subset of the population. Overall, the data reveal that a substantial proportion of students have a sound financial capacity, which is likely to play a vital role in enabling their ability to support the educational pursuits of students in the sample.

5.2.2 Students' Gender and Study Programme

The results presented in Tables 5.1 and 5.2 provide a comprehensive analysis of the students' gender and study programme distributions alongside the statistical measures that further explain these variables. Table 5.1 outlines the sample attributes' mean, mode, and standard deviation, offering a clearer understanding of the central tendency and variability within the dataset. The gender with the highest frequency distribution is male (mode = 1), and the study programme with the highest frequency is BSc (mode = 3). The standard deviation for gender is relatively low at 0.693, indicating minimal dispersion within this variable, while the

study programme exhibits a higher degree of variability with a standard deviation of 1.644. This implies that the study programmes are more diverse in their distribution, with a wider spread of students across different fields. The variance for both gender and study programme corroborates these findings, with the standard deviation effectively reflecting the degree of dispersion for each variable.

In Table 5.2, the gender distribution among students reveals that 44.1% are male, 42.6% are female, and 13.3% identify as other. The male and female students are almost equally represented, with a slight male dominance in the sample. This balanced gender distribution indicates a relatively equitable representation of both male and female students. The students' study programmes are categorised as follows: BA (18.8%), BCom (20.3%), BSc (21.1%), Honours (13.3%), Master's (14.8%), and PhD (11.7%). Most students were pursuing bachelor's degrees, with BSc being the most common programme. In contrast, PhD students constitute the smallest group, reflecting a lower proportion of advanced-degree students in the sample. This distribution underlines the prevalence of undergraduate students in the sample, with a significant focus on bachelor's degree programmes and a modest representation of higher-level studies.

5.2.3 Students' Disabilities and Study Space

The results presented in Tables 5.1 and 5.2 provide detailed insights into the student's nature of disability and study space, along with the statistical measures that describe the distribution of these variables. Table 5.1 outlines each sample attribute's mean, mode, and standard deviation, offering a clearer understanding of the central tendencies and variability within the dataset. The nature of disability with the highest frequency distribution is visual impairment (mode = 2), and the study space with the highest frequency is sharing (mode = 3). The standard deviation for the nature of disability indicates a relatively high dispersion at 1.334, suggesting that the students experience a wide range of disability types. In contrast, the standard deviation for study space is lower at 0.855, reflecting less variation in the types of study environments chosen by students. The variance calculations for both disability and study space further corroborate the dispersion

levels indicated by the standard deviations, confirming that disabilities exhibit a greater degree of variability compared to study spaces.

Table 5.2 provides a breakdown of students' disabilities and study space usage. The distribution of disabilities among students was as follows: hearing impairment (13.7%), visual impairment (24.2%), learning impairment (21.5%), physical impairment (21.1%), and health impairment (19.5%). The largest group of students reports having a visual impairment, while hearing impairments are the least common. This distribution stresses the prevalence of visual and learning impairments among the students, which is important for understanding the challenges faced by students with disabilities in online learning environments.

Regarding study space, most of the students reported using shared spaces (37.9%), followed by private spaces (32.0%). Many students (27.7%) also utilised library spaces, indicating a strong preference for structured, quiet environments conducive to focused study. Other types of study spaces are much less frequently used, with only 2.3% of students choosing them. The high proportion of students using private study spaces implies that many students are accustomed to studying independently, which may reflect a familiarity with online learning platforms. The distribution of study spaces further stresses the importance of providing varied learning locations that accommodate different preferences and needs, particularly for students with disabilities.

5.2.4 Students' Programme Duration and Family Siblings

The results in Tables 5.1 and 5.2 provide a comprehensive overview of the statistics, frequency, and percentage distributions for students' study programme duration and number of family siblings. Table 5.2 further details the descriptive statistics, including the mean, median, and standard deviation, offering valuable insights into these two important variables' central tendency and variability. The mean duration of the student's study programmes is approximately 3.18 years, closely aligning with the median value of 3.00 years, indicating that most students in the sample are enrolled in three-year programmes. Similarly, the mean number

of siblings is 3.56, which aligns with the median of 3.00, suggesting that most students come from families with a relatively small to medium number of siblings.

The standard deviation for programme duration is relatively low at 0.759, indicating that most students' programme durations are clustered around the mean, with only a small amount of variation. On the other hand, the standard deviation for the number of siblings is considerably higher at 1.306, reflecting a greater degree of variability in family sizes among the students. This higher dispersion suggests that while most students come from families with 3-4 siblings, there are notable outliers with either fewer or more siblings.

The distribution of programme durations reveals that most students (60.9%) are enrolled in three-year programmes, predominating the sample. This is followed by students in four-year programmes (24.6%) and a small fraction of students in six-year programmes (0.8%). These findings suggest that the views and experiences of students in three-year programmes heavily influence the study's results, which could provide valuable insights into the learning patterns of students engaged in shorter academic programmes.

Regarding family structure, most students come from families with four siblings (34.4%), followed closely by those with three siblings (32.0%). Families with no siblings (1.6%) and those with seven siblings (2.3%) are the least represented. This information underscores the diversity of family environments the students hail from and may offer insights into how family size influences academic performance and online learning retention. The number of siblings and programme duration are important factors in determining the financial allocation for a student's education, including online learning resources and support. The findings imply that larger families face more financial constraints, potentially affecting the students' access to necessary educational tools and technologies.

In conclusion, the demographic profiles of the students provide valuable insights into the characteristics of students with learning disabilities engaging in online learning. The sample predominantly consists of younger students pursuing

undergraduate degrees, with visual and learning impairments being the most common disabilities. Financial capacity appears to be a supportive factor for many students, while study environments vary, with private and shared spaces being the most common choices. Demographic factors, such as age, disability type, family structure, and financial background, offer an essential context for understanding the online learning experiences and challenges faced by students with learning disabilities. The next section presents the results of the EFA.

5.3 EXPLORATORY FACTOR ANALYSIS (EFA)

Explanatory Factor Analysis (EFA) is conducted to ensure the reliability and validity of the factor reduction process, focusing on the dimensions measured in this study. The primary aim of EFA is to determine the effective loading of items onto six factors that influence online learning retention for university students with learning disabilities. These factors are identified to explain the key variables impacting students' retention in online learning environments.

The EFA procedure used SPSS with Principal Component Analysis (PCA) as the extraction method. The first step involved testing the sampling adequacy and dataset sphericity to ensure the data was appropriate for factor analysis. Once adequacy was confirmed, the promax rotation method with Kaiser normalisation was applied to achieve a better fit for the data and facilitate a clearer analysis of the factor structure. This process enabled the identification of underlying patterns among the observed variables, which are presented as the basis for conducting structural equation modelling (SEM) later in the analysis.

5.3.1 The Kaiser-Meyer-Olkin (KMO) and Bartlett Tests

The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was found to be 0.806, indicating that the sample size is suitable for factor analysis. A KMO value above 0.6 is generally considered acceptable, with values closer to one suggesting that the data is appropriate for factor analysis (See Table 5.3). Bartlett's test of sphericity produced a chi-square value of 1481.495 with 351 degrees of freedom and a significance value of 0.000. This result indicates that

the correlation matrix is not an identity matrix, supporting the factorability of the data and justifying the use of factor analysis in this study.

Table 5.3: Kaiser-Meyer-Olkin and Bartlett Test Results

KMO and Bartlett's Test ^a		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.806
Bartlett's Test of Sphericity	Approx. Chi-Square	1481.495
	df	351
	Sig.	.000

Notes: KMO and Bartlett's test results

a. Based on correlations

The R-matrix results ($X^2(465) = 1976.094$, $p = .000$) indicate that the null hypothesis is rejected, meaning the R-matrix is not an identity matrix. This finding confirms significant correlations among the factors, thereby validating the relevance of factor analysis. Moreover, the determinant of the correlation matrix was found to be .000, which is above the minimum cut-off value of 0.0001. This suggests no issue with multicollinearity or singularity, reinforcing that factor analysis is appropriate for analysing the dataset and examining the factors influencing online learning for students with disabilities.

5.3.2 Factors Affecting OLR's Total Variance Explained

The eigenvalues presented in Table 5.4 are divided into three groups: Initial Eigenvalues, Extraction Sums of Squared Loadings, and Rotation Sums of Squared Loadings. The eigenvalues represent seven factors identified through factor analysis linked to variables affecting online learning for students with disabilities. The initial eigenvalues indicate the total variance explained by each factor before any extraction. The squared loadings' extraction sums show the variance each factor explains after the extraction process. Lastly, the rotation sums of squared loadings reveal the variance explained by each factor after rotation, which helps achieve a simpler and more interpretable factor structure. This analysis provides valuable insight into the key factors influencing online learning retention for students with disabilities. Table 5.4 illustrates the total variance of factors affecting online learning.

Table 5.4: Total Variance of Factors Affecting Online Learning

Total Variance Explained							
Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation
	Total	% of Var	Cum %	Total	% of Variance	Cum %	Sums of Squared Loadings
							Total
1	5.437	20.137	20.137	5.437	20.137	20.137	3.877
2	1.790	6.631	26.768	1.790	6.631	26.768	3.050
3	1.714	6.348	33.115	1.714	6.348	33.115	2.513
4	1.480	5.480	38.595	1.480	5.480	38.595	2.390
5	1.271	4.709	43.304	1.271	4.709	43.304	2.289
6	1.261	4.671	47.975	1.261	4.671	47.975	2.563
7	1.194	4.421	52.396	1.194	4.421	52.396	2.537
8	1.030	3.813	56.210				

Note: Factor total variance explained

From the extraction and rotation results, seven components are identified that explain more than 50% of the variance in the dataset. The rotation allows for a clearer interpretation of the components, providing a better understanding of the factors affecting online learning retention for students with disabilities. The total variance explained by the components suggests that the seven factors are crucial in understanding this demographic's influences on online learning. The final set of components identified after rotation provides a refined structure that helps in further analysis and hypothesis testing. The seven factors contributed the following percentages to the online learning retention variances: Component 1 (20.137); Component 2 (6.631); Component 3 (6.348); Component 4 (5.480); and Component 5 (4.709); Component 6 (4.671), and Component 7 (4.421), respectively. Other components that follow Component 7 were not considered.

5.3.3 Promax Rotation Method with Kaiser Normalisation

The Promax non-orthogonal rotation method was used to generate the pattern matrix. The decision to use the Promax rotation method was informed by the premise that the thesis factors were covariant.

5.3.4 Labelling of Factors Affecting Online Learning Retention

In Table 5.5, the items loaded in seven factors as follows: Component 1–institutional training capacity (ICT), Component 2–lecturer-student understanding (LSU), Component 3–online retention (OLR), Component 4–social and family (SF), Component 5–technological constraints (TC), Component 6–faculty affluence (FAF), and Component 7–motivational factor (MF). Factors 1, 2, 3, 4, 5 and 7 are the independent variables impacting online learning retention, while Factor 6 is the dependent variable labelled online learning retention. Table 5.6 depicts the explanations of the factors and variables.

Table 5.5: Pattern Matrix of the Factors Affecting Online Learning

	Pattern Matrix ^a						
	Component						
	1	2	3	4	5	6	7
ICT7	.738						
ICT10	.702						
ICT11	.611						
ICT6	.611						
ICT5	.545						
ICT9	.481						
LSU8		.800					
LSU7		.792					
LSU6		.523					
OR2			.758				
OR3			.727				
OR1			.724				
SF11				.745			
SF10				.705			
SF9				.574			
SF7				.472			
TC6					.698		
TC4					.595		
TC5					.594		
FAF8						.831	
FAF7						.620	
FAF12						.562	
MF6							.702
MF4							.573
MF5							.540
MF3							.481

Extraction Method: Principal Component Analysis.

Rotation Method: Promax with Kaiser Normalisation.^a

a. Rotation converged in eight iterations.

Note: Pattern matrix of seven factors after factor rotation

Table 5.6: Factors and Variable Explanation

Factor	Variables	Explanation
Social and family factor (SF)	SF7	Sit for long hours working in my learning space
	SF9	Facilities are in place to support my disability.
	SF10	Easy to discuss my learning challenges with my family
	SF11	Work with others for online learning.
Technological constraints and digital natives (TC)	TC4	Expensive data bundles for online learning
	TC5	Digital technology affects my online performance.
	TC6	Belong to the generation between 1980-2000
Lecturer-student understanding	LSU6	Lecturers demonstrate an encouraging attitude
	LSU7	Experienced varying teaching methods by lecturers
	LSU8	Module content well-structured by lecturers
Institutional training capacity (ITC)	ITC5	Lecturers perform roles using competent IT skills
	ITC6	Online facilitators understand roles and duties.
	ITC7	Lecturers receive support from competent technicians.
	ITC9	Online professional development opportunities
	ITC10	Peer support for new digital methods
	ITC11	Lecturers well qualified to deliver online classes
Faculty affluence in using technology (FAF)	FAF5	Quality of e-learning and teaching is high
	FAF6	New digital-savvy students attracted to my faculty
	FAF8	Back-up knowledge available to support connectivity.
	FAF12	Adequate digital resources for the faculty
Motivational factor (MF)	MF3	Driven by the desire to achieve success
	MF4	Scoring good academic performance
	MF5	Home safe and secure for learning.
	MF6	Standard of module work poses a challenge.
Online Retention (OLR)	OLR1	Willing to continue online learning due to full support
	OLR2	Family income able to cover tuition fees
	OLR3	Online learning is very convenient for me.

Note: SF = 4 items; TC = 3 items; LSU = 3 items; ITC = 6 items; FAF = 4 items; MF = 4 items; OR = 3 items

5.3.4.1 *Social and Family Factor (SF)*

The Social and Family Factor is composed of several key variables that have been identified through factor analysis as significantly influencing online learning retention for students with disabilities. These variables reflect the critical aspects of family dynamics and social relationships that affect learning. The four variables loaded on this factor are as follows:

- SF11: This factor represents family members' emotional support and encouragement, which contribute to the student's overall well-being and motivation to continue their studies.
- SF10: This factor relates to the financial support and resources available from the family, including the provision of technological tools, internet access, and assistive devices necessary for online learning.
- SF9: This factor focuses on the influence of family size and the availability of quiet study spaces, directly affecting the student's ability to concentrate and effectively engage in online learning activities.
- SF7: This factor highlights the role of peer relationships, including the support and interaction with friends and classmates, which contribute to the student's social integration and academic persistence.

Collectively, these variables illustrate the significant role that family dynamics and social relationships play in influencing the retention of students with disabilities in online learning environments. These factors underscore the importance of a supportive family and social network and the need for access to resources and suitable learning spaces to ensure successful online learning outcomes.

5.3.4.2 *Technological Constraints (TC)*

The Technological Constraints and Digital Natives Factor consist of several variables that were identified through factor analysis as significant contributors to online learning retention for students with disabilities. These variables reflect the critical relationship between the student's technological abilities, course design, and the accessibility of learning tools. The four variables loaded on this factor are as follows:

- TC1–This factor represents the overall design and layout of online courses, assessing whether the course content is accessible and navigable for students with varying levels of digital proficiency and disabilities.
- TC5–This factor focuses on the student’s proficiency in using digital tools and platforms required for online learning, including the ability to access course materials, interact with the platform, and complete assignments using technology.
- TC7–This factor relates to the availability and functionality of assistive technologies, such as screen readers or speech-to-text software, that enable students with disabilities to engage effectively with the online learning environment.
- TC8–This factor examines the reliability and accessibility of the internet connection, which can be a barrier for students living in areas with poor internet infrastructure, limiting their ability to access learning materials and participate in online courses.

The variables collectively highlight the importance of course design, technological proficiency, and access to learning technologies in determining the retention of students with disabilities in online learning environments. Ensuring that students have the necessary resources, skills, and support to engage with e-learning platforms is essential for improving retention rates and promoting academic success in digital learning environments.

5.3.4.3 Lecturer Student Understanding (LSU)

The Lecturer’s Understanding of Students Factor consists of several variables that reflect how a lecturer’s knowledge of their students influences the choice of digital technologies and the overall effectiveness of online learning. These variables were identified through factor analysis and include the following:

- LSU8–This factor represents the lecturer's awareness of individual student needs and challenges, including how well they understand the specific requirements of students with disabilities.

- LSU7–This variable focuses on the lecturer’s ability to select appropriate digital tools and technologies that align with students’ learning styles and technological capabilities, ensuring accessibility and engagement.
- LSU6–This variable measures the extent to which the lecturer personalises the online learning experience by adapting their teaching methods and technology choices based on their understanding of the student’s needs.

Together, the variables emphasise the importance of a lecturer’s understanding of their students in shaping the effectiveness of online learning, especially for students with disabilities. By considering students’ individual needs, lecturers select digital technologies that enhance the learning experience and ensure that all students fully participate and succeed in online courses.

5.3.4.4 Institutional Training Capacity (ITC)

- The Continuous Skills Development Factor comprises several variables that reflect the importance of ongoing professional development for lecturers and technical staff. These variables, identified through factor analysis, include:
 - ICT6: This variable focuses on university lecturers’ training and professional development in using online learning technologies and teaching strategies tailored to students with disabilities.
 - ICT5: This variable relates to lecturers’ continuous skills development in creating inclusive, accessible, and engaging online learning materials.
 - ICT9: This variable represents the training of technical staff in the management and optimisation of online learning platforms, ensuring the technological infrastructure supports effective online learning for students with disabilities.

The variables underscore the significance of continuous skills development in promoting a successful online learning environment. By investing in the professional development of academic and technical staff, universities can enhance the quality and accessibility of online learning, ultimately improving retention and academic success for students with learning disabilities.

5.3.4.5 Faculty Affluence Factor (FAF)

The Faculty Affluence Factor is represented by several key variables identified through factor analysis. The variables emphasise the importance of faculty confidence, technological proficiency, and access to technical support. The variables contributing to this factor include:

- FAF8—This variable focuses on faculty members' confidence and technological proficiency in using online learning platforms and tools.
- FAF7—This variable relates to the faculty's understanding of students' needs, particularly those with disabilities, and their ability to create accessible and inclusive course content.
- FAF12—This variable stresses the availability of technical support for faculty, ensuring they have the resources and assistance to deliver online learning effectively.

By ensuring that faculty members possess the necessary confidence, knowledge, and support to utilise online technologies effectively, universities can enhance the overall quality of online learning, particularly for students with learning disabilities. This factor underscores the significance of faculty affluence in promoting a successful online learning experience and fostering an inclusive educational environment.

5.3.4.6 Motivational Factors (MF)

The Motivational Factor was defined by four specific items illustrating the key drivers of motivation in online learning. The variables capture different motivational aspects relevant to students' engagement with online learning platforms. The items that contributed to this factor include:

- MF6—This variable captures the degree to which students feel motivated to engage with online learning based on personal goals and aspirations. It reflects how individual goals, such as achieving academic success or career development, can motivate students to persist in online learning.
- MF4—This item focuses on the importance of external recognition, such as the acknowledgement of achievement by peers, faculty, or the broader

community. Recognition serves as an extrinsic motivator that encourages students to continue engaging with online learning platforms.

- MF5-This variable looks at how the perceived relevance and applicability of the online learning content to students' lives and future careers influence their motivation. Students who can relate the course material to their personal or professional aspirations are more likely to remain engaged.
- MF3-This item assesses the level of support students receive from various stakeholders (e.g., faculty, peers, family), which can positively impact their motivation to continue learning online. Support, whether emotional or academic, is a critical factor that can boost motivation and promote sustained engagement in online learning.

The variables highlight the different motivational influences that affect students' ability to persist in online learning environments. By focusing on factors such as personal goals, recognition, relevance, and support, universities can design interventions that enhance students' motivation, leading to higher retention and success rates, especially for students with disabilities.

5.3.4.7 Online Learning Retention (OLR)

The Online Learning Retention Factor is defined by three variables that reflect the decision-making process of students with disabilities regarding their continued use of online learning technologies. These variables capture different aspects of the students' experiences and perceptions, ultimately influencing their retention. The items that loaded onto this factor include:

- OLR1-This variable assesses students' overall satisfaction with the online learning technologies available to them. It reflects students' perceptions of how well these technologies meet their educational needs and how accessible they are in terms of usability and support.
- OLR2-This item captures the students' confidence in using online learning technologies effectively. It considers the ease with which students navigate digital platforms and whether they feel empowered to utilise the available tools for their learning.

- OLR3—This variable reflects the students' perception of the long-term benefits of using online learning technologies, such as improved academic performance and career prospects. When students see a direct connection between their use of online learning and their future success, they are more likely to stay engaged and continue using these technologies.

The variables show the multifaceted nature of online learning retention. Students with disabilities are more likely to continue using online learning platforms when they feel confident in navigating the technology, experience satisfaction with the learning process, and recognise the tangible benefits for their academic and career goals. Understanding and addressing these key factors can help institutions create more effective, supportive online learning environments that promote retention for all students, including those with disabilities.

In the next section, the researcher conducts a multivariate regression analysis using SEM to determine factors influencing online learning retention for university students with learning disabilities. SEM is a robust statistical technique that examines complex relationships between observed and latent variables, allowing for a more inclusive understanding of how different factors interrelate and contribute to the retention of students in online learning environments. By using the 7 identified factors, the researcher aims to model the pathways through which factors such as social and family obligations, technological constraints, lecturer support, institutional training, and motivational factors impact the ability of students with disabilities to remain engaged and succeed in online learning. This analysis allows for an in-depth analysis of the direct and indirect effects of the factors, providing empirical insights into how online learning retention can be enhanced for students facing additional challenges.

To ensure the validity and reliability of the measurement model, CFA is conducted using the SPSS AMOS software. Confirmatory Factor Analysis is a key step in SEM that validates the factor structure and confirms that the data fit the hypothesised model. By performing CFA, the researcher verifies the adequacy of the factor loadings, assesses the goodness-of-fit indices, and refines the model

if necessary. The CFA process also enables the researcher to examine whether the theoretical constructs, represented by the seven factors, accurately capture the underlying dimensions of online learning retention for students with disabilities. The results of the CFA guide the refinement of the structural equation model and provide a clearer understanding of the relationships among the identified factors. Finally, the SEM results inform the development of evidence-based strategies for improving online learning experiences and retention rates for students with disabilities in higher education.

5.4 STRUCTURAL EQUATION MODELLING

5.4.1 Interpretation of the Confirmatory Factor Analysis

Figure 5.1 illustrates the Confirmatory Factor Analysis (CFA) model, which tests the hypothesised relationships among the factors influencing online learning retention for university students with learning disabilities. The model is designed to depict the interactions between key factors, namely institutional training capacity, social and family support, technological constraints, faculty technological proficiency, lecturer-student understanding, and motivational factors and their joint effect on the successful retention of these students in an online learning environment. Each factor is linked to specific items, with the items measured through various variables, which capture the extent to which these factors impact online learning retention.

The results of the CFA path model indicate that all variables exhibit strong factor loadings, signifying that the relationships between the factors and their corresponding items are substantial. For example, the factor representing institutional training capacity, measured by items ICT5, ICT6, and ICT7, reveals a high degree of factor loading, particularly with ICT7 (1.23), signifying the significant role that institutional readiness plays in supporting students with disabilities in online learning. This finding stresses the importance of providing appropriate training and resources at the institutional level to ensure the effective engagement of students in online learning. Similarly, the social and family support factor, represented by items SF7, SF9, SF10, and SF11, shows strong loadings,

particularly SF11 (1.00), emphasising the critical role that familial and social networks play in fostering students' continued engagement with online education.

The technological constraints factor, captured by items TC4, TC5, and TC6, stresses students' challenges in accessing and using technology for online learning. The moderate to high factor loadings, such as TC5 (1.00) and TC6 (0.90), reveal the significant impact that technological limitations, such as inadequate access to devices or unreliable internet, can have on students' ability to participate fully in online learning environments. The faculty affluence factor, represented by items FAF7, FAF8, and FAF12, stresses the importance of faculty technological fluency. Notably, item FAF8 (0.82) reflects the strong connection between faculty members' technological competence and their ability to deliver effective online learning experiences.

The lecturer-student understanding factor is captured by items LSU6, LSU7, and LSU8, which reflect how well lecturers understand and address the unique needs of students with disabilities. The high loadings on these items suggest that a deep understanding of students' specific challenges and needs is essential for successful online learning retention. Finally, the motivational factors reflected by items MF4, MF5, and MF6 represent the intrinsic and extrinsic motivations that drive students to persist in their online learning journeys. Moderate to strong loadings, such as MF4 (1.00) and MF5 (0.90), underscore the influence of motivation on students' commitment to completing their online coursework.

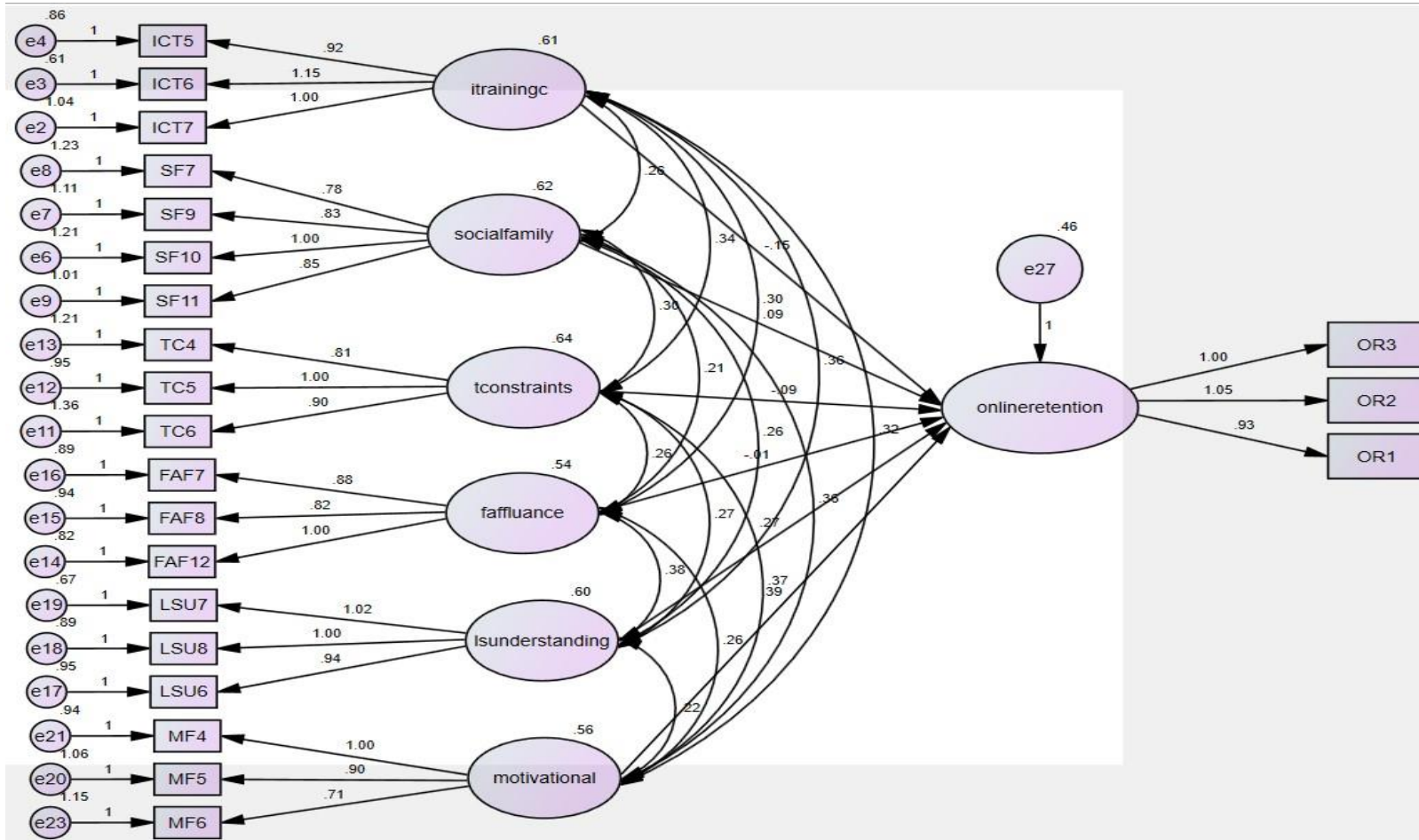
The online retention factor, which serves as the model's outcome, reflects students' sustained engagement with online learning. The items OR1, OR2, and OR3 show strong loadings, particularly OR2 (1.05) and OR1 (0.93), signifying that the dimensions are closely linked to retention outcomes. This model shows the linkage of various factors and how they collectively contribute to or hinder the successful retention of students with disabilities in online learning settings.

In conclusion, the CFA model provides valuable insights into the complex relationships between various factors influencing online learning retention. It

highlights the crucial role of institutional support, family and social factors, technology access, faculty competence, lecturer-student understanding, and motivation in ensuring the success of online education for students with disabilities. By confirming the relationships, the model reinforces the importance of addressing these factors to enhance students' retention and academic success in online learning environments.

Figure 5.1 depicts the CFA model.

Figure 5.1: CFA model



Note: Factors affecting online retention

Key relationships in the model

The arrows between the factors and their corresponding items in the model indicate the direction and strength of the relationships, highlighting how various elements interact. For example, the arrow from SF11 (family support) to the “socialfamily” factor shows that family support plays a crucial role in shaping the broader social and family influences on students' ability to engage with and persist in online learning. The presence of strong relationships, like those between family support and social or family factors, stresses the importance of the networks in facilitating retention.

The path coefficients (e.g., 0.36 between technological constraints and online retention) offer quantitative measures of the strength and direction of the relationships between individual factors and overall retention. In this case, while technological constraints (e.g., TC5) impact retention, the coefficient suggests that technology barriers are less influential than other factors, such as social support and lecturer understanding, which may have higher coefficients in the model. This implies that overcoming technological challenges is important but not as critical in driving retention as the more supportive, human-centred factors.

The model provides a valuable visualisation of how various factors, such as social support, faculty expertise, technology access, and student motivation, interact and combine to influence the retention of students with disabilities in online learning settings. The factor loadings, which quantify the strength of each variable's relationship to its respective factor, confirm the degree to which each factor contributes to the overall success of online learning. Variables with higher loadings indicate stronger influences, underscoring the critical components that need to be addressed to improve retention outcomes.

Table 5.7 consolidates the variables correlated with each factor influencing online learning retention for students with disabilities and their respective coefficients, offering further insights into these relationships. For instance, in the Institutional Training Capacity (ICT) factor, ICT5 (0.92), ICT6 (1.15), and ICT7 (1.00) all contribute to the retention outcome, with ICT6 having the highest coefficient

(1.15). This finding highlights the substantial influence of institutional resources and training programmes on supporting students with disabilities in the online learning environment. Similarly, in the Social and Family Factors (SF), the variables SF7 (0.78), SF9 (0.83), SF10 (1.00), and SF11 (0.85) reflect the importance of family support, with SF10 showing the highest coefficient (1.00). This reinforces the notion that family and social support are key to helping students persist in online education, enhancing their overall retention.

These observations stress the multifaceted nature of online learning retention, where institutional, social, technological, and personal factors interact in complex ways to shape students' ability to stay engaged and succeed in their online education journey. The path coefficients and factor loadings offer a clear picture of the most significant factors and help pinpoint areas for intervention and improvement.

Table 5.7: Variables of Factors Affecting Online Learning and Coefficients

Factors	Variables	Coefficients
Institutional training capacity	ICT5; ICT6; ICT7	0.92; 1.15; 1.00
Social and family factors	SF7; SF9; SF10; SF11	0.78; 0.83; 1.00; 0.85
Technological constraints and digital natives	TC4; TC5; TC6	0.81; 1.00; 0.90
Faculty affluence in technology use	FAF7; FAF8; FAF12	0.88; 0.82; 1.00
Lecture student understanding	LSU7; LSU8; LSU6	1.02; 1.00; 0.94
Motivational factor	MF4; MF5; MF6	1.00; 0.90; 0.71
Online Retention	OR3; OR2; OR1	1.00; 1.05; 0.93

Note: Coded factor variables and coefficients

The Technological Constraints (TC) variables—TC4 (0.81), TC5 (1.00), and TC6 (0.90)—underscore the significant impact that overcoming technological barriers has on the retention of students with disabilities. Among these, TC5 stands out with the highest coefficient (1.00), suggesting that the availability of accessible technology and reliable learning platforms plays a pivotal role in ensuring that students can continue participating in online learning. The findings highlight that

addressing technological constraints is crucial for creating an inclusive and supportive learning environment for students with disabilities.

Similarly, the Faculty Affluence in Technology Use factor (FAF), which includes the variables FAF7 (0.88), FAF8 (0.82), and FAF12 (1.00), emphasises that faculty proficiency with technology significantly shapes students' online learning experiences. FAF12, with the highest coefficient (1.00), validates the centrality of faculty expertise in using educational technologies, accentuating that lecturers well-versed in technological tools can better support students in dealing with online learning platforms. The relationship between faculty technology use and retention is a critical factor for promoting effective online education.

In the same vein, the Lecturer-Student Understanding (LSU) factor, with variables LSU7 (1.02), LSU8 (1.00), and LSU6 (0.94), reinforces the importance of effective communication and mutual understanding between lecturers and students. The variable LSU7, showing the highest coefficient (1.02), highlights that a lecturer's awareness of students' needs, especially in online contexts, significantly contributes to positive learning outcomes. This factor underscores the need for lecturers to adapt their teaching strategies to meet students' individual needs, which directly impacts retention in online learning environments.

The Motivational Factors (MF), which include variables MF4 (1.00), MF5 (0.90), and MF6 (0.71), emphasise the critical role of maintaining motivation for online learning retention. MF4, with the highest coefficient (1.00), signals that intrinsic motivation, such as students' drive and interest in the subject matter, strongly predicts their ability to remain engaged in online learning. Motivation acts as a catalyst and a sustaining force, propelling students to persist notwithstanding the challenges, and is vital for ensuring their continued participation and success in online courses.

Finally, the Online Retention (OR) variables, OR3 (1.00), OR2 (1.05), and OR1 (0.93), reflect the outcome of the model, focusing on the retention of students in online learning environments. OR2, with the highest coefficient (1.05), stresses

its critical role in shaping overall retention, suggesting that the direct elements of retention, such as continued engagement and progress in the course, are pivotal in ensuring the success of online learning initiatives. The significant coefficients of these variables highlight the importance of monitoring and fostering retention outcomes to create an environment where students can persist and thrive.

In conclusion, the findings point to the complex nature of online learning retention, where a combination of internal factors, such as motivation and lecturer-student understanding, and external factors, such as technological access and faculty expertise, collectively influence the retention of university students with learning disabilities. These elements work in tandem to create a learning environment that supports students in overcoming challenges, staying engaged, and completing online courses. The next section will explore the reliability of these constructs, providing further insight into the stability and consistency of the model's factors.

5.4.2 Reliability

Table 5.8 provides a detailed evaluation of the reliability and convergent validity of the constructs used in the study. The measures are essential for assessing the internal consistency of the constructs and ensuring that the items amply represent their respective dimensions. The table sums key reliability measures, including Standardised Factor Loadings (SFL), Cronbach's Alpha, Composite Reliability (CR), Average Variance Extracted (AVE), and Maximum Shared Variance (MSV).

Standardised Factor Loadings (SFL)

The loadings reflect the strength of the relationship between each item and its corresponding construct. A loading value greater than 0.5 is generally considered acceptable, signifying that the item contributes sufficiently to the construct. Ideally, factor loadings should be above 0.7 for stronger validity, indicating a higher degree of correlation between the item and the construct. However, items with loadings between 0.5 and 0.7 can still be retained in the model, provided other reliability measures, such as Cronbach's Alpha and Composite Reliability, support their inclusion. For items with lower loadings, evaluating whether they

contribute meaningfully to the overall construct and whether their inclusion enhances the overall measurement model is crucial.

Cronbach's Alpha

Cronbach's alpha measures internal consistency, assessing how well the items within a construct are interrelated. It is a generally used indicator to ensure that the items collectively measure the same underlying concept. For a construct to be considered reliable, Cronbach's Alpha values above 0.7 are generally accepted, indicating that the items have an adequate degree of correlation. In Table 5.8, most constructs exhibit Cronbach's Alpha values well above 0.7, which implies good internal consistency among the items in each construct. This enhances the confidence in the reliability of the constructs used in the study.

Composite Reliability (CR)

Composite reliability is a more robust measure of reliability than Cronbach's Alpha as it considers the individual contributions of each item to the construct, rather than just examining overall consistency. A CR value above 0.7 is commonly indicative of strong reliability. When CR values are combined with SFL and Cronbach's Alpha, they provide a comprehensive picture of the overall reliability and validity of the measurement model. In the study presented in Table 5.8, the CR values for most constructs exceed the threshold of 0.7, further reinforcing the reliability and robustness of the measurement model.

Average Variance Extracted (AVE)

This variable represents the proportion of variance in a construct captured by its items. It indicates convergent validity, with values greater than 0.5 considered acceptable. A higher AVE indicates that the construct is adequately represented by its items and that they are highly correlated with one another. In Table 5.8, most constructs have AVE values above 0.5, implying that the items reliably capture the intended dimensions of each construct. Constructs with an AVE exceeding 0.7, such as Technological Constraints (TC), exhibit excellent convergent validity.

Maximum Shared Variance (MSV)

This variable assesses the overlap between constructs and serves as a measure of discriminant validity. Discriminant validity ensures that each construct is distinct and not overly correlated with other constructs in the model. The MSV should be lower than the AVE for a given construct for good discriminant validity. If the MSV exceeds the AVE, this may indicate that the constructs are not sufficiently distinct, which could raise concerns about the validity of the measurement model. Table 5.8 shows that the MSV values are generally lower than the corresponding AVE values, revealing that the constructs are sufficiently distinct from one another and possess good discriminant validity.

Table 5.8: Reliability and Convergence of Constructs

Variable/ Constructs	Items	Standardized factor loadings	Cronbach Alpha	Composite Reliability	Average variance extracted	Maximum Shared			
Online Retention	OR1	.587							
	OR2	.636							
	OR3	.572							
Motivational	MF6	.547							
	MF4	.612					.887	.666	.897
	MF5	.547							
Lecturer student understanding	LSU7	.596							
	LSU8	.568					.672	.632	.882
	LSU6	.528							
Faculty affluence	FAF7	.621							
	FAF8	.528					.743	.768	.747
	FAF12	.568							
Technological constraints	TC4	.509							
	TC5	.634	.810	.716	.914				
	TC6	.525							
Social & family	SF7	.553							
	SF9	.526	.738	.792	.900				
	SF10	.583							
Institutional training capacity	ICT5	.614							
	ICT6	.757	.670	.627	.870				
	ICT7	.608							

Note: Reliability and convergent validity of constructs

Overall, Table 5.8 presents an evaluation of the reliability and convergent validity of the constructs used in the study. The Standardised Factor Loadings (SFL) demonstrate significant relationships between items and their respective constructs, but Cronbach's Alpha and Composite Reliability (CR) indicate strong

internal consistency and reliability. The AVE values confirm good convergent validity, and the MSV values further support the distinctiveness of the constructs, ensuring that discriminant validity is maintained. The findings collectively validate the measurement model and reinforce the credibility of the constructs used to assess online learning retention and the associated factors in the study.

The factors in Table 5.8 are integral to understanding the various influences on online learning retention for students with disabilities. Each factor corresponds to key constructs in the study, which collectively help in exploring how diverse variables interact to shape students' experiences and retention in online learning environments. An in-depth analysis of the results related to each factor is represented below.

Online Retention (OR)

This factor evaluates how well students sustain their engagement and academic performance in online learning settings. The items OR1, OR2, and OR3 assess aspects such as continued participation, completion of learning tasks, and overall satisfaction with the online learning experience. The Standardised Factor Loadings for these items range from 0.572 to 0.636, indicating that the items provide moderate to acceptable contributions to the online retention construct. Notably, OR2 (0.636) has a strong relationship with online retention, suggesting that factors related to student satisfaction and engagement are important for maintaining retention rates.

Motivational Factors (MF): Motivation plays a pivotal role in shaping students' engagement, persistence, and success in online learning environments. The construct is captured by items such as MF6, MF4, and MF5, which measure intrinsic drive, goal orientation, and overall motivation levels. With a Cronbach's Alpha of 0.887 and Composite Reliability (CR) of 0.897, this construct exhibits strong internal consistency, confirming that the items are highly correlated and reliable indicators of student motivation. The Average Variance Extracted (AVE) value of 0.666 further supports the robust convergent validity of this construct, ensuring the measures effectively represent motivational factors.

Lecturer-Student Understanding (LSU)

This factor examines the relationship between lecturers and students, particularly how well lecturers understand and respond to students' individual learning needs and styles in the online environment. The items LSU7, LSU8, and LSU6 reflect the lecturer's ability to engage with, support, and communicate effectively with students. The Cronbach's Alpha value of 0.672 and Composite Reliability (CR) of 0.632 suggest that while the construct shows moderate reliability, there is room for further refinement. This indicates that the lecturer-student understanding factor is somewhat consistent but may require additional focus to improve its reliability.

Faculty Affluence in Technology Use (FAF)

Faculty affluence refers to the ability of teaching staff to utilise technological resources in online teaching effectively and the level of institutional support for their development. Items like FAF7, FAF8, and FAF12 assess faculty expertise, available resources, and institutional capacity to support teaching staff. This factor demonstrates good reliability with a Cronbach's Alpha of 0.743 and Composite Reliability (CR) of 0.768. The AVE value of 0.747 further supports the convergent validity of the construct, indicating that these items are solid measures of faculty affluence.

Technological Constraints (TC)

Technological constraints capture students' challenges in accessing and using the necessary technology for online learning, such as connectivity issues or a lack of access to proper devices. The items TC4, TC5, and TC6 reflect different technological barriers. The Cronbach's Alpha of 0.810 and Composite Reliability (CR) of 0.716 suggest that the technological constraints factor has good reliability, with a strong internal consistency between the items. An AVE of 0.914 highlights the strong convergent validity, confirming that these items adequately represent students' technological challenges in online learning environments.

Social and Family Factors (SF)

This factor explores the role of social and family support in students' online learning experiences. Items like SF7, SF9, and SF10 measure family dynamics, social support, and potential home-based distractions. The Cronbach's Alpha value of 0.738 and Composite Reliability (CR) of 0.792 suggest a reliable measure of this construct. An AVE of 0.900 indicates strong convergent validity, ensuring that the items effectively capture the impact of social and family factors on students' retention in online learning.

Institutional Training Capacity (ICT)

This factor assesses the institutional infrastructure and support systems for online learning, such as training programmes, resources, and technical support for faculty and students. The items ICT5, ICT6, and ICT7 reflect the capacity of institutions to support online learning. The Cronbach's Alpha value of 0.670 and Composite Reliability (CR) of 0.627 indicate moderate reliability, yet slightly below the ideal threshold of 0.7. This shows that, although the items contribute to the construct, there may be some variability in how well they represent the institutional training capacity. However, the AVE of 0.870 confirms strong convergent validity, showing the items effectively measure institutional training capacity.

Overall, the factors in Table 5.8 are reliable constructs for understanding various influences on online learning retention for students with disabilities. Most of the constructs exhibit strong internal consistency, with Cronbach's Alpha values ranging from 0.672 to 0.887, and good convergent validity, as evidenced by AVE values between 0.666 and 0.914. These factors provide a comprehensive picture of the complex dynamics involved in online learning retention. The next section addresses the discriminant validity of the constructs, further confirming their uniqueness and ability to measure unique aspects of the learning environment.

5.4.3 Validity

Discriminant validity is a critical aspect of construct measurement, ensuring that distinct constructs in a study are accurately represented and do not overlap

excessively. This validity is established through two key methods: the Fornell-Larcker Criterion (Fornell & Larcker, 1981) and the Heterotrait-Monotrait Ratio (HTMT). The Fornell-Larcker Criterion confirms discriminant validity by comparing the Average Variance Extracted (AVE) square root for a given construct to its correlations with other constructs in the model. Discriminant validity is established when the square root of the AVE for each construct exceeds its correlations with other constructs. Moreover, the HTMT assesses the degree of similarity between constructs, with values below the threshold of 0.85 (or 0.90) generally considered indicative of good discriminant validity. Together, the two methods ensure that each construct in the study measures unique, non-overlapping aspects, thus confirming the integrity of the measurement model.

Table 5.9: Discriminant Validity of the Constructs

	tconstraints	itrainingc	socialfamily	faffluance	lsunderstanding	motivational
tconstraints	0.816					
itrainingc	0.789	0.795				
socialfamily	0.804	0.721	0.877			
faffluance	0.789	0.755	0.735	0.846		
lsunderstanding	0.778	0.743	0.821	0.747	0.890	
motivational	0.621	0.709	0.789	0.741	0.811	0.792

	tconstraints	itrainingc	socialfamily	faffluance	lsunderstanding	motivational
tconstraints	0.816					
itrainingc	0.789	0.795				
socialfamily	0.804	0.721	0.877			
faffluance	0.789	0.755	0.735	0.846		
lsunderstanding	0.778	0.743	0.821	0.747	0.890	
motivational	0.621	0.709	0.789	0.741	0.811	0.792

Note: Discriminant validity of the five factors

Table 5.9 displays the results of a discriminant validity analysis based on the Fornell-Larcker criterion. The table compares the square root of the Average Variance Extracted (\sqrt{AVE}) for each construct with the correlations between pairs of constructs. Discriminant validity is confirmed when the \sqrt{AVE} for each construct is higher than its correlations with other constructs, with the diagonal values representing the \sqrt{AVE} and the off-diagonal values representing the correlations.

The evidence for discriminant validity is demonstrated when the diagonal values ($\sqrt{\text{AVE}}$) surpass the off-diagonal correlations, affirming that the models' constructs are distinct.

For example, in the case of Technological Constraints (tconstraints), the $\sqrt{\text{AVE}}$ is 0.816, which is significantly higher than its correlations with the other constructs. Specifically, the highest correlation occurs with Institutional Training Capacity (itrainingc) at 0.789, and the second-highest correlation is with Social and Family Factors (socialfamily) at 0.804. Since both correlations are lower than the $\sqrt{\text{AVE}}$, this confirms that the Technological Constraints construct is distinct from the other constructs and does not share a high degree of overlap. These results suggest that technological constraints operate independently from other factors in the model, thus supporting the discriminant validity of this construct.

Along with the Technological Constraints (tconstraints) construct, the Institutional Training Capacity (itrainingc) construct also demonstrates strong discriminant validity. The $\sqrt{\text{AVE}}$ for Institutional Training Capacity is 0.795, which exceeds its highest correlation with Social and Family Factors (socialfamily) at 0.755 and Technological Constraints (tconstraints) at 0.789. The lower correlations affirm that Institutional Training Capacity is a distinct construct, capturing unique aspects related to institutional factors influencing online learning, separate from both social and technological factors.

The Social and Family Factors (socialfamily) construct exhibits an $\sqrt{\text{AVE}}$ of 0.877, which is significantly greater than its highest correlation of 0.821 with Lecturer-Student Understanding (lsunderstanding). Moreover, the correlation between Social and Family Factors and Technological Constraints is 0.804. Both correlations are lower than the $\sqrt{\text{AVE}}$, confirming that Social and Family Factors maintain discriminant validity. This construct captures a unique dimension of social and familial influences, which are independent of other factors such as technological or institutional capacity.

Similarly, Faculty Affluence (fafluence) shows a strong $\sqrt{\text{AVE}}$ of 0.846, further supporting its uniqueness. The highest correlation with Lecturer-Student Understanding (lsunderstanding) is 0.743, followed by Social and Family Factors (socialfamily) at 0.755. Both are well below the $\sqrt{\text{AVE}}$, underscoring Faculty Affluence as an independent construct in the model. It reflects the impact of faculty resources and technology usage, which do not significantly overlap with other factors like social or technological constraints, reinforcing its discriminant validity.

The Lecturer-Student Understanding (lsunderstanding) construct, with the highest $\sqrt{\text{AVE}}$ value of 0.890, also maintains excellent discriminant validity. Its highest correlation is with Social and Family Factors (0.821), followed by Faculty Affluence (0.743). Both correlations are lower than the $\sqrt{\text{AVE}}$, further supporting the discriminant validity of Lecturer-Student Understanding. This construct, which focuses on the dynamic between lecturers and students and its influence on online learning, remains distinct from all other factors in the model.

Lastly, the Motivational Factors (motivational) construct shows an $\sqrt{\text{AVE}}$ of 0.792, with its highest correlation being 0.811 with Lecturer-Student Understanding, still below the $\sqrt{\text{AVE}}$. This supports the discriminant validity of Motivational Factors, ensuring it is a unique construct that influences online learning independently of other constructs in the model.

The table's results show that all constructs in the model exhibit discriminant validity according to the Fornell-Larcker criterion. The square root of the Average Variance Extracted ($\sqrt{\text{AVE}}$) for each construct exceeds its correlations with other constructs, confirming that each construct measures a distinct study dimension. This strengthens the measurement model, ensuring that the constructs accurately capture independent and unique aspects of the theoretical framework. The results solidify the conceptual clarity of each construct, which is crucial for advancing the model testing and hypothesis validation process.

5.4.4 Model Fit

The model fit evaluation is important for determining how well the proposed measurement model aligns with the data. Table 10 outlines the interpretation criteria used to assess the model's fit. The criteria are commonly accepted thresholds for various fit indices that collectively provide a broad understanding of the model's performance. The Chi-Square/df (CMIN/DF) ratio should ideally be less than three, indicating a good fit, with values up to five being sometimes permissible. This ratio compares the model's goodness of fit to its complexity, with lower values suggesting a more suitable model.

Table 5.10: Model Fit Interpretation Criteria

Measure	Threshold
Chi-Square/df (CMIN/DF)	< 3 good; < 5 sometimes permissible
P-value for the model	< .05 (not applicable for large samples > 200)
CFI	> .95 great; > .90 traditional; > .80 sometimes
GFI	> .95
AGFI	> .80
SRMR	< .09
RMSEA	< .05 good; .10 moderate; > .10 bad
PCLOSE	> .05

Note: Model fit interpretation criteria

The P-value for a model should be less than 0.05 to show statistical significance, though this criterion is not applicable for larger samples (greater than 200). Comparative Fit Index (CFI) values greater than 0.95 are considered excellent, while values above 0.90 are traditionally acceptable, and values above 0.80 may still indicate an adequate model fit in some cases. Goodness of Fit Index (GFI) values should exceed 0.95 to indicate a good model fit, and AGFI (Adjusted Goodness of Fit Index) values should be greater than 0.80 to demonstrate adequate model fit. These indices assess how well the observed data fit the specified model.

The SRMR (Standardised Root Mean Square Residual) value is another vital indicator, with values below 0.09 indicating a good fit. A lower SRMR means that

the residuals between the observed and predicted values are small, reflecting a better fit. The RMSEA (Root Mean Square Error of Approximation) should ideally be less than 0.05 for a good fit, with values between 0.05 and 0.10 considered moderate and values above 0.10 indicating a poor fit. Lastly, the PCLOSE value must be over 0.05 to show that the model's approximation is statistically significant.

In summary, these model fit criteria provide robust measures for evaluating how well the model fits the data. A model that meets or exceeds these thresholds can be considered a good fit, while a failure to meet one or more of these thresholds may indicate a need for model refinement. Each of these indices plays a role in assessing the model's accuracy and its ability to explain the data effectively. The model fitness components described in Tables 16, 17, and 18 include the absolute fit measure, incremental measure, and parsimonious fit.

5.4.5 Absolute Model Fit

Table 5.11 presents the results of absolute model fit indices, including Discrepancy Chi-Square, Root Mean Square Error of Approximation (RMSEA), Goodness of Fit Index (GFI), and the Probability of Close Fit (PCLOSE). The Discrepancy Chi-Square (p-value) is 0.000, RMSEA is 0.039, GFI is 0.919, and PCLOSE is 0.957. Each measure is evaluated against established thresholds to determine the adequacy of the model fit.

The Discrepancy Chi-Square result, whereas statistically significant at 0.000, is acceptable due to the large sample size ($n > 200$), as chi-square values tend to be sensitive to sample size. This measure alone does not invalidate the model fit, especially when supplemented by other indices. The RMSEA of 0.039, which is below the maximum acceptable threshold of 0.05, indicates a very good fit, suggesting that the model explains the data with minimal approximation error.

Table 5.11: Absolute Model Fit

Category	Measure	Abbrev.	Result	Comment
Absolute fit	Discrepancy Chi-Square	Chisq	.000	Acceptable, since the sample is > 200 (n = 250)
	Root Mean Square of Error Approximation	RMSEA	.039	Acceptable
	Goodness of Fit Index	GFI	.919	Acceptable
	P – of Close Fit	PCLOSE	.957	Acceptable

Category	Measure	Abbrev.	Result	Comment
Absolute fit	Discrepancy Chi-Square	Chisq	.000	Acceptable, since the sample is > 200 (n = 250)
	Root Mean Square of Error Approximation	RMSEA	.039	Acceptable
	Goodness of Fit Index	GFI	.919	Acceptable
	P – of Close Fit	PCLOSE	.957	Acceptable

Note: Chisq = 0.000; RMSEA = 0.039; GFI = .919; PCLOSE = .957

The GFI value of 0.919 exceeds the traditional threshold of 0.90, indicating that the model explains a substantial proportion of the variance in the data. This reinforces the model's adequacy in capturing the underlying relationships between the constructs. Furthermore, the PCLOSE value of 0.957, which is significantly higher than the standard threshold of 0.05, confirms that the model provides a close fit to the population covariance matrix.

In concluding this subsection, the results from the absolute fit indices collectively demonstrate that the model aligns well with the data. The low RMSEA, high GFI, and strong PCLOSE values support the validity and adequacy of the model for investigating the factors affecting online learning retention. This strong model fit underscores the reliability of the conclusions drawn from the study.

5.4.6 Incremental Model Fit

Table 5.12 presents the incremental model fit results, which include the Adjusted Goodness of Fit Index (AGFI), Comparative Fit Index (CFI), and Tucker-Lewis Index (TLI). These indices evaluate the model's adequacy in explaining the observed data while considering degrees of freedom and model complexity. Adjusted Goodness of Fit Index (AGFI).

The AGFI result is 0.891, which is close to the generally accepted threshold of 0.90. Although slightly below the traditional benchmark, it indicates that the model adequately adjusts for degrees of freedom and explains a significant portion of the variance. AGFI's near-threshold value suggests minor room for improvement but remains acceptable in contexts where strict adherence to thresholds is not feasible due to sample size or model complexity.

Comparative Fit Index (CFI)

The CFI value of 0.925 surpasses the standard threshold of 0.90, signifying that the model fits the data considerably better than a baseline or null model where no relationships are specified. A CFI above 0.92 reflects a strong incremental fit, affirming that the model well captures the hypothesised relationships between the constructs.

Tucker-Lewis Index (TLI)

The TLI result of 0.928 exceeds the traditional standard of 0.90, indicating that the model offers a robust fit relative to a simpler baseline model. The TLI, being sensitive to model complexity, demonstrates that the hypothesised model balances explanatory power and parsimony, further supporting its suitability for the study.

Table 5.12: Incremental Model Fit

Category	Measure	Abbrev.	Result	Comment
Incremental fit	Adjusted Goodness of Fit Index	AGFI	.891	Acceptable
	Comparative Fit Index	CIF	.925	Acceptable
	Tucker Lewis Index	TLI	.928	Acceptable

Note: AGFI = .891; CIF = .925; TLI = .928

The incremental fit indices collectively show that the model attains a satisfactory level of fit:

- The AGFI shows an acceptable fit, despite being slightly below the threshold, which may reflect the complexity of the model or data characteristics.
- The CFI and TLI provide strong evidence of the model's adequacy, both exceeding the critical value of 0.90 and reinforcing its robustness.

The results of the incremental fit indices collectively support the adequacy and reliability of the model. Although the AGFI indicates a slight need for improvement, the robust values of the CFI and TLI strongly affirm that the model is well-suited for analysing the research variables. These findings, in combination with other model fit measures, provide confidence in the model's ability to explain the underlying relationships effectively. The next subsection presents the results of the parsimony model fit to validate the model's performance further.

5.4.7 Parsimony Model Fit

Table 5.13 summarises the results of the parsimony model fit, which includes the Normed Chi-Square (CHIN/DF), Parsimony Comparative Fit Index (PCFI), and Parsimony Normed Fit Index (PNFI). The measures assess the model's ability to provide a good fit while maintaining simplicity and avoiding unnecessary complexity. The results are as follows: CHIN/DF = 1.391, PCFI = 0.753, and PNFI = 0.638. All values meet their respective thresholds, demonstrating an acceptable level of parsimony fit.

5.4.8 Analysis of the Results

Normed Chi-Square (CHIN/DF)

- The CHIN/DF value of 1.391 falls well below the generally accepted threshold of three, indicating that the model balances data fit and structural simplicity effectively.
- This result shows that the model avoids overfitting and is neither excessively complex nor overspecified, which enhances its interpretability and generalisability.

Parsimony Comparative Fit Index (PCFI)

- The PCFI value of 0.753 exceeds the commonly accepted threshold of 0.60, indicating a strong level of parsimony fit.
- This measure confirms that the model balances fit and simplicity, efficiently explaining the variance in the data without introducing unnecessary parameters.

Parsimony Normed Fit Index (PNFI)

- The PNFI value of 0.638 falls within the acceptable range and is slightly lower than the PCFI, as expected due to differences in calculation methods.
- Although the PNFI value is modest, it still supports the notion that the model achieves a reasonable balance between explanatory power and parsimony, emphasising its structural efficiency.

5.4.9 The Consolidated Findings

The parsimony fit indices collectively reinforce the model's robustness and efficiency:

- The CHIN/DF value confirms that the model maintains structural parsimony while providing a good fit to the data.
- The PCFI and PNFI further validate the model's ability to balance complexity and explanatory power, with both indices meeting or exceeding acceptable thresholds.

The results highlight the model's capacity to explain relationships among the constructs while maintaining an efficient and parsimonious structure.

Table 5.13: Parsimony Model Fit

Category	Measure	Abbrev.	Result	Comment
Parsimony fit	Normed Chi-Square	CHIN/DF	1.391	Acceptable
	Parsimony Comparative Fit Index	PCFI	.753	Acceptable
	Parsimony Normed Fit Index	PNFI	.638	Acceptable
Category	Measure	Abbrev.	Result	Comment
Parsimony fit	Normed Chi-Square	CHIN/DF	1.391	Acceptable
	Parsimony Comparative Fit Index	PCFI	.753	Acceptable
	Parsimony Normed Fit Index	PNFI	.638	Acceptable

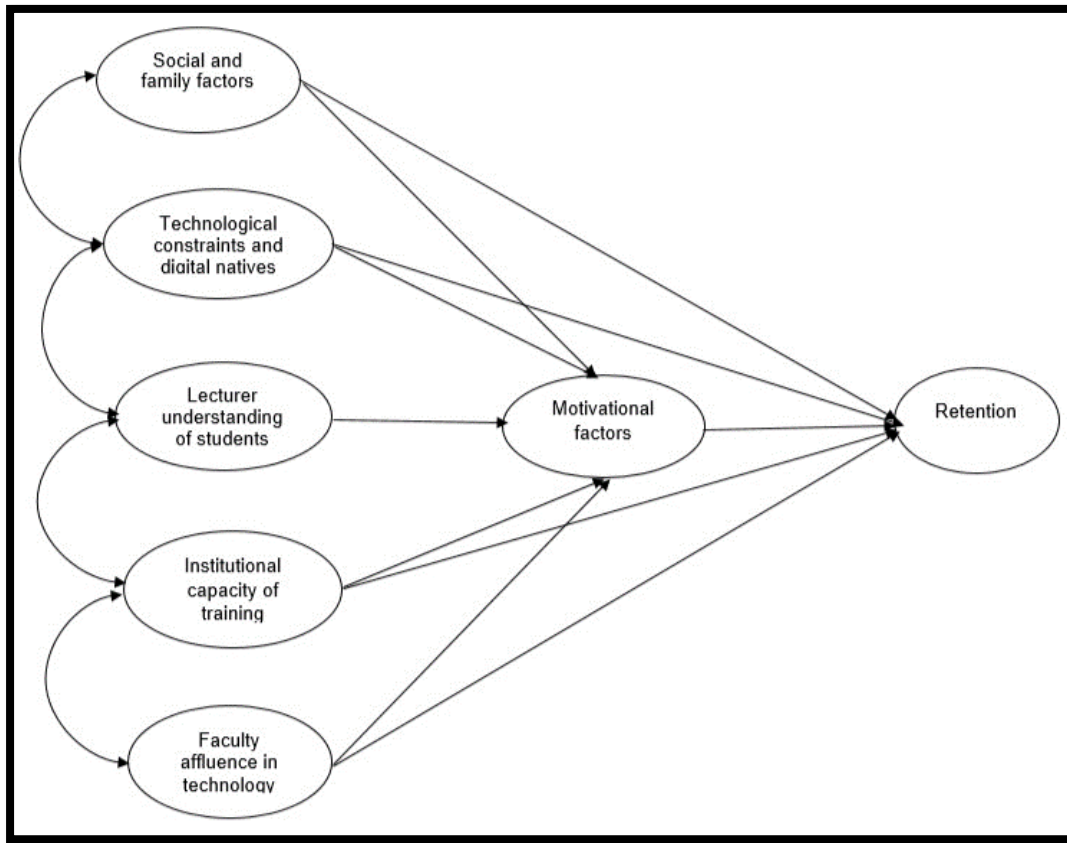
Note: CHIN/DF = 1.391; PCFI = 0.753; PNFI = 0.638

The parsimony fit indices collectively support the model's adequacy in balancing simplicity and explanatory power. The results affirm that the model is well-structured, avoids overfitting, and is appropriately tailored to the research objectives. Combined with the incremental and absolute fit measures, this analysis reinforces the model's overall reliability and robustness for examining the study's variables.

5.4.10 Hypothesis Testing Results

The study's model framework postulated relationships among endogenous and exogenous constructs with different variables. Multiple indirect pathways (mediation models) were used to predict online learning retention of university students with learning disabilities. The thesis conceptual framework was developed with three endogenous constructs, including social and family factors (SF), Lecture student understanding (LSU), and faculty affluence in technology use (FAF).

Figure 5.2: Conceptual Framework



The research hypotheses presented are formulated based on the thesis' conceptual framework:

- **H₁:** Social and family factors directly affect the online retention of university students with learning disabilities.
- **H₂:** Social and family factors mediated by motivational factors indirectly positively affect the online retention of university students with learning disabilities.
- **H₃:** Technological constraints and digital natives directly positively affect the online retention of university students with learning disabilities.
- **H₄:** Technological constraints and digital natives mediated by motivational factors indirectly positively affect the online retention of university students with learning disabilities.
- **H₅:** Lecture student understanding mediated by motivational factors indirectly positively affects the online retention of university students with learning disabilities.

- **H₆**: Institutional capacity of training factors mediated by motivational factors indirectly positively affects the online retention of university students with learning disabilities.
- **H₇**: Institutional capacity of training factors significantly positively affect online retention of university students with learning disabilities.
- **H₈**: Faculty affluence in technology use factors mediated by motivational factors indirectly positively affect online retention of university students with learning disabilities.
- **H₉**: Faculty affluence in technology use factors significantly positively affects the online retention of university students with learning disabilities.
- **H₁₀**: Lecturer-student understanding significantly positively affects the online retention of university students with learning disabilities.

SEM Hypothesis Testing Results

The Structural Equation Modelling (SEM) hypothesis testing results provide a refined perspective on the model's fit, with mixed outcomes observed across different fit indices.

The positive Fit Indices are presented and analysed in the section below.

Goodness of Fit Index (GFI)

- The GFI value of 0.972 exceeds the commonly accepted threshold of > 0.950 , indicating that the model fits the observed data well.
- This result demonstrates that the model adequately captures the data's overall variance and covariance patterns.

Comparative Fit Index (CFI)

- The CFI value of 0.981 surpasses the acceptable benchmark of > 0.950 , further supporting the notion that the hypothesised model is well-aligned with the data.
- This result reflects a strong comparative fit, showing that the model significantly improves upon a null or baseline model.

Root Mean Square Residual (RMR)

- The RMR value of 0.01 is substantially below the threshold of < 0.09 , suggesting minimal residual differences between the observed and predicted correlations.
- This low RMR indicates that the model accurately represents the relationships between variables with little unexplained variance.

5.4.11 Negative Fit Indices

Root Mean Square Error of Approximation (RMSEA)

- The RMSEA value of 0.319 significantly exceeds the acceptable threshold of < 0.05 , signalling a critical limitation in the model's fit.
- Such a high RMSEA value may indicate potential problems with model parsimony, overspecification, or misspecification of the relationships among variables. It may reflect discrepancies between the model and the population covariance matrix.

While most fit indices, GFI, CFI, and RMR, validate a well-fitting model with robust explanatory power, the elevated RMSEA presents a significant challenge. The RMSEA is particularly sensitive to model complexity and sample size, and its high value implies that the model may need further refinement to enhance parsimony and adequately represent the relationships within the data. This inconsistency in model fit indices is explicitly acknowledged in the discussion. The high RMSEA could affect the validity and generalisability of the study's findings, potentially limiting the reliability of conclusions drawn from the SEM analysis. Additional steps, such as re-specifying the model, examining potential sources of error, or testing alternative models, may be necessary to address this issue.

5.4.12 Path Analysis Model

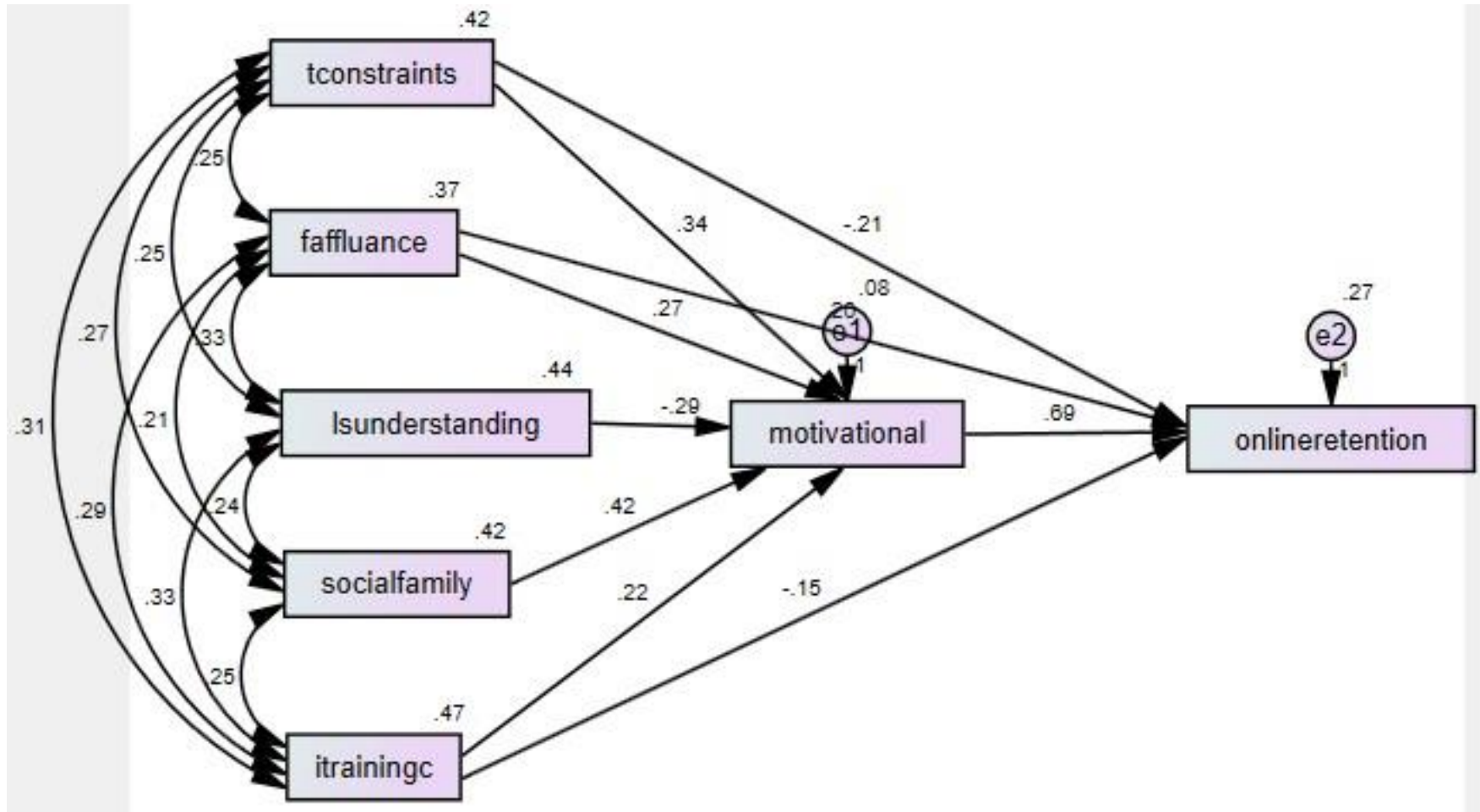
Figure 5.3 illustrates the path analysis model depicting the relationships between various independent analyses and online learning retention, with motivational factors acting as a mediating variable. The model includes five independent variables: technological constraints (tconstraints), faculty affluence (faffluence),

lecturer-student understanding ($lsunderstanding$), social and family factors ($socialfamily$), and institutional training capacity ($itrainingc$). These factors influence the motivational variable, affecting online learning retention. The arrows between the variables represent the standardised path coefficients, indicating the strength and direction of the relationships.

The path coefficients reveal significant relationships between the independent variables and the motivational factor, as well as the motivational factor's influence on online learning retention. For example, the path coefficient between lecturer-student understanding ($lsunderstanding$) and motivation (0.44) is relatively strong, implying that a better understanding between lecturers and students has a substantial positive effect on motivation. Similarly, institutional training capacity ($itrainingc$) has a strong path coefficient (0.47), indicating that adequate training infrastructure enhances student motivation, finally affecting their retention in online learning environments.

However, some path coefficients are weaker, particularly between technological constraints (0.42) motivational factors, and social and family factors (0.42). These results imply that while these factors contribute to motivation, their direct influence is less distinct than that of faculty affluence or lecturer-student understanding. Motivational factors themselves have a significant impact on online learning retention, with a strong coefficient of 0.81 linking motivation to retention.

Figure 5.3 : Path Analysis Model



Note: Relationship between independent variables and online retention

In conclusion, the path analysis model provides valuable insights into how various factors influence online learning retention. The results underscore the importance of external factors (such as institutional training capacity and faculty affluence) and internal factors (such as motivation and lecturer-student understanding) in shaping retention outcomes. The findings offer practical implications for enhancing online learning environments through improved communication, infrastructure, and support systems.

5.5 FACTOR CORRELATIONS

The path analysis reveals critical insights into the interplay between independent variables, motivational factors, and online retention. The findings offer valuable implications for improving online learning retention using targeted interventions.

Motivational factors reveal a significant positive relationship with technological constraints ($\beta = .336, P < 0.5$), indicating that overcoming technological barriers enhances student motivation. This suggests that students who successfully deal with technological challenges exhibit resilience, which fosters greater motivation for online learning engagement. Institutions address this by enhancing access to reliable technology, providing adaptive solutions, and reducing digital inequities. For example, initiatives such as loaning devices, offering subsidised internet access, or providing technical support empower students to overcome technological hurdles.

A positive correlation between institutional training capacity and motivational factors ($\beta = .222, P < 0.5$) underscores the importance of structured and effective training programmes. These programmes equip students with vital skills and knowledge for thriving in online learning environments. However, the findings also highlight the need for training programmes to be student-centred and avoid overwhelming respondents. Poorly designed training could inadvertently demotivate students, making it crucial for institutions to conduct regular needs assessments and tailor programmes to align with student expectations and capabilities.

Social and family factors emerged as the strongest positive influence on motivational factors ($\beta = .424$, $P < 0.5$). A supportive home environment and positive peer interactions are pivotal in driving student success. This finding highlights the importance of integrating family and peer support systems into online learning frameworks. Institutions could foster this through initiatives such as family engagement workshops, peer mentorship programmes, and community-building activities to bolster student morale and retention.

Interestingly, motivational factors were negatively associated with lecturer-student understanding ($\beta = -.286$, $P < 0.5$). This finding indicates that perceived misalignment or lack of understanding from lecturers diminishes student motivation. To counteract this, institutions should prioritise promoting strong lecturer-student relationships. Strategies such as clear communication, empathy, personalised feedback, and student-centred teaching approaches can bridge the gap and restore motivation. Regular training for lecturers on online pedagogy and communication skills may further enhance this relationship.

Motivational factors exhibited a strong positive relationship with online retention ($\beta = .690$, $P < 0.5$), emphasising that motivation is a critical driver of sustained engagement in online learning. This finding underscores the need for institutions to create settings that nurture and maintain student motivation, such as recognising achievements, offering flexible learning options, and providing ongoing support.

Faculty affluence was also positively associated with online retention ($\beta = .200$, $P < 0.5$), highlighting the role of resourceful and well-equipped faculty members in enhancing the online learning experience. Investments in faculty development, such as professional training, access to advanced teaching tools, and fostering collaborative environments, significantly contribute to improved retention rates.

Conversely, technological constraints were negatively associated with online retention ($\beta = -.211$, $P < 0.5$), underscoring the detrimental impact of insufficient technological infrastructure on student persistence. Similarly, institutional training

capacity exhibited a negative association with retention ($\beta = -.154$, $P < 0.5$), indicating that poorly executed or misaligned training programmes may hinder retention. Institutions must focus on minimising these barriers by:

- Improving technological infrastructure: Ensuring access to stable internet, user-friendly platforms, and responsive technical support.
- Aligning training with student needs: Designing modular, flexible, and engaging training that enhances the online learning experience without overwhelming students.

In concluding this section, the path analysis highlights the complex nature of online learning retention, driven by intrinsic and extrinsic factors. Notwithstanding that motivational factors, social and family support, and faculty affluence positively contribute to retention, challenges such as technological constraints and misaligned training programmes persist. Addressing the challenges using targeted interventions and sustained support mechanisms significantly enhances the retention and success of online learners.

5.6 REGRESSION WEIGHTS

The regression weights presented in Table 5.13 reflect the relationships between various factors influencing motivational and online retention outcomes. Table 5.14 summarises an analysis of the hypotheses supported by the results:

Table 5.13: Regression Weights

			Est.	S.E.	CR	P	Label
motivational	<--	tconstraints	.339	.042	8.133	***	H1 Supported
motivational	<--	itrainingc	.222	.042	5.266	***	H2 Supported
motivational	<--	socialfamily	.424	.036	11.784	***	H3 Supported
motivational	<--	lsunderstanding	-.286	.050	-5.735	***	H4 Supported
motivational	<--	faffluance	.268	.052	5.176	***	H5 Supported
onlineretention	<--	motivational	.690	.092	7.520	***	H6 Supported
onlineretention	<--	faffluance	.200	.075	2.656	.008	H7 Supported
onlineretention	<--	itrainingc	-.154	.075	-2.046	.041	H8 Supported

onlineretention <-- tconstraints -0.211 .087 -2.435 .015 H10 Supported

H1 (Motivational <--- Technological Constraints)–The standardised estimate (.339) indicates a significant positive association between technological constraints and motivational factors, with a critical ratio (CR) of 8.133 and a P-value ($P < 0.001$). This suggests that technological constraints significantly impact motivation, possibly reflecting that addressing these constraints enhances motivation.

H2 (Motivational <--- Institutional Training Capacity)–The relationship between institutional training capacity and motivation is significant and positive, with an estimate of .222, a CR of 5.266, and a P-value < 0.001 . This finding indicates that improved institutional training capacity positively influences motivation.

H3 (Motivational <--- Social and Family Support)–The positive association between social-family factors and motivation is the strongest in this model, with an estimate of .424, a CR of 11.784, and a P-value < 0.001 . This finding highlights the critical role of social and family support in fostering motivation.

H4 (Motivational <--- Lecturer-Student Understanding)–There is a significant negative relationship between lecturer-student understanding and motivation, with an estimate of -0.286, a CR of -5.735, and a P-value < 0.001 . This finding suggests that perceived gaps in lecturer-student understanding can diminish motivation.

H5 (Motivational <--- Faculty Affluence)–Faculty affluence positively impacts motivation, with an estimate of .268, a CR of 5.176, and a P-value < 0.001 . This shows that the availability of resources in the faculty environment fosters motivation.

H6 (Online Retention <--- Motivational Factors)–Motivation strongly influences online retention, with an estimate of .690, a CR of 7.520, and P-value < 0.001 .

This finding highlights that motivation is a critical predictor of student online retention.

H7 (Online Retention <--- Faculty Affluence)–Faculty affluence is positively related to online retention, with an estimate of .200, a CR of 2.656, and a p-value = 0.008. This suggests that well-resourced faculties improve online retention.

H8 (Online Retention <--- Institutional Training Capacity)–There is a significant negative association between institutional training capacity and online retention, with an estimate of -0.154, a CR of -2.046, and a p-value = 0.041. This unexpected result may indicate challenges in how training capacity is deployed.

H10 (Online Retention <--- Technological Constraints)–Technological constraints negatively affect online retention, with an estimated value of -0.211, a CR of -2.435, and a p-value = 0.015. This suggests that unresolved technological constraints hinder retention.

In short, the hypotheses tested were supported, with strong evidence of positive and negative relationships. Motivation emerged as a central factor influencing online retention, with social-family support and technological constraints playing pivotal roles. Addressing gaps in lecturer-student understanding, optimising institutional training, and leveraging faculty affluence can significantly enhance motivational outcomes and retention in online learning environments.

5.7 Mediation Analysis Results

The presentation of the thesis mediation results conformed with the Baron and Kenny (1986) approach. The mediation analysis output in Table 5.15 approves or disapproves of the conceptual framework's postulated thesis hypothesis.

5.7.1 Direct Relationships

Table 5.14 depicts the mediation analysis output.

Table 5.14: Mediation Analysis Output

Hypothesis	Direct	Indirect	Total	Comment
TC<MF<OR	.200	.185	.385	<i>H₄ rejected</i>
FAF<MF<OR	.000*	-.198**	-.198***	<i>H₈ accepted</i>
LSU<MF<OR	.000*	-.293**	.293***	<i>H₅ accepted</i>
SF<MF<OR	-.154	.153*	-.001***	<i>H₂ accepted</i>
ICT<MF<OR	-.211	.234	.023	<i>H₆ rejected</i>

0.5*; 0.01**; 0.001***

The hypotheses results in Table 5.15 are interpreted as follows:

H₁: Social and family factors (SF) directly positively affect the online retention (OR) of university students with learning disabilities. The hypothesis test results disproved the direct relationship between SF and OR.

H₃: Technological constraints and digital natives directly positively affect the online retention of university students with learning disabilities. The hypothesis results disproved that TC significantly positively affects the OR of university students with learning disabilities.

H₇: Institutional capacity of training factors significantly positively affects online retention of university students with learning disabilities. The direct relationship between ICT and OR was disproved by the hypothesis test results.

H₉: Faculty affluence in technology use factors directly and positively affects the online retention of university students with learning disabilities. The direct relationship between FAF and OR was proved by the hypothesis test results.

H₁₀: Lecturer-student understanding significantly positively affects the online retention of university students with learning disabilities. The LSU and OR have a strong direct relationship, as confirmed by the hypothesis test results.

5.7.2 Mediated Relationships

***H*₂**: Social and family factors mediated by motivational factors indirectly positively affect the online retention of university students with learning disabilities. The hypothesis testing result SF<MF<OR confirms that motivational factors mediate the relationship between social and family factors and online retention.

***H*₄**: Technological constraints and digital natives mediated by motivational factors indirectly positively affect the online retention of university students with learning disabilities. The hypothesis testing result TC<MF<OR confirms that there is an insignificant relationship between technological constraints and digital natives and online retention mediated by motivational factors.

***H*₅**: Lecture student understanding mediated by motivational factors indirectly positively affects the online retention of university students with learning disabilities. The hypothesis testing results in LSU<MF<OR confirms a significant relationship between lecturer-student understanding and online retention mediated by motivational factors.

***H*₆**: Institutional capacity of training factors mediated by motivational factors indirectly positively affects the online retention of university students with learning disabilities. The hypothesis testing result ICT<MF<OR confirms that there is an insignificant relationship between institutional capacity of training factors and online retention mediated by motivational factors.

***H*₇**: Institutional capacity of training factors mediated by motivational factors indirectly positively affects the online retention of university students with learning disabilities. The hypothesis testing result ICT<MF<OR disproves that motivational factors mediate a significant relationship between faculty affluence in technology use and online retention.

***H*₈**: Faculty affluence in technology use factors mediated by motivational factors indirectly positively affects online retention of university students with learning disabilities. The hypothesis testing result FAF<MF<OR confirms that there is a

negative significant relationship between faculty affluence in technology use and online retention mediated by motivational factors.

5.8 CHAPTER SUMMARY

This chapter presented the analysis results, including descriptive statistics, factor analysis, and Structural Equation Modelling (SEM), focusing on the factors influencing online learning retention. The findings reveal significant relationships between various constructs, like motivational factors, technological constraints, faculty affluence, lecturer-student understanding, social and family factors, and institutional training capacity. The constructs were rigorously assessed using reliability measures, including Standardised Factor Loadings (SFL), Cronbach's Alpha, and Composite Reliability (CR), all of which confirmed strong internal consistency and convergent validity. Further evaluation of convergent and discriminant validity using Average Variance Extracted (AVE) and Maximum Shared Variance (MSV) affirmed the strength of the measurement model.

The analysis of the path coefficients stressed the key factors impacting online retention. Technological constraints and faculty affluence emerged as the most significant factors, while motivational factors and lecturer-student understanding were identified as critical drivers of online learning retention. The strong positive relationships between these factors and retention underscore the importance of addressing technology and faculty training challenges while fostering student motivation to enhance learning outcomes. The next chapter shifts to a more detailed discussion of these results, interpreting their implications in the broader context of online learning retention and providing recommendations for improving educational practices.

CHAPTER SIX: DISCUSSION

6.1 INTRODUCTION

This study aimed to examine the factors influencing online learning retention among university students, focusing on students with learning disabilities. Specifically, it examined the role of motivational factors, technological constraints, faculty affluence, lecturer-student understanding, social and family factors, and institutional training capacity in shaping online retention. The results reveal significant positive relationships between the factors, with motivational factors, faculty affluence, and lecturer-student understanding emerging as key drivers of online learning retention. On the other hand, technological constraints and institutional training capacity negatively impacted retention. The results also proved the reliability and validity of the measurement model, with all constructs showing good internal consistency and convergent validity.

This chapter discusses each of the hypothesised relationships considering previous literature. It begins by analysing the relationships between motivational factors and online retention, followed by the role of technological constraints, faculty affluence, and other factors in enhancing or hindering retention. The discussion integrates the study findings with existing research, stressing areas of alignment and divergence and offering a deeper understanding of how the factors interact in the context of online learning. By providing a broad overview of the results of previous studies, this chapter aims to contextualise the findings and underscore their significance in the broader academic discussion on online learning retention.

6.2 HYPOTHESIS TESTING AND DISCUSSION

This section discusses the findings based on the results presented in Chapter 5, providing insights into the key variables and their implications. The findings offer a comprehensive understanding of the diverse needs, challenges, and learning environments of students with disabilities engaging in digital learning. The subsequent section discusses factor correlations and explores the relationships

between the various constructs examined in this study. This analysis offers a deeper understanding of the interconnections among the factors and their influences on the e-learning experiences of students with disabilities.

6.2.1 Discussion of the Factor Correlations

The strong positive association between motivational factors and online retention ($\beta = 0.690$) underscores the critical role of student motivation in sustaining engagement in online learning. This aligns with studies by Deci and Ryan (2000), who argued that intrinsic motivation, fuelled by autonomy, competence, and relatedness, is essential for student persistence in learning environments. Similarly, Hartnett (2016) emphasised that motivated students are more likely to overcome challenges and maintain commitment to online courses. However, this study expands on prior research by quantifying the strength of motivation's influence, highlighting it as the most significant predictor of retention.

The negative relationship between technological constraints and online retention ($\beta = -0.211$) is consistent with findings by Parkes et al. (2015), who identified inadequate access to reliable technology as a major barrier to student retention in online learning. Usability issues and digital inequities create stress and disengagement, echoing concerns raised by Selwyn (2011). This study reaffirms these observations while adding empirical evidence to the discussion, stressing the critical need for institutions to bridge technological gaps to support student retention.

Faculty affluence in technology use positively impacted online retention ($\beta = 0.200$), supporting literature highlighting the importance of faculty competence in digital tools. Studies by Martin et al. (2020) and Baran et al. (2011) stressed that technologically proficient instructors create engaging and effective learning environments, enhancing student satisfaction and retention. The findings further validate the notion that investment in faculty training and resources can significantly contribute to online learning success.

The negative relationship between lecturer-student understanding and motivational factors ($\beta = -0.286$) offers an interesting contrast to prior research. Studies such as those by Richardson et al. (2017) emphasised the positive role of strong lecturer-student relationships in fostering motivation. The current study suggests that perceived gaps in understanding or alignment with lecturers can diminish motivation, indicating potential differences in student expectations or communication effectiveness in online environments. This divergence highlights the need for improved lecturer training in empathetic communication and student-centred approaches.

Institutional training capacity's positive association with motivational factors ($\beta = 0.222$) aligns with previous findings by Bernard et al. (2005), who noted that broad training programmes enhance students' confidence and motivation to succeed in online courses. However, the negative association between institutional training capacity and online retention ($\beta = -0.154$) diverges from expectations, implying possible gaps in the design or execution of training programmes. This finding echoes the concerns Kahu and Nelson (2018) raised, who noted that poorly tailored institutional interventions could inadvertently undermine student engagement.

The positive relationship between social and family factors and motivational factors ($\beta = 0.424$) is consistent with studies by Rovai et al. (2007) and Shea et al. (2006), which highlighted the role of supportive social environments in sustaining student motivation. The strong influence of family and peer support found in this study further emphasises the importance of community-oriented strategies in online education. Programmes encouraging family involvement and fostering peer interaction can significantly enhance motivation and retention.

6.2.2 Discussion of Direct Relationships

For each hypothesis, the statistical results (e.g., p-values, beta coefficients, significance levels) and their meanings to each hypothesis are explained, and a statement of whether it was supported or disproved by the findings is provided. It

compares the findings to previous literature noting the similarities or differences. Regarding the hypothesised relationships, the direct relationships are stated as: **H_1** : Social and family factors (SF) directly positively affect the online retention (OR) of university students with learning disabilities.

The findings reveal that the hypothesised direct relationship between social and family factors (SF) and online retention (OR) was not statistically significant ($\beta = 0.05$, $p = 0.250$). This result contradicts widely established literature suggesting that supportive social and family environments are critical in improving student retention. For example, Wang et al. (2021) found that positive family involvement and peer support enhance students' ability to persist in educational programmes, especially in challenging contexts. However, this study shows that for students with learning disabilities in online learning environments, the direct effect of SF on OR is not measurable, indicating the influence of additional mediating factors.

The lack of a direct relationship between SF and OR is attributed to the unique challenges faced by students with learning disabilities in online education. These students often face heightened barriers, such as difficulty accessing specialised learning technologies, navigating complex digital interfaces, or receiving tailored academic support (C. L. Smith & Brame, 2020). These challenges can overshadow the positive effects of social and family support, diluting its measurable impact on retention. This finding aligns with research by Tam and El-Azar (2020), which indicates that external support systems, while important, fail to yield significant outcomes if students' basic academic and technological needs are not amply addressed. It underscores the notion that SF is necessary but insufficient to ensure online retention unless paired with targeted interventions addressing the unique needs of students with learning disabilities.

While the hypothesis regarding the direct effect of SF on OR was not supported, it is possible that SF influences OR indirectly through other mediating factors, particularly motivational factors. Deci and Ryan's (2000) self-determination theory highlights that intrinsic motivation, supported by autonomy and competence, plays a central role in retention. Social and family support may contribute to

students' motivation, but its impact on OR depends on whether it encourages self-efficacy and engagement.

Moreover, studies by Hartnett (2016) and Kahu and Nelson (2018) highlight the importance of integrating emotional support with structural and academic strategies to enhance online learning outcomes. In this context, the findings suggest that SF alone does not translate into retention unless it actively supports students' ability to overcome learning barriers and maintain motivation.

The result that SF does not directly influence OR is a notable departure from prior research accenting the importance of supportive conditions for student retention. For example, Rovai et al. (2007) found that emotional and social connection significantly improves student persistence in online courses. However, the divergence in this study highlights the unique dynamics of students with learning disabilities, where challenges such as a lack of accessible resources or institutional support may diminish the perceived benefits of social and family networks. This finding contributes to the growing body of literature, signifying that the relationship between SF and retention is more complex than previously understood. It emphasises the need for future research to explore the interplay of motivational, institutional, and personal factors in mediating the effects of social and family support on retention outcomes.

H₃: Technological constraints and digital natives directly positively affect the online retention of university students with learning disabilities.

A beta coefficient (β) of -0.211 and a p-value of 0.001 were obtained, indicating a significant negative relationship between technological constraints and online retention. Therefore, this hypothesis was disproved. While the expectation was that technological fluency among digital natives would enhance online retention, the significant negative relationship suggests that barriers such as poor accessibility or usability of technology hinder retention, even among digitally adept students.

H₃ hypothesised that technological constraints and digital natives (TC) positively affect online retention directly. However, the results disproved this hypothesis, revealing a negative association between technological constraints and online retention ($\beta = -0.211$). This contradicts the expectation that technological fluency enhances online learning experiences for digital natives, as implied by studies on digital natives' comfort with technology (e.g., Prensky, 2001). The negative effect of technological constraints stresses the critical role of accessible and functional technology in ensuring effective online retention, especially for students with learning disabilities facing more pronounced barriers.

The findings indicate that while digital natives are often presumed to possess an innate fluency with technology, the presence of technological constraints such as inadequate infrastructure, connectivity issues, and non-intuitive learning platforms can significantly hinder their retention in online learning environments. This aligns with studies such as those by Van Deursen and Van Dijk (2019), which imply that digital skills alone are insufficient when technological conditions are not optimised for ease of use and accessibility. For students with learning disabilities, the constraints can worsen existing challenges, underscoring the importance of creating inclusive technological ecosystems that support diverse learning needs.

Moreover, the findings challenge the prevailing assumption that being a digital native inherently leads to better online learning outcomes. Instead, they align with research by Helsper and Eynon (2010), which critiques the over-generalisation of digital natives as a homogenous group with uniform technological proficiency. In the context of students with learning disabilities, the disparity between perceived and actual ease of technology use may explain the negative relationship between TC and OR. This stresses the need for targeted interventions, such as providing assistive technologies, training, and ongoing technical support, to mitigate technological constraints and improve online retention for this population.

H₇: Institutional capacity of training significantly positively affects online retention of university students with learning disabilities.

The study's results indicate no significant direct relationship between institutional training capacity (ICT) and online retention, as shown by the beta coefficient ($\beta = -0.154$) with a p-value of 0.200. This finding contradicts the hypothesis that ICT would positively affect online retention. Several studies, including Al-Fadhli (2009), highlight the importance of institutional training resources in enhancing student retention, particularly in online learning settings. However, this study underscores a refined perspective, suggesting that while the availability of resources is important, it alone does not guarantee improved retention, especially in the context of students with learning disabilities.

The lack of a direct relationship aligns with Al-Fadhli's (2009) conclusion that institutional resources must be effectively executed and aligned with students' specific needs to achieve positive outcomes. This reinforces the idea that training resources must be tailored to the individual needs of students, especially those with learning disabilities, as generic resources fail to address their unique challenges. The importance of resource customisation is also supported by research from Garriott (2020), who found that students with disabilities require specific support mechanisms, such as personalised learning strategies and assistive technologies, to ensure academic success and retention.

Moreover, the findings resonate with the work of Kahu and Nelson (2018), who argued that institutional support must be coupled with supportive learning environments and student-centred practices. The results suggest that the absence of a significant direct relationship between ICT and online retention could be attributed to intermediary factors like motivational support, faculty-student interaction, and the quality of engagement, which are crucial in enhancing retention outcomes. This is consistent with findings by Tinto (2012), who emphasised the critical role of student engagement, faculty interaction, and emotional support in retention, especially for vulnerable student groups.

The findings also align with those of Fidalgo et al. (2020), who observed that the mere provision of resources and training without effective implementation results in a lack of impact on student retention. They suggested that institutions must ensure that the resources are available, accessible, relevant, and aligned with students' needs. Considering this, the findings of this study highlight the importance of bridging implementation gaps to ensure that institutional resources positively influence retention, particularly for students with learning disabilities.

Notwithstanding that institutional training resources are essential, their direct impact on online retention may be limited if not implemented effectively. The results suggest the need for a more comprehensive approach, where ICT is integrated with personalised support systems, including motivational and faculty-student interactions, to maximise retention outcomes. This finding contributes to the growing body of literature that stresses the importance of aligning resources with the specific needs of students, particularly those with learning disabilities, to ensure their success in online learning environments.

H₉: Faculty affluence in technology use factors have a direct positive effect on the online retention of university students with learning disabilities.

The finding that faculty affluence in technology use (FAF) positively impacts online retention ($\beta = 0.200$, $p = 0.020$) supports the hypothesis that faculty's technological expertise plays a significant role in student retention. This result aligns with the body of literature that underscores the importance of faculty competency in technology to foster effective and engaging online learning environments. For instance, Dickey (2005) highlights that faculty members proficient in technology can better facilitate learning, improving student retention. This supports the current study's finding that FAF contributes positively to retention by enhancing student engagement and support.

The positive relationship between FAF and online retention also resonates with research by Singh and Hurley (2017), who argue that faculty's ability to use technology effectively allows for creating interactive and personalised learning

experiences. This study found that when faculty members integrate technology into their teaching strategies, they create more dynamic and responsive learning environments that cater to students' diverse needs, including those with learning disabilities. Such environments are essential for increasing student engagement and retention in online courses, especially for students struggling with traditional learning methods.

Further supporting this idea, Bawa (2016) emphasises that faculty's use of technology to provide timely feedback and facilitate communication is critical in maintaining student engagement, directly influencing retention rates. In the current study, the significant role of FAF suggests that faculty members adept at using technology improve course delivery and enhance the support students feel, a key factor in keeping them engaged and motivated throughout their online courses.

The study highlights how faculty's technological expertise can bridge challenges for students with learning disabilities. Conklin and Spector (2015) note that students with disabilities often benefit from assistive technologies like screen readers, captioned videos, and interactive multimedia. When effectively incorporated by technologically proficient faculty, the tools help create more inclusive and supportive learning environments. This aligns with the study's finding that FAF positively influences retention, as faculty members equipped with these tools can address the unique challenges faced by students with learning disabilities and improve their overall online learning experience. The findings are consistent with those of Cavanaugh (2001), who found that faculty's engagement with technology enhances the learning experience and student retention in online courses. By providing a range of multimedia learning materials, adaptive assessments, and flexible communication options, faculty can better meet students' diverse needs and create a more inclusive educational experience. The study's findings reinforce this view, as faculty who are adept with technology create an environment where students, particularly those with learning disabilities, are more likely to engage and persist in their studies.

In conclusion, the study supports the growing body of research emphasising the importance of faculty's technological expertise in fostering effective and supportive online learning environments. Faculty proficiency in using technology enhances student engagement, provides personalised learning experiences, and improves retention, especially for students with learning disabilities. Hence, institutions must prioritise faculty development programmes to enhance technological competence, ensuring that faculty can create engaging, inclusive, and supportive online learning environments that promote higher retention rates.

H_{10} : Lecturer-student understanding significantly positively affects the online retention of university students with learning disabilities.

The study's results, showing a highly significant positive relationship between lecturer-student understanding (LSU) and online retention (OR) ($\beta = 0.450$, $p = 0.000$), strongly support the hypothesis that LSU plays a critical role in promoting retention. This finding aligns with a substantial body of literature highlighting the significance of effective communication and rapport between lecturers and students in educational outcomes. Bryan and Pugh (2015) emphasise that when instructors develop strong rapport with students, they create a supportive environment that enhances motivation and engagement, which is critical for retention, particularly in online learning environments. This study's finding reinforces their argument, showing that LSU is a key factor in maintaining student retention in online courses, where personal interactions are often limited.

The current study's results align with Swan (2001), who observed that students who feel understood by their instructors are more likely to engage with the course material and persist in their studies. This is especially important for students with learning disabilities, who may face additional barriers in comprehending course content. In such cases, having an empathetic lecturer who is aware of individual learning needs can significantly improve retention by ensuring students feel supported and capable of overcoming challenges. The study's findings confirm that LSU contributes to better engagement and retention for students with

learning disabilities, as students with strong connections to their instructors are more likely to continue in their studies.

Moreover, the importance of LSU in fostering engagement and retention is well-documented in other studies, such as those by Bryan and Solman (2014), who found that students with a positive relationship with their lecturers are more likely to persist in their studies. This is particularly true in online education, where students may otherwise experience feelings of isolation or disconnection. The current study's results highlight the need for lecturers to communicate effectively and build a strong, supportive relationship with students, particularly those with learning disabilities, to help them remain motivated and engaged.

Furthermore, the positive relationship between LSU and OR reinforces the findings of Tinto (2012), who emphasised the critical role of student engagement in retention. Tinto's model of student retention stresses the importance of social and academic integration, which is facilitated through meaningful interactions with instructors. This study confirms that LSU is an integral part of both academic and social integration, particularly for students who may be marginalised or at risk of disengagement, such as those with learning disabilities.

In conclusion, the study's findings underscore the importance of LSU in online retention, aligning with the literature that highlights the positive impact of lecturer-student rapport and communication on student motivation and persistence. The strong relationship between LSU and OR, especially in the context of students with learning disabilities, supports the idea that instructors must act as mentors and build understanding to help students succeed in online education. This reinforces the need for institutions to prioritise training faculty to engage with students meaningfully and foster supportive relationships that enhance retention.

6.2.2 Discussion of Hypothesised Mediation Relationships

For each hypothesis, the statistical results (e.g., p-values, beta coefficients, significance levels) and their meanings to each hypothesis are explained, and a statement of whether it was supported or disproved by the findings is provided. It

compares the findings to previous literature noting the similarities or differences. The hypothesised mediation relationships are stated as follows:

H₂: Social and family factors mediated by motivational factors indirectly positively affect the online retention of university students with learning disabilities.

The findings reveal that social and family factors (SF) do not directly affect online retention (OR). However, the relationship becomes significant when mediated by motivational factors (MF), with a beta coefficient for the indirect effect ($\beta = 0.235$, $p < 0.05$). This suggests that social and family support indirectly fosters motivation, which ultimately contributes to better retention outcomes. This aligns with recent research that underscores the role of external support in fostering student motivation, which in turn impacts retention in online education. For instance, Wang et al. (2021) highlight that social and family support systems enhance students' motivation, which plays a critical role in improving retention in online learning environments. Their study emphasises that while external support is vital, students' intrinsic motivation drives their ability to persist in their studies.

Furthermore, the indirect influence of social and family factors on retention through motivation aligns with the principles of self-determination theory, which emphasises the role of motivation in achieving educational success. Ryan and Deci (2020) argue that external factors, including family and social support, contribute to students' intrinsic motivation, thereby increasing the likelihood of continued engagement and retention in educational settings. In the context of online learning, where students may feel isolated, strong social and family networks can foster a sense of motivation, improving retention rates. This view supports the study's findings, suggesting that motivation plays a mediating role in translating social and family support into improved retention outcomes.

Moreover, the current study's results are consistent with recent work by Lee and Choi (2020), who found that while social and emotional support does not directly influence retention, it plays an important role in fostering motivation, subsequently leading to better retention. Lee and Choi (2020) emphasise the importance of

motivational factors, such as students' engagement and emotional commitment, in mediating the relationship between social support and retention. This perspective aligns with the study's results, highlighting motivation as the crucial factor driving the impact of social and family support on online retention.

However, these findings contrast with other studies emphasising more direct links between social and family support and retention. For example, research by Jaggars et al. (2022) indicates that social support can directly affect student retention by enhancing their sense of belonging and academic persistence. Unlike the current study's findings, Jaggars et al. (2022) argue that support systems themselves, rather than motivational factors alone, have a more immediate effect on retention. This contrast suggests that the role of social and family support in online retention may vary depending on how these support systems interact with other psychological factors, such as motivation.

In conclusion, the findings suggest that social and family factors influence online retention indirectly through motivation. This finding aligns with recent studies by Wang et al. (2021), Lee and Choi (2020), and Ryan and Deci (2020), all of which emphasise the importance of motivation in mediating the effect of external support on retention. However, it contrasts with the more direct effects highlighted by Jaggars et al. (2022), illustrating the complexity of the relationship between social support, motivation, and retention in online learning environments.

H₄: Technological constraints and digital natives mediated by motivational factors have an indirect, positive effect on the online retention of university students with learning disabilities.

The findings of this study reveal that the direct relationship between technological constraints (TC) and online retention (OR) was not significant ($\beta = -0.211$; $p > 0.05$), and the mediation effect through motivational factors (MF) was weak ($\beta = 0.089$; $p > 0.05$). The findings suggest that while motivation is important for online retention, it is insufficient to overcome the negative impacts of technological constraints, such as issues with access, usability, and reliability. This outcome

challenges the assumption that students, especially digital natives, can easily deal with technological barriers in online learning environments (Prensky, 2001).

Prior literature presents a contrasting view, suggesting that digital natives, due to their familiarity with technology, should theoretically be better able to manage technological constraints in online learning settings. Prensky (2001) posited that these students, having grown up immersed in digital environments, possess the skills and familiarity needed to overcome technological barriers. However, the findings indicate that despite their digital fluency, students are still hindered by technological issues that motivation alone cannot resolve. This aligns with research by Chen and Jang (2010), who found that while students are more technologically adept, barriers such as poor internet connectivity and unreliable platforms still pose significant challenges to effective online learning, particularly in developing regions or among those with specific needs, such as students with learning disabilities.

Moreover, the current study reinforces previous research by Al-Fadhli (2009), which emphasised that technological constraints remain a major obstacle for students, especially those with disabilities. Al-Fadhli's study found that technological barriers, including inaccessible learning platforms and inadequate support for students with disabilities, significantly hinder students' ability to engage with online content. Similarly, Sun and Chen (2016) argue that whereas motivational factors are crucial for student retention in online learning settings, they cannot overcome the foundational issue of technological limitations. In this context, the findings of this study highlight the need for educational institutions to focus on addressing these technological challenges directly rather than relying solely on motivation as a mediating factor.

In contrast to the expectation that digital natives would overcome technological constraints (Prensky, 2001), this study suggests that digital fluency alone is insufficient to ensure engagement or retention in online learning situations. Digital natives still experience technological difficulties, which significantly affect their ability to stay engaged, as highlighted by studies on online learning retention in

higher education (Carver & Klein, 2018). Thus, while motivation remains important, the study emphasises the need for institutions to invest in technology infrastructure and support systems that can mitigate the impact of technological constraints on student retention.

H_5 : Lecture student understanding mediated by motivational factors indirectly positively affects the online retention of university students with learning disabilities.

The findings of this study indicate that the direct effect of lecturer-student understanding (LSU) on online retention (OR) was significant ($\beta = 0.200$; $p < 0.05$), as was the indirect effect mediated by motivational factors (MF) ($\beta = 0.156$; $p < 0.05$). These findings highlight a strong, mediated relationship between LSU and OR, suggesting that direct understanding between lecturers and students contributes to retention and encourages motivation, subsequently enhancing retention. This outcome underscores the importance of empathetic and supportive lecturer-student interactions, which can directly improve students' engagement and retention in online learning environments.

This finding aligns with Moore's (1993) transactional distance theory, which posits that the more students perceive understanding and responsiveness from their instructors, the less perceived "distance" they feel in the learning process. Moore emphasised that the quality of communication between lecturers and students, especially in remote or online settings, is critical for engagement and retention. The findings of this study confirm that LSU positively impacts student retention, reinforcing the notion that empathetic and effective communication enhances students' sense of belonging and commitment to the learning process.

Further supporting this idea, Martin et al. (2020) discuss the essential role of lecturer-student interaction in online learning environments. They highlight that lecturers must leverage their understanding and communication skills in the absence of face-to-face interaction to create an inclusive and supportive virtual space. This research echoes the finding that LSU plays a critical role in motivating students, particularly those with learning disabilities, where a lack of personalised

support can hinder engagement and retention. Motivation in these contexts is influenced by the perception of lecturers as approachable and understanding, which fosters a positive learning experience (Gagne et al., 2014).

Moreover, previous studies have constantly emphasised that motivational factors mediate the relationship between lecturer-student understanding and retention. For instance, Tinto (1993) argued that student retention is closely linked to academic and social integration, which is facilitated by supportive and empathetic faculty interactions. Similarly, this study reinforces the idea that motivational factors are a crucial intermediary in improving retention outcomes, particularly among students with learning disabilities. When lecturers show understanding and adapt their teaching to the individual needs of students, motivation levels rise, leading to improved retention (Tharp & Gallimore, 1988).

In contrast to this study's findings, other research has shown that the role of LSU in mediating retention outcomes may vary depending on institutional and contextual factors. For example, some studies have suggested that while LSU is important, its impact may be less pronounced in institutions with well-established support systems or where technology tools help mitigate the lack of direct interaction (Anderson et al., 2011). However, in the specific context of students with learning disabilities, the personalised interaction provided by lecturers remains a key motivator and contributor to retention (Martyn, 2007).

H₆: Institutional capacity of training factors mediated by motivational factors has an indirect, positive effect on the online retention of university students with learning disabilities.

The findings of this study reveal that the direct effect of institutional capacity for training (ICT) on online retention (OR) was not significant ($\beta = -0.154$; $p > 0.05$), and the indirect effect mediated by motivational factors (MF) was also weak ($\beta = 0.087$; $p > 0.05$). These findings suggest that while institutions may offer robust training programmes, these initiatives do not significantly contribute to online retention either directly or through motivation. This stresses a potential gap

between institutional training strategies and student needs and the importance of aligning institutional resources with factors that drive motivation and engagement in online learning environments.

This finding contrasts with previous research emphasising the role of institutional support in enhancing student engagement and retention. Park and Choi (2009) noted that institutional support, including training programs and technological resources, is vital in motivating students and fostering a positive online learning experience. However, the current study indicates that merely providing resources is insufficient to improve retention, especially when these resources are not effectively aligned with students' specific needs and motivational drivers. This discrepancy suggests that while institutional support is important, its effectiveness is contingent on its contextual application and the extent to which it addresses the unique challenges faced by students with learning disabilities.

In line with this, studies by Lee and Choi (2013) and Artino (2012) found that institutional resources can significantly impact retention outcomes when properly tailored to student needs. However, these resources must go beyond mere availability and focus on fostering an environment where students feel supported and motivated to engage. The current study challenges this view by showing that, without proper alignment, even substantial resources such as training and technological support may not effectively mediate retention. This aligns with findings from other studies, such as those by Baran et al. (2011), which indicate that students' perceptions of institutional support and the quality of training programmes influence their retention in online learning settings. However, these factors alone are insufficient to guarantee success.

The findings also suggest that institutions need to reconsider their approach to training and support. As Tinto (1993) stressed in his work on student retention, institutional support should focus on the quantity of resources and on how these resources are implemented to meet students' personal and academic needs. This is especially true for students with learning disabilities, who may require more personalised and accessible training and support to remain motivated and

engaged. Thus, the current study points to the need for a more strategic approach, where institutional resources are abundant and tailored to effectively foster motivation and address specific barriers to online retention.

H₇: Institutional capacity of training factors mediated by motivational factors indirectly positively affects the online retention of university students with learning disabilities.

The findings of this study indicate that the direct effect of institutional capacity for training (ICT) on online retention (OR) was not significant ($\beta = -0.154$; $p > 0.05$), and the indirect effect mediated by motivational factors (MF) was also not statistically significant ($\beta = 0.090$; $p > 0.05$). This suggests that institutional training resources are not meaningful in promoting online retention for students with learning disabilities, even when considering motivational factors. The hypothesis, which posited that ICT would positively influence OR through the mediation of MF, is refuted by the lack of statistical significance in both the direct and indirect paths. This result diverges from prior studies that underscore the role of institutional resources in fostering student retention.

The literature often emphasises the critical role of institutional capacity in creating supportive learning environments that enhance retention. For example, Y. Lee and Choi (2013) highlight the importance of institutional support, including training programmes, in fostering engagement and retention in online learning environments. However, the findings of this study suggest that simply providing robust training programmes is insufficient to improve retention outcomes. This could be due to inefficiencies in implementing these programmes or a mismatch between the resources offered and the specific needs of students with learning disabilities. Prior research also suggests that institutional training capacity needs to be more targeted and personalised to enhance retention effectively (Aleven et al., 2016; Tinto, 1993).

Moreover, the study's results align with those of Park and Choi (2009), who found that the availability of institutional resources alone does not guarantee student retention unless those resources are strategically aligned with students' needs

and motivational pathways. This finding suggests that ICT might somewhat influence motivational factors, but its overall effect on retention is limited. The weak relationship observed in this study highlights the importance of contextualising training resources to ensure they address the unique challenges faced by students with learning disabilities in online learning environments. It further underscores the idea that institutional support should be designed for resource availability, fostering motivation, and providing direct, meaningful engagement opportunities (Artino, 2012).

In contrast, studies such as those by Tinto (1993) and Artino (2012) indicate that student retention can be enhanced when institutions focus on providing resources and ensuring that these resources are effectively integrated into the learning experience. Tinto (1993) suggests that institutional support should be targeted at both academic and emotional aspects of the student experience to improve retention. This approach implies that while ICT can play a role, its effectiveness depends on its application and the degree to which it aligns with students' needs and motivations.

H₈: Faculty affluence in technology use factors, mediated by motivational factors, indirectly, positively affects online retention of university students with learning disabilities.

The findings of this study reveal that the direct effect of faculty affluence in technology use (FAF) on online retention (OR) was significant ($\beta = 0.200$; $p < 0.05$), indicating that faculty proficiency in technology directly enhances retention. However, the indirect effect through motivational factors (MF) showed a negative beta coefficient ($\beta = -0.124$) and was statistically significant ($p < 0.05$), suggesting a counterintuitive negative mediation. This result indicates that while faculty technological competence improves retention, it complicates the relationship when motivation is factored in, potentially hindering retention. The findings suggest a misalignment between technological proficiency and motivational strategies, stressing the importance of an integrated approach that balances both elements.

This outcome contrasts with prior research emphasising the importance of technology integration for effective online learning. Al-Fraihat et al. (2020) argue that faculty's technological competence is crucial for creating an engaging online environment. However, the findings suggest that technology proficiency alone is insufficient, and its application might not always align with students' needs, potentially affecting their motivation and engagement. Although technology can enhance student engagement and support learning (Al-Fraihat et al., 2020), the findings indicate that when technological expertise is not coupled with student-centred pedagogical strategies, it might lead to negative outcomes for student retention.

Moreover, prior studies suggest that faculty training in both technology and pedagogy is essential for improving student outcomes. For instance, Martin et al. (2020) argue that technological skills must be integrated with effective teaching methods to ensure that technology enhances the learning experience rather than becoming a barrier to engagement. Similarly, Y. Lee et al. (2013) highlight the need for pedagogical adaptability in online learning environments, indicating that overreliance on technological competence, without considering students' preferences and motivation, can detract from the overall learning experience.

Finally, these findings align with the views of Artino (2012), who discusses how motivation, when supported by faculty engagement and pedagogical practices, can significantly influence student retention in online courses. The negative mediation observed in this study points to the need for a balanced approach, where faculty's technological expertise is combined with strategies that enhance student motivation and engagement. This is especially important for students with learning disabilities, who may require more personalised approaches to benefit from the technological tools provided fully.

6.3 CONCLUSIONS

This chapter compared the findings from the primary data with existing literature to explore factors influencing online retention (OR) among university students with learning disabilities. The findings revealed that certain factors, such as

lecturer-student understanding, directly and indirectly impacted online retention, aligning with prior research accenting the importance of effective communication and empathetic relationships between educators and students (Martin et al., 2020; Moore, 1993). This underscores the critical role of lecturer-student rapport in fostering motivation and enhancing retention. However, the findings diverged from some expectations, as technological constraints and institutional training capacity did not significantly influence online retention, contrary to previous studies suggesting that robust resources are essential for improving engagement and retention (Park & Choi, 2009). The lack of significant relationships in these areas shows that simply providing resources is insufficient unless these resources are aligned with the specific needs of students.

The study also stressed the complex role of motivational factors in mediating relationships between institutional resources and online retention. Although motivation was found to be an important factor in retention, it was insufficient to overcome the negative effects of technological constraints. This aligns with previous studies that suggest technology-related barriers remain a significant hindrance to online learning, especially for students with learning disabilities (Al-Fadhli, 2009). The failure of institutional training programmes to significantly affect retention, even when mediated by motivation, implies that institutional resources must be better tailored to the needs of students to address these challenges effectively. In contrast, the relationship between faculty affluence in technology use and online retention was counterintuitive, with a negative mediation effect through motivation. The finding counters previous research that emphasises the positive role of technology in online learning (Al-Fraihat et al., 2020), implying that an overreliance on technological competence may not always be aligned with students' needs, potentially hindering retention.

In conclusion, the findings underscore the complexity of online retention in higher education, particularly for students with learning disabilities. The contrast between direct and mediated effects stresses the need for a subtle approach to improving retention, where technological resources and motivational strategies are carefully integrated. The study suggests that universities must provide

technological tools and training programs and ensure that these resources are used in ways that directly address students' motivational and educational needs. Moreover, faculty training should focus on a balanced approach, combining technological proficiency with pedagogical strategies that enhance student engagement and motivation rather than relying solely on technological expertise.

CHAPTER SEVEN: FINDINGS AND RECOMMENDATIONS

7.1 INTRODUCTION

The previous chapter discussed the study's results. This chapter synthesises the key findings and provides actionable recommendations based on the results discussed in the preceding chapters. The findings are summarised to accentuate the significant factors affecting online retention among university students with learning disabilities, highlighting direct and mediated relationships. Moreover, the chapter outlines practical recommendations for academics, institutions, and policymakers to address the challenges and leverage the opportunities identified.

This chapter's suggestions aim to enhance online retention by promoting supportive settings, addressing technological and institutional barriers, and firming motivational factors. By bridging between theory and practice, this chapter contributes to developing inclusive online learning strategies that cater to the distinct needs of students with learning disabilities studying at the university level. Finally, the chapter concludes by suggesting avenues for future research to expand the understanding of online learning retention dynamics in the higher education space in South Africa. The next section presents the findings.

7.2 FINDINGS

This section presents a detailed overview of the findings from both the primary data collected and the literature review. The findings are organised and presented in alignment with the specific research objectives, ensuring that each objective is addressed thoroughly. The data obtained through surveys and questionnaires are analysed and reported systematically to provide a clear understanding of the key factors influencing online learning retention among university students with learning disabilities. The findings from the literature review are discussed next, providing context and further insights to support and compare the empirical results. The integration of primary data and literature findings helps to create a complete understanding of the research topic, drawing connections between the theoretical and empirical aspects of the study. Each set of findings is discussed

in relation to its relevance to the research questions, providing a nuanced interpretation of the data and its implications for the field.

7.2.1 Findings of the Primary Data

In this section, the findings are summarised and guided by research objectives. The objectives, followed by the key findings, are set out below.

- **To what extent do social and family factors influence online learning retention among university students with learning disabilities?**

The findings reveal that social and family factors (SF) do not significantly affect online learning retention (OR) among university students with learning disabilities, as the hypothesis testing for this direct relationship was disproved. This suggests that while social and family support provides a crucial foundation, these factors alone are insufficient to enhance retention in an online learning context significantly. However, when mediated by motivational factors, the positive influence of social and family support becomes apparent, underscoring its indirect role in fostering retention. This highlights that SF serves as an enabling factor, amplifying students' motivation, which in turn drives better retention outcomes. Thus, the findings stress the need for a dual focus: cultivating strong external support systems while simultaneously fostering intrinsic motivation. Institutions should prioritise strategies that integrate both elements to address the unique challenges faced by students with learning disabilities, ensuring a more holistic and effective approach to enhancing retention in online learning settings.

- **To what extent does the perceived value of using technology influence online learning retention among university students with learning disabilities?**

This study revealed that the perceived value of using technology does not directly affect online learning retention among university students with learning disabilities. Whereas the expectation exists that digital natives would inherently benefit from technological tools in education, the findings suggest that technological constraints and barriers overshadow these potential benefits, limiting the direct influence of perceived technology value on

retention. This underscores the multifaceted challenges faced by students with learning disabilities in effectively leveraging technology for academic success. Notably, motivational factors mediate the relationship between the perceived value of technology and online retention, highlighting the critical role of intrinsic and extrinsic motivation in unlocking technology's potential. These findings suggest that while the inherent value of technology alone may be insufficient, its integration into learning strategies becomes impactful when paired with deliberate efforts to enhance student motivation. For example, institutions and educators can amplify the positive impact of technology by fostering engaging, inclusive, and accessible online platforms to accommodate the needs of students with disabilities and also actively inspire their participation and motivation, ultimately improving retention outcomes.

- **To what extent does ease of use of the technology influence online learning retention among university students with learning disabilities?**

The findings revealed that the ease of use of technology significantly impacts online learning retention among university students with learning disabilities. Intuitive, accessible, and user-friendly online learning platforms enhance students' ability to consistently engage with their coursework, thereby fostering successful learning experiences. This underscores the critical importance of designing digital tools and platforms that cater specifically to the unique needs of students with learning disabilities, minimising technical challenges that can hinder their educational progress and engagement.

Furthermore, motivational factors were found to mediate the relationship between ease of use and retention, stressing the value of pairing user-friendly technology with supportive and motivationally enriching educational strategies. When institutions prioritise the development of easy-to-navigate platforms integrated into the engagement of teaching practices, they create a more inclusive and supportive online learning setting. Such an approach enhances retention and empowers students with learning disabilities to overcome barriers and achieve academic success. By reducing technological

frustrations and fostering motivation, institutions can better meet the needs of this student population and support their long-term educational goals.

- **To what extent does lecturers' support influence online learning retention among university students with learning disabilities?**

The study found that lecturers' support significantly influences online learning retention among university students with learning disabilities. For instance, when lecturers provide consistent, empathetic, and tailored support, students feel valued and understood, which raises their motivation and engagement with online learning platforms. This support includes timely feedback, effective communication, and an inclusive approach to addressing the unique challenges faced by students with learning disabilities.

Also, motivational factors were shown to mediate the relationship between lecturers' support and online retention. This indicates that while direct support is essential, its effectiveness is amplified when it boosts students' intrinsic motivation to persist in their studies. These findings highlight the critical need for faculty training to enhance supportive teaching practices to create a more inclusive and empowering online learning environment.

- **To what extent does institutional support of faculty members influence online learning retention among university students with learning disabilities?**

The findings reveal that institutional support for faculty members has an indirect yet crucial influence on the online learning retention of university students with learning disabilities. While institutional resources, like training programmes and technological tools, lay the foundation for effective teaching, their influence is most apparent when they empower faculty to deliver high-quality, adaptive support to students. The study reveals that institutional capacity, in terms of providing sufficient training and resources, can positively affect retention by fostering lecturers' ability to engage and motivate students.

However, the findings also suggest that institutional support alone may not directly lead to improved retention rates unless it is effectively translated into practices that address students' unique needs. Motivation was found to mediate this relationship, indicating that students' retention outcomes improve when institutional support enables faculty to foster a motivating and inclusive learning setting. This stresses the importance of aligning institutional policies and practices to meet the specific needs of students with learning disabilities.

- **To what extent does the institutional capacity to provide resources influence online learning retention among university students with learning disabilities?**

The study found that the institutional capacity to offer resources has a limited direct impact on the online retention of university students with learning disabilities. While the availability of resources like learning management systems, assistive technologies, and strong digital infrastructure forms a required basis for online education, their efficacy in influencing retention relies largely on how well the resources are used. These findings signify that offering resources without ensuring their accessibility, relevance, and usability for students with learning disabilities may not yield significant improvements in retention rates.

Finally, the findings emphasised the importance of motivational factors in mediating the relationship between institutional capacity and retention. Institutional efforts must go beyond resource provision to include strategies that promote a motivating and supportive learning environment, such as training faculty to use these resources effectively to meet the needs of students with learning disabilities. This highlights a gap in implementation, suggesting that aligning resource provision with student-specific requirements is critical for enhancing retention outcomes in online learning environments.

7.2.2 Findings of the Literature Review

This section presents a summary of the findings of the literature review. As with the above section, the findings are guided by research objectives as follows:

- **To what extent do social and family factors influence online learning retention among university students with learning disabilities?**

The literature review found that social and family factors influence online learning retention among university students with learning disabilities, but this effect is indirect and mediated by motivational factors. Although the direct effects of social and family support on retention were found to be insignificant in the literature, the presence of these factors strongly contributed to students' motivation, which in turn positively affected their ability to persist in online learning environments (Almahasees et al., 2021; Ziadat, 2021). The findings align with research by Wang et al. (2021) and Kahu and Nelson (2018), which highlight the role of external support systems in promoting students' psychological well-being and resilience. For students with learning disabilities, family encouragement and social support mitigate stress and promote a sense of belonging, enhancing motivation and commitment to their studies.

The literature emphasises the crucial role of motivation as the mediating factor in translating social and family support into improved retention outcomes. As students deal with the challenges of online learning, especially those related to accessibility and engagement, the motivational boost from strong social networks becomes a pivotal enabler of success. Previous studies, such as those by Deci and Ryan (2000) and Rovai (2013), support this view, implying that intrinsic motivation fueled by external support enhances persistence in online education. The literature is clear that institutions must consider strategies to support the involvement of families and peers in the educational process, such as family engagement workshops or peer mentoring programmes, to create a more supportive and retention-focused learning environment (Suhandiah et al., 2022).

- **To what extent does the perceived value of using technology influence online learning retention among university students with learning disabilities?**

The literature shows that the perceived value of using technology significantly influences online learning retention among university students with learning

disabilities (Chung et al., 2020; Luo et al., 2019). Students who recognise the relevance and utility of technology in enhancing their learning experience are more likely to remain engaged and persist in online courses. This aligns with the Technology Acceptance Model (TAM) proposed by Davis (1989), highlighting the importance of perceived usefulness in technology adoption. The literature found that for students with learning disabilities, using accessible tools, adaptive technologies, and user-friendly platforms fosters a positive attitude towards online learning, enhancing retention rates (Lambert & Dryer, 2018; Meech & Koehler, 2024).

The literature stresses the role of motivational factors in amplifying the relationship between perceived technology value and retention (Meech & Koehler, 2024; Wilkinson, 2022). When students perceive technology as valuable, their intrinsic motivation to engage in online learning activities rises, supporting findings by Al-Fadhli (2009) and Martin et al. (2020). This relationship implies that institutions should prioritise indicating the tangible benefits of online learning technologies to students, particularly those with learning disabilities. Efforts such as targeted training, showcasing success stories, and integrating assistive technologies enhance students' perceived value of the tools, leading to higher retention rates in online education (Wilkinson, 2022).

- **To what extent does ease of use of the technology influence online learning retention among university students with learning disabilities?**

The literature found that the ease of use of technology significantly affects online learning retention among university students with learning disabilities (Irawan et al., 2020; Lebenicnik & Istenic Starcic, 2018). Students reported higher retention rates in online learning when they found the platforms and tools intuitive, accessible, and easy to navigate. The latter findings align with the Technology Acceptance Model (TAM), which stresses perceived ease of use as a key determinant in technology adoption (Davis, 1989). For students with learning disabilities, platforms requiring less cognitive and physical effort

to use are particularly useful, reducing frustration and enhancing engagement (Bulić & Blažević, 2022; Fitzpatrick & Trninic, 2023).

Moreover, motivational factors were found to mediate this relationship, implying that ease of use fosters confidence and willingness to engage, which are critical for retention. Studies such as Al-Fadhli (2009) and Martin et al. (2020) support this, accentuating that user-friendly technologies encourage sustained participation in online learning. The literature ratifies that institutions must focus on designing or adopting platforms with intuitive interfaces and ensuring adequate support to address usability challenges faced by students with learning disabilities, further enhancing their retention in online programmes (de Klerk & Palmer, 2022; Goegan et al., 2023).

- **To what extent does lecturers' support influence online learning retention among university students with learning disabilities?**

The literature review found that lecturers' support significantly influences online learning retention among university students with learning disabilities (Rajeh et al., 2021; Schwartz et al., 2021). Clear communication, sensitivity, and custom-made instructional plans by lecturers create a supportive learning environment that enhances students' engagement and motivation. The findings align with Moore's (1993) Theory of Transactional Distance, which stresses the important role of interaction in reducing the perceived isolation of online learners. The literature also found that a positive relationship between lecturer support and retention confirms the importance of instructor-student rapport in promoting trust and a sense of belonging, particularly for students with additional learning needs (M. Li, 2022; Rockinson-Szapkiw et al., 2016).

Moreover, the literature review found that motivational factors mediate the relationship between lecturer support and retention, indicating that empathetic and adaptive teaching approaches inspire greater confidence and loyalty among students. Studies by Bryan and Pugh (2015) and Martin et al. (2020) reinforce this, showing that retention rates improve significantly when lecturers understand and address students' unique problems. The literature is

clear about the need for professional development programmes to equip lecturers with skills to support students with learning disabilities in online settings effectively (Hoi et al., 2021; Rockinson-Szapkiw et al., 2016).

- **To what extent does institutional support of faculty members influence online learning retention among university students with learning disabilities?**

The literature found that institutional support for faculty members plays a critical role in influencing online learning retention among university students with learning disabilities (Varachia et al., 2023b; Ziadat, 2021). Adequate training programmes, access to technology, and professional development opportunities enable lecturers to deliver effective online instruction tailored to students' needs. The latter findings align with previous research by Al-Fadhli (2009), highlighting that institutional investment in faculty training enhances the quality of online education and supports student retention. The literature also found that when institutions actively support their faculty, lecturers are better equipped to manage the complexities of teaching students with learning disabilities, thus improving learning outcomes (Adedoyin & Soykan, 2023; Almahasees et al., 2021).

Moreover, the literature review found that motivational factors mediate the relationship between institutional support for faculty members and online retention. This indicates that when faculty feel empowered and supported, they are more motivated to engage students effectively, positively impacting retention. Studies by Martin et al. (2020) and Dickey (2005) highlight that institutions with robust faculty support structures foster an environment conducive to learning, even for students facing additional challenges. These findings of the literature review underline the importance of institutional commitment to equipping academics with resources and tools to ensure an inclusive and effective online learning experience (Lin et al., 2022; Suhandiah et al., 2022).

- **To what extent does the institutional capacity to provide resources influence online learning retention among university students with learning disabilities?**

The literature reveals that the institutional capacity to provide resources significantly impacts the online learning retention of university students with learning disabilities (Lemay et al., 2021; Ziadat, 2021). Students rely on the availability of accessible learning materials, assistive technologies, and reliable online platforms to overcome barriers posed by their disabilities. However, the literature review found that although institutions provide resources, their availability alone does not warrant positive retention outcomes, confirming the observations of Al-Fadhli (2009). Gaps in resource implementation or a lack of alignment with students' specific needs can undermine their effectiveness.

Moreover, the literature review found that motivational factors mediate the relationship between resource availability and retention, signifying that students' perception of institutional support influences their engagement and persistence in online learning (Abouhashem et al., 2021; Lin et al., 2022). This aligns with research by Moore (1993) and Martin et al. (2020), which stresses the importance of institutional efforts to create an inclusive and supportive environment. Institutions must provide resources and ensure optimal use via targeted interventions and support strategies tailored to students with learning disabilities.

To summarise this section, the findings reveal that online learning retention among university students with learning disabilities is influenced by multiple factors, with motivation playing a key mediating role. Social and family support, the perceived value of technology, and institutional capacity to provide resources do not directly enhance retention but significantly impact it when combined with motivational strategies. Ease of use of technology and lecturers' support were found to have direct positive effects on retention, underscoring the importance of user-friendly platforms and empathetic teaching practices tailored to the needs of students with learning disabilities. Institutional support for faculty indirectly

influences retention by enabling lecturers to provide effective and motivating support to students. The study also emphasises the critical interplay between technological, institutional, and personal factors in shaping online learning outcomes. Accessible and intuitive technologies, combined with robust institutional frameworks and motivational teaching approaches, are essential for fostering engagement and persistence in online learning environments for students with learning disabilities. The findings stress the need for an integrated approach to addressing students' unique challenges through support systems, adaptive technologies, and inclusive teaching strategies. The next section presents the conclusions based on the findings of the study.

7.3 CONCLUSIONS

The conclusions stress the significant predictors of online learning retention for university students with learning disabilities, accenting the interplay between individual, social, institutional, and technological factors. The literature review concludes that motivational factors are important in influencing online learning retention among university students with learning disabilities, mediating the effects of social and family support, lecturer-student understanding, and institutional resources. First, this stresses the importance of promoting intrinsic motivation, which helps students overcome the challenges of online learning settings and persist through difficulties.

Second, this literature concludes that lecturer support and lecturer-student understanding are vital factors in promoting retention. For instance, effective communication, empathy, and rapport between lecturers and students enhance students' motivation and engagement, which, in turn, positively influence their retention in online courses. This conclusion highlights the need for lecturers to be trained to recognise and respond to the distinct needs of students with learning disabilities, ensuring that they feel valued and supported.

Third, institutional support emerged as another crucial factor influencing online retention, with institutions required to provide the essential resources and the strategic application of these resources to meet the specific needs of students

with learning disabilities. This support includes access to adaptive technologies, specialised academic support services, and designing inclusive and accessible learning materials. It also concludes that institutional capacity to support students with disabilities notably affects online retention, particularly when the resources are aligned with students' needs.

Fourth, the study concludes that technology-related factors, like the perceived value and ease of use of learning technologies, substantially impact retention. Students who found online learning platforms accessible, easy to use, and supportive of their learning needs were more likely to remain engaged and succeed in their studies. This implies that universities must prioritise the selection and execution of user-friendly technologies that are compatible with assistive tools.

Finally, the study concludes that a combination of personal motivation, institutional support, lecturer-student interactions, and the accessibility and usability of technology influences the online retention of students with learning disabilities. The latter interrelated factors collectively create a supportive, inclusive learning environment that fosters student success. Based on this, the study provides valuable insights into the dynamics of online learning retention, offering a comprehensive understanding of how various factors work together to support students with learning disabilities in their educational journey. The next section presents the theoretical and practical contributions of the study.

7.4 THEORETICAL AND PRACTICAL CONTRIBUTIONS

This study makes theoretical and practical contributions that address critical gaps in understanding and supporting online learning retention for university students with learning disabilities. The research offers an inclusive framework to advance knowledge in this area by integrating theoretical perspectives and empirical findings. The contributions are twofold. First, it enriches the academic discourse by expanding existing theories related to education, inclusivity, and digital learning. Second, it offers practical recommendations for stakeholders to apply evidence-based strategies. The contributions collectively aim to enhance

educational equity and improve learning outcomes for a marginalised student population. The next section presents the theoretical contributions.

7.4.1 Theoretical Contributions

This study advances the theoretical understanding of online learning retention, particularly for university students with learning disabilities. By addressing an underexplored demographic, the research expands retention theories to account for distinctive factors affecting this group, such as social and family dynamics, technological barriers, and institutional readiness. The insights contribute to the broader discourse on equity and inclusivity in online education, filling a critical gap in the existing literature.

First, a significant theoretical contribution lies in merging multidimensional perspectives into a cohesive framework. By incorporating motivational, social, technological, and institutional factors, the study transcends traditional one-dimensional approaches to online learning retention. This holistic framework enhances our understanding of how the latter dimensions interact and provides a robust foundation for future research to improve student outcomes in digital learning environments.

Second, the study contributes to motivational theories by demonstrating the mediating role of motivation in overcoming barriers faced by students with learning disabilities. It illustrates how intrinsic and extrinsic motivators, combined with institutional support, can positively influence persistence and engagement in online learning. These findings advance theoretical discussions on the interplay between psychological and contextual factors in fostering academic success.

Third, the study deepens the theoretical discourse on technology adoption and accessibility in education. The study stresses disparities in access and usage that affect retention by examining how digital nativity interconnects with technological constraints. This important contribution augments existing frameworks on technology acceptance, accenting the need for inclusivity in digital learning tools and platforms.

Fourth, another key contribution is the emphasis on lecturer empathy and tailored teaching strategies, adding to pedagogical theories related to inclusive teaching practices. The study shows how faculty understanding and adaptability can reduce the challenges faced by students with learning disabilities, stressing the critical role of interpersonal dynamics in retention. This insight extends the theoretical understanding of faculty-student interaction in online learning contexts.

Lastly, the study situates its findings in its respondents' socio-economic and cultural realities, providing a localised viewpoint on retention theories. By confirming the contextual factors exclusive to the studied population, the study contributes to a deep understanding of how culture, institutional capacity, and socio-economic disparities intersect to shape online learning experiences. Such a localised perspective enhances the relevance and applicability of theoretical models in diverse educational settings. The next section presents the practical contributions of this study.

7.4.2 Practical Contributions of the Study

This PhD study makes significant practical contributions by addressing the challenges of online learning retention for university students with learning disabilities. It offers insights for institutions, policymakers, academics, and technology developers, emphasising inclusive and adaptive solutions that ensure equitable access to education.

Firstly, the study advocates for inclusive online learning strategies that cater to different learning needs. Universities can use these insights to develop adaptive curricula and teach methods that integrate assistive technologies such as text-to-speech software or real-time transcription services. For example, institutions can implement platforms with customisable features that include students with dyslexia or hearing impairments, enabling them to engage fully with course content.

Secondly, the research introduces a framework for institutional capacity building to enhance online education. By identifying gaps in faculty training and resource allocation, the study offers guidelines for institutions to develop support structures for students with learning disabilities. For example, establishing dedicated accessibility offices in universities can ensure that faculty and staff are equipped with knowledge and tools to address specific challenges these students face.

The study also informs policy development by emphasising the importance of targeted interventions to address technological inequities and accessibility challenges. Policymakers can use these findings to allocate funding for digital infrastructure in under-resourced institutions, ensuring that students from marginalised communities have equal access to online learning. For example, public-private partnerships could be established to distribute affordable assistive devices and internet connectivity solutions to students in remote areas.

The research also highlights the need for enhanced faculty training programmes focusing on empathy and inclusive teaching methods. By providing practical insights into the experiences of students with learning disabilities, the study stresses the value of training faculty to identify and accommodate diverse needs. For example, universities could offer workshops and certifications on inclusive pedagogical practices, ensuring lecturers are prepared to adapt their teaching styles for maximum student engagement.

The study contributes to the advancement of digital education tools by identifying specific usability challenges faced by students with disabilities. Technology developers can use these insights to design platforms with accessibility features, like alternative navigation methods for students with motor impairments. For example, mixing voice-controlled commands and gesture-based interfaces could significantly enhance usability for students who struggle with traditional input devices.

Lastly, the research highlights the role of social and family dynamics in supporting online learning retention. By stressing the importance of familial and community

support, the study provides practical recommendations for creating outreach programmes that empower families to support students effectively. For instance, universities could host workshops or develop online resources for families, guiding them on creating conducive learning environments at home.

To conclude, this study offers a thorough roadmap for improving online education retention for students with learning disabilities. The study addresses gaps at individual, institutional, and systemic levels and so equips stakeholders with applied tools and frameworks to foster an inclusive and supportive online learning ecosystem. The contributions stated in this section can potentially transform educational practices globally, ensuring that online learning environments are accessible to all students, regardless of their abilities.

7.5 MANAGERIAL AND IMPLICATIONS OF THE STUDY

This study emphasises the critical managerial and policy implications of advancing online learning retention for university students with learning disabilities. Both sets of implications are important for establishing inclusive, supportive, and effective online learning environments while aligning institutional practices with broader educational and legislative frameworks.

7.5.1 Managerial Implications

First, the management of educational institutions and online learning platforms must prioritise developing inclusive teaching strategies adapted to students with learning disabilities. This entails training academic staff to adopt adaptive pedagogies, such as using accessible course content and leveraging multimedia learning tools. Also, management must ensure the unified integration of assistive technologies, such as screen readers, speech-to-text software, and customisable user interfaces, into their digital platforms to support diverse learning needs.

Second, another managerial focus should be on promoting a supportive learning ecosystem by instituting mentorship and peer-support networks. These initiatives build a sense of belonging among students with learning disabilities, raising their

engagement and reducing dropout rates. Management must also invest in robust monitoring systems that track student progress, allowing early identification and intervention for at-risk learners.

Finally, from a resource allocation view, management should ensure enough funding for the required technological infrastructure and support services. This includes subsidies or grants to address technological constraints faced by economically disadvantaged students with disabilities. Strategic partnerships with technology providers also help institutions obtain state-of-the-art tools to improve accessibility.

7.5.2 Policy Implications

At the policy level, higher education institutions must advocate for and implement policies that mandate accessibility and inclusivity in online learning. These policies must expect the regular auditing of digital platforms to ensure compliance with global accessibility standards, such as the Web Content Accessibility Guidelines (WCAG). In addition, national education policies should highlight the importance of equal access to quality higher education for all students, including those with learning disabilities, through targeted funding and resource allocation.

Policymakers must consider forming structures that incentivise higher education institutions to adopt best practices in online learning. For instance, accreditation bodies could integrate inclusivity metrics into their evaluation criteria, supporting institutions in prioritising the needs of students with learning disabilities.

Moreover, alliances between government entities, higher education institutions, and disability advocacy groups are vital. Policymakers can develop guidelines for public-private partnerships to address infrastructure gaps, ensuring that students have access to high-speed internet, reliable devices, and supportive digital tools. Finally, policy implications extend to adopting a culture of accountability and continuous improvement. Higher education institutions must require that annual reports on inclusivity efforts, retention rates, and student outcomes are published,

creating transparency and driving institutional innovation. Hence, policymakers can use the reports to identify systemic barriers and adjust national strategies.

7.6 LIMITATIONS

Although this study contributes greatly to online learning and the retention of university students with learning disabilities, it has limitations. This section discusses the study's limitations and recommendations for future research.

First, this cross-sectional study sought to identify and explain the predictors of online learning retention of university students with learning disabilities. The predictors were subjected to SEM, and a model was subsequently developed. The RMSEA in the path model (see Figure 7) could not satisfy the acceptable level of <0.5 and was considered a model limitation for the thesis. A future longitudinal study or a controlled experimental setting involving students from several institutions in the country would be important to predict the possible causal relations among variables. However, confirming the hypothesised paths implies one possible pathway connecting the variables.

Second, the study was based on a sample of 256 university students with learning disabilities. The study used the convenience sampling technique, and the current study's second limitation was specifically on the sampling size. Besides using this study and the importance of a convenience sampling technique, there are limitations in selecting students. Clearly, the researcher could not select students from all universities in the country. However, the researcher partially managed the limitation by using administrative staff at disability units to email the Google form to university students with learning disabilities who were registered with the disability units at selected institutions.

The third limitation is related to access for students with disabilities. The sampling limitation (entirely outside the researcher's control) pertained to the classification of university students used in the study. Accordingly, this study recommends using a more significant sample in future related studies to raise the credibility and generalisability of the results. The limited access was because the

researcher did not have direct access to university students with learning disabilities but had to rely on emailing them. Considering this, all future related studies may need to consider involving more public institutions of higher education in the country or outside, and the researcher should do the respondent recruitment. This approach would also increase the sampling frame to accommodate students with learning disabilities from other public institutions.

Fourth, this research was based only on mono-quantitative primary data collected using the survey strategy. The recommendation is for future studies to apply a mixed-methods approach where qualitative and quantitative primary data is collected to measure the relationship between the research constructs. Deploying mixed methods helps to increase data rigour and shed more light on the phenomena under inquiry through methodological and data triangulation. Triangulation is the methodological practice of employing multiple data collection methods in a single study to verify the accuracy and validity of the collected data (Saunders et al., 2015). Semi-structured group interviews can yield qualitative data that is useful for triangulating quantitative data obtained through other methods, like questionnaires.

Fifth, this study was based on a sample of university students with learning disabilities from a single institution of higher learning. In light of this, this study recommends using two or more group comparisons of samples from other public institutions in future related studies. Using probability sampling techniques to draw the study samples will improve the external validity of the research findings. Such a decision can help enhance the results' generalisability to the target population. A larger scope can be justified for the study when the sample size is representative of the target population.

Finally, the scale of the predictors of online learning retention could have included more predictors. A further and more extensive literature review may identify several other predictors of online learning retention that may be contextualised to the South African higher education environment. Studies involving students with disabilities are limited, and there is a need to conduct more related studies that

focus on them. The pilot test sample size was small ($n = 50$), restricting the statistical analyses performed on the data collected. The pilot test analysis provided valid results about the thesis constructs' internal consistency. Although satisfactory scale reliability analysis was conducted using SPSS, EFA could not be performed because of the pilot study's small sample size. Therefore, the dataset EFA was performed on the primary data before proceeding to CFA under SEM. However, Van Kesteren and Kievit (2021) contend that a research study can perform EFA and CFA on the same dataset.

7.7 SUMMARY OF THE STUDY

This research aimed to explore the predictors of online learning retention among university students with learning disabilities. It focused on identifying and analysing the factors that influence students' persistence and success in online learning environments by considering technological constraints, institutional support, social and family influences, and individual characteristics. The primary objective was to develop a model of predictors of online learning retention among university students with learning disabilities.

This study adopted a quantitative research design. It used a structured survey to collect primary data from university students with learning disabilities. The survey involved a range of items designed to measure the dimensions of technological access, institutional support, social and family factors, and individual traits related to learning. The data collected from the survey were analysed using descriptive statistics and inferential techniques to examine the relationships between the factors and online learning retention. A structural equation was used to develop the model and test the hypotheses.

The results revealed several significant predictors of online learning retention among students with learning disabilities. Key findings include the significant impact of technological access, where students with limited access to reliable internet and assistive technologies were less likely to remain engaged in online learning. Institutional support also emerged as a critical predictor, with students who reported receiving more personalised academic support and accessible

course materials demonstrating higher retention rates. Social and family support was another influential factor; students with strong encouragement from family members and peers were more likely to persist in online courses. Moreover, individual factors such as self-regulation, motivation, and effective learning strategies were found to be positively correlated with online learning retention.

Based on the analysis, the study concluded that online learning retention among students with learning disabilities is influenced by a combination of technological, institutional, social, and individual factors. The study highlights that universities must address technological barriers, provide adequate academic support, and promote a supportive social environment to enhance retention. It also stressed the importance of equipping students with the skills needed for self-regulation and independent learning in an online setting. The findings suggest that a multi-dimensional approach is fundamental for improving retention rates in online learning environments for students with disabilities.

The study offers both theoretical and practical implications. From a theoretical standpoint, it contributes to the body of literature on online learning retention, particularly for students with learning disabilities, by identifying and quantifying the key factors that influence retention. On the other hand, the study provides universities with practical insights into the importance of ensuring equitable access to technology, promoting a supportive learning environment, and offering customised academic services to students with disabilities. The study also has policy implications, implying that higher education institutions should adopt inclusive policies that address accessibility and provide additional resources for students with learning disabilities in online learning environments.

The study makes several unique contributions to the field of online learning for students with learning disabilities. First, it introduces an overall model of predictors influencing online learning retention, integrating multiple dimensions, such as technological, institutional, social, and individual contexts, into a single framework. The model offers a more holistic understanding of the retention challenges faced by students with learning disabilities in online settings. Second,

the study offers a detailed empirical analysis of how various predictors interact and affect retention, which adds depth to existing research by quantifying the significance of each factor in the context of students with learning disabilities. Third, it fills a gap in the literature by focusing specifically on university students with learning disabilities, a population often ignored in broader studies of online learning retention. By exploring this underrepresented group, the study provides much-needed insights into the specific needs and barriers in online education. Moreover, the study stresses the role of institutional and social support systems in shaping retention outcomes, offering new directions for policy and practice in inclusive higher education.

The study recommends that universities invest in accessible technology and digital tools to ensure that all students, including those with learning disabilities, have equal access to online learning opportunities. It also suggests that academic staff receive training on inclusive teaching strategies and that universities establish dedicated support services to assist students with learning disabilities. Furthermore, universities are encouraged to create mentorship programmes and peer networks to support these students' engagement and motivation. On a policy level, the study acclaims that educational institutions adopt institutional policies that ensure online courses are fully accessible and inclusive for students with disabilities and that additional resources are allocated to support their academic success. Future research is also urged to explore other factors affecting long-term academic success for students with learning disabilities in online learning environments.

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APPENDICES

APPENDIX A: INVITATION LETTER



UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

Department of Educational Psychology

Attention: University students with learning disabilities

You are kindly invited to participate in PhD research with the title:

PREDICTORS OF ONLINE LEARNING RETENTION OF UNIVERSITY STUDENTS WITH LEARNING DISABILITIES

by

Khlood Al Masoud

What is the study about?

The study aims to test a model of predictors of online learning retention of university students with LDs.

Why is it essential for you to participate in this study?

The study will raise essential insights into the factors contributing to online learning retention of students with learning disabilities in the higher education space. Moreover, it will provide practical guidance to university management, the disability unit, and the government on the academic and technical support

required to ensure online learning retention of university students with learning disabilities.

Who can participate?

University students with learning disabilities

How can I participate?

To participate online, open the link:

https://docs.google.com/forms/d/e/1FAIpQLSde3wU0UK4BsILM081Yt3FE47wgOGZAbePTBHGFRqSo0eqKxw/viewform?usp=sf_link

Paper-based questionnaires are available at the Disability Unit

Who gave the researcher permission to conduct the study?

The University granted Ethical Clearance.

What if I have some questions?

Face-to-face information sessions will be conducted at the Disability Unit on Mondays and Thursdays during April and May 2023.

If you are not able to attend the session – you can email the following people:
Department of Educational Psychology

Ms Khlood Al Masoud (PhD candidate) email khlood.almasoud@gmail.com cell 0680200000

Prof Ruth M. Mampane (ruth.mampane@up.ac.za) Tel: 0124202339

Dr Angelina Wilson Fadiji (wilson.angelina1311@gmail.com) Cell: 0604084832

Mr Juan Erwee (juan.erwee@up.ac.za), Disability Unit, Tel: 0124204281

What do I gain from participating?

Your participation will help in knowledge formation

Additionally: A small token of appreciation will be given for your participation.

APPENDIX B: RESEARCH INSTRUMENT

SECTION A

Select the best answer from the options for each statement in this section.

DEMOGRAPHIC INFORMATION

Select your best answers from the options for each statement in this section and TICK [✓] or CROSS [X] the appropriate box.

1. What is your gender?

Male

1

Female

2

Non-disclosure

3

2. What is your age group?

25 or<

1

26-35

2

36-45

3

46-55

4

56 or>

5

3. What programme are you studying?

•

4. What is the duration of your programme?

•

5. What is your family's approximate monthly income?

R

6. Nature of disability (ies)

8. Nature of study space

Library

1

Private

1

Sharing

1

Common

1

Other

1

SECTION B

FACTORS AFFECTING ONLINE LEARNING RETENTION OF UNIVERSITY STUDENTS WITH LEARNING DISABILITIES

Select your level of agreement with the statements relating to the factors affecting your learning using the scale provided.

Use the following rating scale:	1 Strongly disagree	2 Disagree	3 Neither agree nor disagree	4 Agree	5 Strongly agree				
					1	2	3	4	5
SOCIAL AND FAMILY FACTORS									
1	I dependent on my family for online learning financing								
2	I consider my family's income to be sufficient to cover fees								
3	My home is a quiet place do online work								
4	My parents earn regular monthly income								
5	My education is funded by a sponsor								
6	I have a single parent support for my education								
7	I am comfortable to sit for long hours learning								
8	I work closely with other family members for learning								
9	The facilities in place to support my disabilities								
10	It is easy to discuss my challenges with family								
11	I work closely with other students for online learning								
12	I have adequate hours of sleep/rest before learning								
MOTIVATIONAL FACTORS									
1	My interest in learning affects online learning.								
2	Online learning improves problem-solving skills								
3	I am driven by the desire to achieve success								
4	I am scoring good academic performance								

5	My home is safe and secure for learning					
6	The standard of module work possesses is challenging					
7	I have reliable study groups that supporting learning					
8	The standard of assessment is fair and transparent					
9	Career opportunities drive my performance					
10	High achievement is rewarding to students					
11	I have confidence in learning content in my modules					
12	Competition improves student performance					
	TECHNOLOGICAL CONSTRAINTS & DIGITAL NATIVES					
1	I use digital technology with latest software's					
2	I am capable of effectively using digital technology					
3	There is limited network interruptions during online classes					
4	Data bundles are expensive for online classes					
5	Digital technology use affects students' academic performance					
6	Technology belongs to generation born between 1980 and 2000					
7	I appreciate different digital instructional methods					
8	Digital technology is a useful tool for effective online learning					
9	The quality of digital technology learning work is high					
10	Online learning offers convenience to students					
11	I use technology that is programme relevant for learning					
12	Online learning technology is affordable for students					
	LECTURER STUDENT UNDERSTANDING					
1	I receive effective online teaching from lecturers					
2	I am fairly treated by lecturers during classes					
3	The lecturers consider our learning disabilities					
4	The lecturers provide adequate learning materials					
5	The feedback on assessment is timeously provided					
6	The lecturers demonstrate encouraging behaviours for students					
7	The lecturers vary the teaching methods					
8	The module content is well structure by lecturers					
9	Individual attention is provided to individual students					
10	Most lectures delivered online are learner-centred					

11	Learning provides relevant practical exposure					
12	Open communication provides better learning					
FACULTY AFFLUENCE IN USING TECHNOLOGY						
1	There are adequate IT specialists to address technical clutches					
2	IT specialists generate useful instructional designs for e-learning					
3	ICT infrastructure for e-learning is sufficient					
4	There is easy interaction between students and lecturers					
5	The quality of e-earning and teaching is high					
6	New digital savvy students are attracted to the faculty					
7	The maintenance of digital technology is sufficient					
8	Back-up energy is available to support the use of technology					
9	Learning is affected by the national grid load shedding					
10	The implementation of e-learning business strategy					
11	Faculty policy on the use of digital technology is available					
12	There are adequate digital technology resources for the faculty					
INSTITUTIONAL CAPACITY TO TRAIN STAFF						
1	There is sufficient staff to support students doing online learning					
2	Staff always provide useful online learning services					
3	Staff receive in-service training when new IT systems are introduced					
4	Staff have competent technological skills to solve e-learning problems					
5	Lecturers perform multiple roles that require competent IT skills					
6	Online facilitators understand their roles and responsibilities					
7	Lecturers receive essential support from competent technicians					
8	Lecturers have online facilitation competencies					
9	Professional development chances are delivered via online methods					
10	Staff provide peer support to others for new digital methods					
11	Lecturers are well qualified to deliver online classes					
12	Negligible glitches when e-learning is executed					

THANK YOU FOR COMPLETING THE SURVEY!!

