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Virtual Teaching and Online Learning Ecosystem: Harnessing the Power of Digital Education for Equitable Educational Experiences

A Thesis Submitted By
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A thesis submitted to the Faculty of Humanities, University of the Witwatersrand, Johannesburg, in fulfilment of the requirements for the degree of Doctor of Philosophy.

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Faculty of Humanities
School of Education
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Abstract

Virtual teaching and online learning have gained momentum as a response to the pandemic, revealing its potential and piquing the attention of the higher education sector. Higher Education Institutions (HEIs) are now recognising the value of this mode of instructional delivery for its unique affordances beyond maintaining educational continuity, but also for its adoption during non-disruptive times. The use of virtual teaching and the advancement of technology have led HEIs to invest in virtual instructional delivery, extending learning opportunities beyond closed brick-and-mortar environments to open online education ecosystems. To provide students with ubiquitous and equitable access to education, there is a need to understand how we can harness the power of digital education in an online education ecosystem while addressing structural and systemic barriers for effective virtual teaching and online learning. This research study aims to gain this understanding and provide insights into the opportunities offered by virtual teaching and online learning in the context of digitalisation in South Africa, a developing country. Additionally, the research study presents a sustainable Virtual Teaching and Online Learning Ecosystem Framework (VTOLE-Framework) for HEI's, specifically tailored to South Africa's unique needs and challenges, with a focus on transforming digital education contributing to Sustainable Development Goals (SDGs) 4 (quality education) and 10 (reduced inequalities). Grounded in pragmatism, this mixed-methods study uses purposive sampling to gather data from 165 academic educators through an online questionnaire (containing both open-ended and closed-ended questions), supplemented by in-depth interviews with six academic educators across three HEIs (one urban, one rural, and one ODeL). Given its multifaceted nature, the research study draws on Socio-Technical Theory, Ecological Systems Theory, Transactional Distance Theory and the Community of Inquiry Framework to inform its analysis, which includes a thematic analysis of qualitative data and simple descriptive statistics and data visualisations for quantitative data. In responding to the research questions, the research study reveals six crucial aspects for facilitating equitable educational experiences in virtual teaching and online learning ecosystems (1) Harnessing the Power of Digital Education to Facilitate Virtual Teaching and Online Learning, (2) Core Elements Facilitating Virtual Teaching and Online Learning, (3) Optimising Virtual Teaching and Online Learning Environments Through Pedagogical and Student-Centred Design, (4) Higher Education Institutions Facilitating Support for Virtual Teaching and Online Learning, (5) Addressing External Macro Factors to Enhance Virtual Teaching and Online Learning Environments, and (6) Learning from the Past and Continuous

Advancements to Build the Future of Virtual Teaching and Online Learning. Furthermore, in the development of the VTOLE-Framework, the key findings identified seven themes (1) Pedagogical and Student-Centred Course Design, Structure and Technology Integration, (2) Dialogue, Social Presence and Collaborative-Cognitive Learning Environment, (3) Academic Educator Professional Development and Teaching Competencies, (4) Student Efficacy, Agency and Support Cultivation, (5) Institutional Structure, Resource Availability and Education Equity, (6) Contextual Realities of National Infrastructure Readiness and Political Climate, (7) Socio-economic and Socio-cultural Context. The research study adds to the existing knowledge in the field by offering perspectives into harnessing the power of digital education while tackling structural and systemic barriers for virtual teaching and online learning in South Africa. It offers a practical solution of a VTOLE-Framework, outlining equitable access and digital inclusion for the successful implementation of virtual teaching and online learning in higher education.

Keywords: Digital Education, Equitable Access, Virtual Teaching, Online Learning, Higher Education

Declaration

I declare that this thesis is my own, unaided work. It is being submitted for the Degree of Doctor of Philosophy at the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination at any other University.

Name of Candidate: Fatima Makda

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Date: 16 May 2025

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Academic Footprints

This section provides an overview of the author's scholarly contributions through peer-reviewed journal articles, book chapters, conference proceedings and conference presentations during her PhD journey. These publications represent her research interests and highlight her engagement with the academic community. They include both collaborative and independent work, reflecting the interdisciplinary nature of her research and its impact within the educational field.

Journal Articles

Published

Makda, F. (2025). Digital education: Mapping the landscape of virtual teaching in higher education–a bibliometric review. *Education and Information Technologies*, 30(2), 2547-2575.

Dlamini, R., & **Makda, F**. (2024). Sustainable interactive remote teaching and online learning: A reflexivity case study. *The Independent Journal of Teaching and Learning*, 19(2), 10-29.

Makda, F., & Dlamini, R. (2022). Assessing the Validity and Reliability of Quality Design Criterion Rubric to Evaluate Online Courses: A Case of Three Entrepreneurial Online Short Courses. *International Journal of Education and Development using Information and Communication Technology*, 18(2), 80-110.

In Press

Motheogane, M., Dlamini R., **Makda, F.**, Mesuwini, J. (in press). Equitable Education: Virtual Modes of Instructional Delivery. *South African Journal of Higher Education*.

Modise, MP., **Makda, F.** (in press). The Impact of External Markers' Qualifications for Assessment in Open Distance Education. *Journal of Learning for Development*.

Book Chapters

Dewa, A., & **Makda, F.** (2024). Digital Innovations: Individualization of Professional Education Through Phrónêsis in the TVET Landscape. *In Technical and Vocational Teaching in South Africa: Practice, Pedagogy and Digitalisation* (pp. 33-47). Cham: Springer Nature Switzerland.

Conference Proceedings

Jaffer, T., & **Makda, F.**, (2025). Exploring Assistive Technologies for Enhancing Classroom Inclusivity: A Systematic Review. In *INTED2025 Proceedings* (pp. 4171-4177). IATED.

Khunou, B., & **Makda, F.**, (2025). Exploring Culturally Responsive Teaching (CRT) in Digital Spaces: A Systematic Review. In *INTED2025 Proceedings* (pp. 4164-4170). IATED.

Makda, F., & Dlamini, R. (2022, April). A Rubric: Indicators of Quality Design for Online Courses. *In Society for Information Technology & Teacher Education International Conference* (pp. 211-218). Association for the Advancement of Computing in Education (AACE).

Conference Attendance and Presentations

2025 | INTED:19th International Technology, Education and Development Conference | Valencia, Spain (Virtual)

2024 | ICTVET: Advancing TVET for Digitalized World, Youth Skilling, Employability and Sustainable Development (National, Regional, Continental, and International) | Cape Town, South Africa

2024 | IFIP: Reshaping an Unequal World Through Social Justice and Digital Technologies | Cape Town, South Africa

2024 | Saera: Education Ideologies and National Development | Bloemfontein, South Africa

2023 | Saera: Education(al) Foundations, Education(al) Futures | East London, South Africa

2023 | Open Distance and eLearning: ODeL in the Global South: Opportunities in times of volatility, uncertainty, complexity, and ambiguity (VUCA) | Johannesburg, South Africa

2022 | Saera: Education in Transition: Challenges and Opportunities | Cape Town, South Africa

2021 | Saera: Education for Inclusivity and Sustainability in Times of Increasing Inequalities | Johannesburg, South Africa

Abbreviations

4IR	Fourth Industrial Revolution
AR	Augmented Reality
CoI	Community of Inquiry
CPD	Continuous professional development
DLE	Digital Learning Ecosystem
EST	Ecological Systems Theory
HE	Higher Education
HEI	Higher Education Institution
ICT	Information and Communications Technology
IT	Information Technology
KYS	Know Your Student
LMS	Learning Management System
MR	Mixed Reality
NDP	National Development Plan
ODeL	Open Distance and e-Learning
OERs	Open Education Resources
SAMR	Substitution, Augmentation, Modification and Redefinition
SAQA	South African Qualifications Authority
SDGs	Sustainable Development Goals
STS	Socio-Technical Systems Theory
TDT	Transactional Distance Theory
TPACK	Technological Knowledge, Pedagogical Knowledge, and Content Knowledge
UDL	Universal Design for Learning
VLE	Virtual Learning Environments
VR	Virtual Reality
VTOLE	Virtual Teaching and Online Learning Ecosystem

Definition of Terms

To ensure the precise comprehension throughout the presentation of the research study, the core definitions used within the study are as follows:

Academic Educators – academic teaching staff at higher education institutions, ranging from associate lecturers to professors.

Cognitive Presence – the extent to which students and academic educators, through sustained communication, construct meaning.

Community of Inquiry – a theoretical framework that describes how learning occurs through a collaborative and interactive process. It encourages collaborative learning in a group setting where students engage in meaningful discussions and critical thinking to construct their understanding of a topic while also confirming their shared comprehension with peers under the guidance and support of an academic educator.

Dialogue – academic educators provide instruction, but also encourage students to ask questions, share their thoughts, and participate in the learning process.

Digital Education – the integration of digital technologies, digital pedagogies and resources to create engaging and effective learning experiences.

Digital Inclusion – ensuring everyone has equal access to digital technologies and access to the knowledge and skills to use them effectively.

Digital Learning Ecosystem – an interconnected network of technologies, stakeholders, practices, and social aspects of learning, working synergistically to create a cohesive and supportive educational environment.

Digital Technologies – tools, systems, and devices that can generate, create, store, or process data, and are specifically used to support the transformation of traditional learning experiences into online environments.

Digital Pedagogies – the method and practice of how to effectively use digital technologies in teaching and learning.

Ecological Systems Theory – a theory that examines how students develop within a network of interconnected environments, from immediate settings to broader social and cultural contexts.

Equitable Access – providing all students with the necessary resources, support and educational opportunities they need to succeed, regardless of their background and circumstances.

Extrinsic Factors – external influences that originate outside of the students, academic educators and higher education institutions that they do not directly influence or control.

Intrinsic Factors – internal influences that originate from the students, academic educators and higher education institutions that they directly influence or control.

Learning Management System – a software application with the ability to streamline various learning management tasks and facilitate the design and delivery of online courses and online learning experiences.

Learning Theories – offer insights into the methods behind knowledge acquisition, information processing, and memory consolidation in students.

Online Learning – a mode of learning that occurs through the internet, often accessed through a web-based application or learning management system.

Social Presence – a sense of community and connection that students feel with each other, impacting their ability to learn and communicate openly and effectively.

Socio-Technical Systems Theory – a theory that emphasises the organisation's function through the interconnectedness of social subsystems (people, culture, processes) and technical subsystems (tools, technologies, infrastructure).

Structure – the level of flexibility in a programme's educational objectives (what students are expected to learn), teaching strategies (how students learn), and the evaluation methods (how student learning is assessed) and how they can be tailored to students' needs or progress.

Student Autonomy – students taking ownership of their learning through the development of independent learning skills, including self-directedness and self-regulation.

Student Self-efficacy – students' ability to control their thoughts, actions, and how they navigate their surroundings.

Teaching Presence – academic educators' ability to design cognitive and engaging learning activities, facilitate discussions that encourage critical thinking, and guide students towards achieving personal, meaningful and educationally valuable learning goals.

Theoretical Framework – helps to build a strong foundation for the research by providing a set of established ideas (concepts and propositions) and definitions of relevant terms, allowing the researcher to analyse virtual teaching and online learning in a structured and comprehensive way.

Transactional Distance – the psychological or communicative space that separates the academic educator from the student in the transaction between them, occurring in the structured or planned learning situation.

Virtual Teaching – a mode of instructional delivery which involves virtual interaction through a video conferencing tool between academic educators and students through lectures, tutorials, seminars, or other forms of required sessions.

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1. Chapter 1: Introduction

This section introduces the details of the entire research study titled: *Virtual Teaching and Online Learning Ecosystem: Harnessing the Power of Digital Education for Equitable Educational Experiences*. The foundational elements of the research study are outlined here. Central to this introductory chapter are a brief background, the outlining of the context, the research problem, the aim of the study, the research questions that guide the study, the objectives, and its ensuing significance, thereby contextualising the overarching purpose of the research study within the existing scholarly discourse. Additionally, this chapter presents the methodological underpinnings, describes the underlying assumptions shaping the research study's parameters, and acknowledges its limitations. Finally, this introductory chapter serves as a guide as it outlines the scope of the subsequent chapters of the entire research study.

1.1. Background

Over the last decade, higher education institutions (HEIs) have invested in digital and virtual education to expand learning opportunities beyond the 'brick and mortar' classroom (Goralski & Falk, 2017; Makda 2024). Such investments and the proliferation of digital solutions in the higher education sector are not without controversy, including resistance from academic educators who must adjust their professional practices, the formidable issue of the digital divide, the lack of infrastructure, and the disparities in technology access hindering the equitable participation of students from diverse socio-economic backgrounds (Adam et al., 2019). However, the increased recognition of digital education is indicative that the higher education sector is making every effort to keep up with the educational needs of students to bridge content knowledge gaps and design ubiquitous learning environments for digital inclusion. Enriching the educational experience for students enables higher education to be more accessible and allows students to develop knowledge and capabilities to address needs and contribute to social development and economic growth (World Bank, 2018).

As we look back at the occurrences during the years 2020 to 2023, we find ourselves reflecting and remembering the lessons learnt during the pandemic, post-pandemic, and the tentative steps towards a renewed educational era. While the pandemic period presented a series of unique challenges, it also served as a powerful ordeal, forming valuable lessons and prompting significant introspection within the education sector and academic community (Zhao, 2020). The pandemic initially plunged most of us into the unfamiliar territory of virtual teaching,

demanding an unprecedented level of resilience and adaptability from students and academic educators (Bozkurt et al., 2020). While this period necessitated the development of self-reliance and digital fluency, it also highlighted the crude realities of the digital divide, where unequal access to technology and resources exacerbated existing educational disparities (Bozkurt et al., 2020; Woldegiorgis, 2022). Still, the virtual environment facilitated the continuation of instructional delivery beyond the confinement of the physical classroom, exposing us to diverse perspectives and enriching learning experiences using learning management systems (LMS) and collaborative online platforms (Demmans, 2020).

Virtual teaching and online learning afforded multimodal interactive lessons using online resources catering to diverse learning styles, while collaborative platforms advanced connections and encouraged the exchange of ideas beyond four walls (Jeong & Hmelo-Silver, 2016). Data-driven insights gathered from digital assessments on the LMS empowered academic educators to modify instruction and provide targeted support, affording personalised learning experiences (Arthars et al., 2019; Liu et al., 2017). These experiences acted as a catalyst for change within the educational space. It forced us to confront existing inequalities, adapt to unforeseen circumstances, and re-evaluate the role of virtual teaching in the learning process (Woldegiorgis, 2022). The lessons learnt from virtual teaching and online learning throughout the pandemic era remain engraved in our collective consciousness.

Looking toward the future, it is imperative to acknowledge that digital education and virtual teaching are no longer a mere novelty; it has become an indispensable tool within the pedagogical delivery of instruction (Makda, 2024). Moving ahead, the challenge lies in designing a virtual teaching and online learning framework that balances using technological advancements at our disposal with the consideration of creating accessible and equitable educational experiences for our students. Harnessing the affordances of digital technologies and digital pedagogies while addressing structural and systemic barriers effectively can assist in developing a teaching and learning environment where digital technologies seamlessly augment instruction, encouraging participation and active engagement from students and improving the instructional delivery for equitable education.

Now is a period of reflection, transition, unlearning and relearning (Rupčić, 2024). By leveraging digital education and the lessons learnt from the pandemic period, we can collectively work towards transforming the higher education sector by building an equitable online education ecosystem incorporating virtual teaching and online learning that improves

the delivery of subject content and equips all students with the knowledge, skills, and adaptability needed allowing students to thrive in the contemporary world.

1.2. Context of the Study

A multitude of formidable challenges plague the South African higher education system, casting a long shadow on reducing inequalities and providing equitable access to quality education. While traditional on-campus models have nurtured generations, their rigid frameworks crack under the weight of contemporary pressures. Geographic barriers, socio-economic disparities, and physical limitations restrict knowledge pursuit for countless individuals (Ananga & Biney, 2017), infringing social inclusion. Furthermore, there is an increase in the frequency of student unrest, pandemics, warfare, political instability, climate change, and natural disasters with consequences that vary in their duration, scale, and repercussions (Bartusevičienė et al., 2021). These complex challenges are further compounded by South Africa's resource-intensive infrastructure and higher education funding scarcity, placing strain on contact higher education institutions as student populations surge and educational aspirations diversify (Adeniyi et al., 2024).

Within the walls of HEIs, standardised pedagogy often falters in the face of diverse learning styles and contemporary demands. One-size-fits-all approaches struggle to keep pace with the 21st century's dynamic needs (Luna, 2015; Singh et al., 2023). Passive learning environments, static curricula, and limited opportunities for active engagement hinder student participation, impede effective knowledge transfer, and leave many students grappling with incomplete understanding (Afshari, 2021; Hao et al., 2021). Traditional teaching methods, designed for physical classrooms, fail to translate seamlessly to the digital domain (Ushakov et al., 2021).

In the face of these challenges, a transformative solution demands attention – a virtual teaching and online learning framework. This offers a range of new opportunities to break down existing barriers to human development, social exclusion and help achieve the Sustainable Development Goals (SDGs) 4 and 10, which focus on quality education and reducing inequalities, respectively. Embracing virtual teaching and online learning signifies a promising path toward sustainable education (Khandelwal & Shankar, 2022) by harnessing the power of digital education and innovative practices to break down barriers, democratise knowledge, and provide transformative, accessible educational experiences. Thus, moving beyond geographical constraints, financial burdens and granting equitable access to quality education for all. This framework's transformative potential extends beyond access, providing a dynamic

teaching and learning environment that cultivates lifelong learners and bridges the gap between traditional pedagogy and the demands of contemporary society. Contemporary society increasingly revolves around digital domains, demanding alignment from the higher education system. Flexible and resilient education models are no longer a luxury but a necessity (Ali, 2020; Dhawan, 2020).

1.3. Problem Statement

The advancement of technology and the use of virtual teaching and online learning ecologies to ensure educational continuity during times of disruptions have led higher education institutions (HEIs) to invest in virtual instructional delivery even in times of non-disruption, extending opportunities beyond the traditional 'brick and mortar' monopoly. Traditional instructional delivery of higher education often struggles to adapt to the evolving needs of students in a rapidly changing world (Mhlongo et al., 2023). The demand for flexible, accessible, and engaging educational experiences has intensified, particularly with the rise of digital education, digital technologies, and diverse student demographics. Digital education, virtual teaching and online learning can bridge this gap and address South Africa's current brick-and-mortar infrastructure-related challenges and educational access limitations. Despite this, there is still a need to understand how we can harness the affordances of digital technologies and digital pedagogies for digital education while addressing structural and systemic barriers for effective virtual teaching and online learning to provide students with ubiquitous access to equitable education. While online learning platforms present undeniable opportunities, current online learning approaches, despite offering opportunities, often lack a holistic view, hampering the realisation of the full potential of virtual teaching environments. They neglect crucial consideration of factors on access, culturally responsive pedagogical course design, effective evaluation practices, the development of interactive and collaborative learning environments, institutional support for diverse students and the needs of academic educators. Existing virtual teaching and online learning frameworks tend to focus on isolated aspects, failing to consider the intricate interplay between these elements and the broader institutional context. This is further exacerbated by a lack of consideration of the socio-economic context, systemic barriers and technological disparities that limit access for certain student demographics in South Africa.

The central problem lies in the absence of a comprehensive virtual teaching and online learning framework that bridges the gap between traditional pedagogy and the unique demands of the

online environment while considering the existence of systemic barriers and contextual realities of South Africa. While research abounds on digital education and virtual teaching, frameworks specifically for the South African context remain scarce, despite the ongoing digital transformation and emphasis on virtual modalities (Mays, 2022). Consequently, online learning experiences suffer from reduced student engagement, limited interaction, and shallow knowledge acquisition. This not only diminishes the potential of online learning but also exacerbates existing inequalities by failing to cater to diverse learning styles and socio-economic needs of students, leading to further social exclusion. It is essential to understand the relationship between virtual teaching and online learning for both equality and equity. As HEIs leverage digital education and integrate virtual teaching, the need for a comprehensive framework to guide, support, and sustain these initiatives becomes more critical than ever. The absence of a cohesive and adaptable virtual teaching and online learning framework presents a multitude of challenges for higher education institutions and their stakeholders, hindering sustainable implementation and impacting students' educational experiences. Thus, the urgent need arises to design and institutionalise an adaptive and sustainable virtual teaching and online learning framework that aligns with institutional goals and stakeholders' needs. This framework needs to facilitate equitable, accessible and high-quality transformative educational experiences in the contemporary digital age. A well-researched and adequately designed virtual teaching and online learning framework can act as a stepping stone for the digital transformation of education in South Africa.

This research study addresses this critical gap by exploring how the power of digital education can be harnessed to improve virtual teaching and online learning by developing a comprehensive virtual teaching and online learning framework for higher education within the South African context. This framework leverages insights from Socio Technical Theory (Davis et al., 2014), the Ecological Framework (Bronfenbrenner, 1979), the Theory of Transactional Distance (Moore, 1997) and the Community of Inquiry framework (Garrison et al., 2000), with careful consideration of structural factors, systemic barriers and the contextual realities of South Africa. The aim is to develop a framework that creates a virtual teaching and online learning equitable educational experience.

The researcher explores how the South African higher education system can harness the power of digital education to improve instructional delivery and provide equitable and sustainable access to education through virtual teaching and online learning. This research study ambitiously tackles higher educational inequality in South Africa by exploring how digital

education and virtual teaching can improve equitable access to quality education. Recognising limitations of existing models that do not consider South Africa's unique context, the research study prioritises digital equity to ensure the developed framework is relevant. The research study explores current academic educator practices and develops approaches for integrating digital technologies into online education systems with existing inequalities. The successful development of such a framework holds the potential to significantly transform the higher education sector. It can assist in democratising access to quality education, cater to diverse students' needs, and cultivate deeper learning, collaboration, and critical thinking skills in students. This research study, therefore, carries profound implications for the future of higher education, from leveraging the power of digital education to creating transformative educational experiences. The research study explores the complex interplay of factors that contribute to effective virtual teaching and online learning, ultimately aiming to transform the higher education sector toward a more equitable, inclusive and impactful future for all students.

1.4. Aim of the Study

The South African education system, deeply marked by the legacy of apartheid, continues to grapple with systemic inequalities that hinder equitable access to quality education. The post-apartheid era has witnessed significant efforts to transform the education space, addressing disparities in all their forms. However, as education advances into the digital age, new challenges and opportunities arise. The emergence of virtual teaching and online learning presents a potential avenue for broadening access to education and mitigating historical inequalities. By exploring the potential of digital education in South Africa, this research study has two main aims.

The first is to explore how the power of digital education can be strategically harnessed to enable virtual teaching and online learning specifically focused on creating a transformative educational experience by reducing the gap of transactional distance, enhancing student autonomy and knowledge acquisition while considering structural factors, systemic barriers and the contextual realities in South African higher education. Addressing the limitations of traditional pedagogy and brick-and-mortar resource constraints, this research study investigates the potential of virtual teaching and online learning to improve equitable access to education and optimise knowledge transfer within the virtual learning environment for transformative equitable educational experiences. Considering the intricate interplay of contextual, social, economic, technical, cultural and institutional factors influencing virtual teaching and online

learning adoption and implementation, this research study explores and analyses these diverse influences at a microsystem, mesosystem, exosystem, macrosystem and chronosystem level. This contributes to a deeper understanding of how digital education, virtual teaching and online learning can be leveraged to enhance educational opportunities, particularly for marginalised communities. Through this, the research study secondly aims to develop a sustainable and adaptable Virtual Teaching and Online Learning Ecosystem Framework (VTOLE-Framework) specifically tailored to South Africa's unique needs and challenges. This framework acts as a stepping stone for higher education institutions to overcome barriers, democratise knowledge, and provide equitable learning opportunities for all students.

Through this comprehensive exploration, the research study makes the following contributions:

- Provide insights into harnessing the power of digital education for virtual teaching and online learning.
- Offer perspectives on virtual teaching adoption, integration and implementation.
- Investigate intrinsic and extrinsic factors for virtual teaching and online learning success.
- Explore systemic barriers impeding digital inclusion and equitable access to virtual teaching and online learning in higher education.
- Contribute to the body of knowledge for virtual teaching, online learning, and equitable and sustainable education.
- Design and develop a transformative and sustainable VTOLE-Framework.

Overall, this research study seeks to understand the interrelationship between the social and technical aspects under multiple levels of influence to bridge the gap of transactional distance. By doing so, it intends to create a transformative virtual educational experience that meets the demands of contemporary society, empowering South African HEIs to embrace virtual teaching and online learning as a foundation for equitable, accessible, quality, and sustainable education for all.

1.5. Research Questions

The following research questions guide the study:

1. How can digital education be harnessed to enhance virtual teaching and online learning across diverse student populations?
2. What factors should be considered in the design and development of virtual teaching and online learning across multiple ecological environments?
    a. What intrinsic factors should be considered in designing and developing virtual teaching and online learning environments to optimise educational experiences?
    b. What extrinsic factors and systemic barriers must be addressed to implement effective and equitable virtual teaching and online learning?

1.6. Objectives of the Study

The objectives of the research study are to:

1. Describe how digital education can be harnessed to facilitate virtual teaching and online learning for diverse student populations,
2. Identify and analyse the critical factors influencing the design and development of effective virtual teaching and online learning environments across multiple ecological environments,
3. Determine the intrinsic factors that can provide and optimise educational experiences in virtual teaching and online learning ecosystems, and
4. Determine the extrinsic factors and explore the systemic barriers impeding digital inclusion and equitable access to virtual teaching and online learning ecosystems in higher education.

1.7. Significance of the Study

Within the area of higher education, where established theories, models, and frameworks grapple with issues of inequitable access, limited student educational experiences, and the increase in disruption to traditional teaching, this research study presents an impactful solution – a proposed Virtual Teaching and Online Learning Framework Ecosystem (VTOLE-Framework). The research study offers a theoretical exploration of a well-designed framework that considers the intricate interplay of contextual, social, economic, technical, cultural and institutional factors that influence successful virtual teaching and online learning adoption and

implementation. The framework is meticulously constructed to bridge geographical disparities, empower individuals, and tailor virtual learning experiences to the diverse needs and cultural backgrounds of South African students.

The VTOLE-Framework offers a set of actionable principles and practices that can be customised and adopted by academic educators and HEIs across South Africa. This scalability holds the potential to democratise knowledge, empower academic educators, and cultivate a generation of globally competitive students equipped with the skills and adaptability to thrive in the 21st century. But the impact extends beyond students; academic educators equipped with guidance become active agents in the virtual mode of instructional delivery. Their understanding of virtual teaching and online learning practices deepens, their teaching abilities increase, and ultimately, student learning outcomes increase. This ripple effect has the potential to revolutionise South African higher education, paving the way for a more accessible, equitable, and impactful learning environment for all students.

1.8. Theories and Philosophy Underpinning the Research

The research study is situated in the context of a collective exploration of a new online equitable education ecosystem. Education ecosystems are multifaceted and can be complex with a variety of tools, information and communications technology (ICT), academic educators, students, learning environments, resources, institutions and the interconnected relationships among these diverse components (Andriushchenko et al., 2020). Consequently, a strong foundation is essential for the design and development of an effective virtual teaching and online learning framework.

Numerous established theories, models, and frameworks are available within the scholarly discourse. This research study specifically employs Socio Technical Theory (Davis et al., 2014), the Ecological Framework (Bronfenbrenner, 1979), the Theory of Transactional Distance (Moore, 1997) and the Community of Inquiry framework (Garrison et al., 2000). These selections are described and substantiated further with their impact on the development of a theoretical framework in Chapter 2, the Literature Review.

Various research philosophies are prevalent within the scholarly space. A research philosophy serves to provide context that guides the execution of research grounded in perspectives concerning the nature of reality and knowledge (Collis & Hussey, 2014). It encapsulates beliefs and assumptions on the generation of knowledge and delineates the methodologies for data

collection, analysis, and utilisation. The predominant research philosophies encompass (1) positivism, (2) realism, (3) interpretivism, (4) postmodernism, and (5) pragmatism (Saunders et al., 2009).

The research study is grounded in pragmatism as it aims to investigate and explore the perspectives of a cohort of academic educators and their social roles within the intricate dynamics of an online education ecosystem, particularly focusing on virtual teaching and online learning. A mixed method is used with a predominant qualitative approach complemented by subordinate quantitative techniques. Further elaboration on these aspects is provided in Chapter 3, Research Design and Methodology.

1.9. Assumptions and Limitations

While the Virtual Teaching and Online Learning Ecosystem Framework (VTOLE-Framework) strives to provide consideration of equitable access to quality education through virtual teaching and online learning, critical assumptions necessitate careful consideration. The assumption of ubiquitous internet access and reliable technology overlooks potential disparities in South African infrastructure and some student contexts. Similarly, expecting universal digital literacy, technical literacy and standardised technology across institutions could underestimate digital divides and diverse platform compatibility. Access to conducive study spaces and resources might also be uneven, further impacting student success. While digital technologies hold potential, their appeal should not obscure the need for a harmonious balance between technology, pedagogical practice and instructional delivery. Furthermore, academic educator readiness and enthusiasm for virtual teaching and online learning might mask the need for tailored professional development, training and support. Strong institutional commitment and leadership support are crucial, but potential resistance should be acknowledged. Finally, aligning virtual teaching and online learning practices with existing frameworks requires careful examination to ensure effective online learning without compromising academic rigour.

1.10. Chapter Summary

The first chapter presented the foundation of the research study by introducing the topic at hand. This introduction encompassed a multifaceted approach, offering a comprehensive overview of the research related to virtual teaching and online learning. Within this first chapter, the context of the research study was presented, establishing the pressing research problem. Subsequently, the chapter presented the research questions and specific objectives

that guide the research study. Recognising the potential impact of this research, the chapter further expanded upon the significance of the study, highlighting its anticipated contributions. To provide a theoretical foundation, the chapter looked at the relevant theories and philosophical underpinnings that inform the research design. The chapter then acknowledged the inherent assumptions and limitations, providing transparency and paving the way for a critical understanding of the development of the research study. Finally, an overview of subsequent chapters is provided.

1.11. Overview of the Study

Chapter one introduced the topic, providing a general overview of the research study. It outlined the context of the study, the research problem, the aim, the research questions, the objectives, the purpose, and the significance of the study, the theories and philosophy underpinning the research, the assumptions, and the limitations of the study.

Chapter two provides a review of the literature laying the groundwork for synthesising insights through a comprehensive exploration of a theoretical framework and discussion of the key themes and components that underpin the understanding of harnessing digital education for virtual teaching and online learning as well as contribute towards the design and development of a virtual teaching and online learning framework.

Chapter three presents the research design and methodology used in the research study. This chapter provides the information pertaining to the research design, research instruments, the procedures for data collection and data analysis, discusses the trustworthiness, validity and reliability of the research instruments and the proposed framework, the pre and pilot testing, any limitations that may exist, and the ethical considerations.

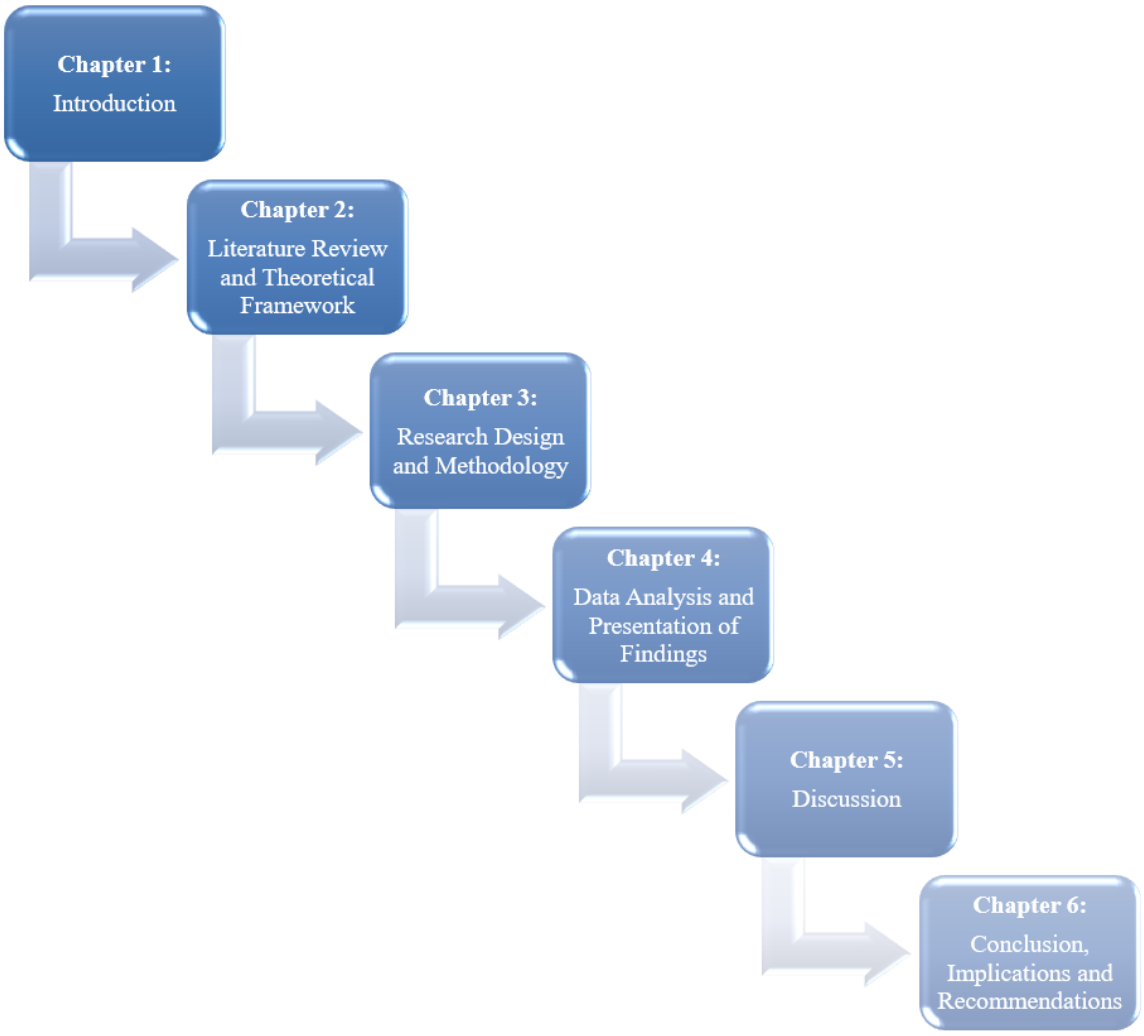
Chapter four comprises a presentation of the data analysis, the main findings, and an interpretation of the data collected to explore how the power of digital education can be harnessed to enable virtual teaching and online learning and for the design and development of the virtual teaching and online learning framework. Descriptions and implications of the research findings are also presented.

Chapter five provides an in-depth discussion of the findings, connecting them to existing knowledge found in the literature review. A summary of the key results and discussions of how they fit into the virtual teaching and online learning framework is provided.

Chapter six concludes the research study by providing an overview of the study, responding to the research questions, offering recommendations, discussing the implications and contributions for research and practice and providing suggestions for future research.

Figure 1 provides a graphical representation of the overview of the research study.

Figure 1: Overview of the Study



2. Chapter 2: Literature Review and Theoretical Framework

2.1. Chapter Overview

The literature review lays the groundwork for synthesising insights through a comprehensive exploration of the theoretical framework and discussion of the key themes and factors that underpin the harnessing of digital education to design and develop a Virtual Teaching and Online Learning Ecosystem Framework (VTOLE-Framework) for equitable and transformative educational experiences. This chapter begins with the background of the research study focusing on digital education inherent in virtual teaching and online learning. This is followed by an overarching aim of developing a comprehensive theoretical framework, emphasising the role of four fundamental theoretical foundations; Socio Technical Theory (Davis et al., 2014), the Ecological Framework (Bronfenbrenner, 1979), the Theory of Transactional Distance (Moore, 1997) and the Community of Inquiry Framework (Garrison et al., 2000). Thereafter, a strategic approach of using bibliometric analysis techniques and the literature is reviewed to identify relevant key authors and scholarly publications that align with establishing a foundation for the in-depth review and discussion of various themes essential to understanding the intricacies of virtual teaching and online learning. Attention is directed to an array of factors and themes across a microsystem, mesosystem, exosystem, macrosystem, and chronosystem level relating to digital education, virtual teaching and online ecosystems. The comprehensive analysis undertaken in this literature review not only situates the research study within the broader academic discourse but also contributes to the ongoing dialogue on effective virtual teaching and online learning.

2.2. Definition of Topic and Background Discussion

The rapid digitalisation of education has significantly transformed teaching and learning processes over the past decade. This transformation has been driven by the proliferation of digital technologies, necessitating higher education institutions to adopt more flexible and adaptable approaches to keep pace with technological advancements (Bozkurt et al., 2020; Martin et al., 2020). Traditional teaching methods, once sufficient, are increasingly inadequate in addressing the diverse ways students communicate and learn in a digitally integrated world (Bozkurt et al., 2020; Prensky, 2004). Thus, a shift towards a modernised mode of instructional delivery, which embraces digital education, is crucial for sustainable education in contemporary society (Alenezi et al., 2023).

As defined by Hajam et al. (2021) “Digital education is the key to harness vast potential enabled by ICT revolution to augment teaching-learning process and to increase range, scope and quality of education services. By enabling open access to remote resources, knowledge sharing, easy online certification and degree programmes, skill development initiatives and any-where, any-time, any-pace mechanisms for attending classes; digital education has revolutionized global education paradigm.” In simple words, digital education refers to the innovative application of technology in teaching and learning. It encompasses innovative use of digital tools and technologies to design curriculum and engage students, enabling flexible, any-time, any-place learning (Alenezi et al., 2023; Amiti, 2020). Digital education considers the different theories that underpin the design of the curriculum. The use of digital technologies and digital pedagogies enables academic educators to design engaging learning opportunities for their students in the subjects and courses that they teach.

Digital education leverages technology to create engaging and interactive learning experiences. The integration of digital tools has transformed traditional teaching methods, enabling students to access knowledge anytime and anywhere. This shift has distorted the lines between formal and informal learning, empowering students to take control of their education. While digital technologies offer immense potential, careful consideration is needed to understand their impact on student learning and to maximise their benefits (Alenezi et al., 2023). The paradigm shift towards digital education reflects a broader rethinking of educational methodologies, incorporating digital technologies to enhance learning experiences. This approach not only supports diverse learning styles and needs but also addresses the growing demand for accessible and inclusive education (Alenezi et al., 2023; Basham et al., 2020). The integration of digital technologies into educational practices has led to a reimagining of traditional roles, pedagogies, and student-academic educator interactions, thereby transforming the global education paradigm.

Virtual teaching and online learning is a concept of digital education, encompassing the use of digital platforms and tools for instructional delivery and learning engagement (Alenezi et al., 2023). Virtual teaching involves academic educators delivering lessons virtually, using virtual classrooms and video conferencing platforms to facilitate real-time interaction (Al-Samarraie, 2019). Online learning, meanwhile, encompasses a variety of activities, including self-paced courses, interactive modules, and digital resources accessible through e-learning platforms and educational websites (Ally, 2004; Anderson, 2004b). These modalities offer significant advantages in terms of flexibility, accessibility, and scalability, making education more

inclusive for geographically dispersed and diverse student populations. In South Africa, for example, the implementation of virtual teaching and online learning is crucial in addressing educational disparities and promoting digital inclusion. However, the success of these educational strategies depends on a well-designed virtual education ecosystem that supports both synchronous and asynchronous learning. The use of virtual teaching and online learning enables academic educators to design accessible and engaging learning opportunities for their students in the subjects and courses that they teach (Bozkurt et al., 2020). Learning opportunities which are versatile, cost-efficient, and geographically accessible, that can accommodate diverse learning styles and student educational needs, are necessary for higher education in South Africa (Makumbe, 2020; Singh et al., 2023). This type of learning experience highlights the need for digital transformation in higher education through a new virtual education ecosystem. Education ecosystems are grounded by a variety of components like people, content, systems, and other resources that rely on interconnectivity across time and space. Presently, the concept of learning that is customised to the individual needs of students, allowing access to education beyond time and space, is increasingly acknowledged as a significant approach to teaching and education (UNESCO, 2023).

A digital learning ecosystem represents an integrated framework that combines technology, pedagogy, and the social context to create effective and equitable learning environments (Tammets et al., 2022). This ecosystem is not merely about the availability of digital tools but also about their strategic integration to enhance educational outcomes. It includes a comprehensive array of digital tools, platforms, and methodologies that facilitate interactive learning experiences. Key factors in designing and developing such ecosystems include understanding intrinsic elements like the integration of digital technologies, digital content quality and pedagogical strategies that optimise educational experiences (Koehler & Mishra, 2009; Mishra & Koehler, 2006). Additionally, extrinsic factors such as technological infrastructure, policy frameworks, and socio-economic barriers must be addressed to ensure equitable access to these digital resources. Overcoming systemic barriers, such as the digital divide and lack of digital literacy, is essential for creating an inclusive and effective online education ecosystem (Redecker & Punie, 2017; Van Dijk, 2017).

In the context of this research study, a digital learning ecosystem encompasses virtual teaching and online learning as core components. It represents a broader framework that integrates technology, pedagogy, and the social context to create effective learning experiences. While virtual teaching and online learning focus on the delivery of instruction and content, the digital

learning ecosystem provides direction for the relationships and interplay of the supportive infrastructure and environment for these activities to thrive.

2.3. Theoretical Foundations

The research study focuses on how digital education can be used to facilitate virtual teaching and online learning by exploring intrinsic (internal) and extrinsic (external) factors to provide students with ubiquitous and equitable access to education. Given this intricate nature, the research study draws on theoretical foundations from Socio Technical Theory (Davis et al., 2014), the Ecological Framework (Bronfenbrenner, 1979), the Theory of Transactional Distance (Moore, 1997) and the Community of Inquiry Framework (Garrison et al., 2000) to develop a theoretical framework which is used as a lens throughout the study.

2.3.1. Socio-Technical Systems Theory

The Socio-Technical Systems Theory (STS), formulated by Trist and Bamforth (Trist & Bamforth, 1951; Trist, 1981), and Emery (Emery, 1980; Emery, 2016; Emery & Marek, 1962), is based on the concept of open systems, acknowledging that no two institutions are identical or face the same environmental challenges (Von Bertalanffy, 1950). At its core, STS posits that the design and performance of any organisational system can only be fully understood and improved when both social and technical aspects are integrated and treated as interdependent components of a complex system (Abbas & Michael, 2023). This framework explores how social and technical elements operate within a system, co-evolving and influencing each other, which leads to the development of new practices, structures, and outcomes. From a socio-technical system perspective, any organisation or its parts are composed of interacting sub-systems.

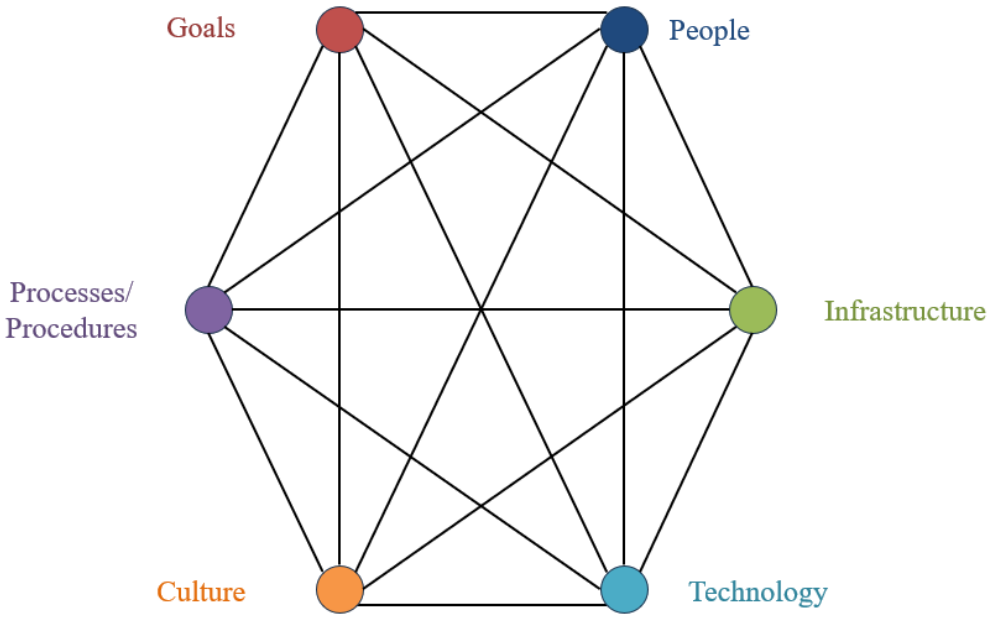
STS emphasises the interdependence of the social and technical aspects, meaning they mutually influence each other (Leavitt, 1965). Organisational change often fails because it focuses too much on one aspect, usually technology, and neglects the complex interdependencies that exist between the social and technical aspects. These social and technical elements are not independent but constantly interact and affect each other. STS provides insight into these complex interactions, moving beyond a simplistic view of technology as the sole driver of change in virtual teaching and online learning. It highlights how social factors can influence the effectiveness of technology and vice versa (Abbas & Michael, 2023). The technology system encompasses not only information technology but also the skills, knowledge,

procedures, and tools that individuals use to complete tasks. On the other hand, the social system includes relationships between individuals, communication and information flow, values, attitudes, and motivation. Therefore, any organisation comprises individuals with capabilities, working towards goals, following processes, using technology, operating within a physical infrastructure, and sharing cultural assumptions and norms (Abbas & Michael, 2023).

The research study draws from the work of Davis et al. (2014), whose socio-technical systems framework builds upon Leavitt's (1965) initial schema. Leavitt's (1965) work on organisational change introduced a framework emphasising the interconnectedness of people, tasks, structure, and technology (Davis et al., 2014; Leavitt, 1965). The framework proposes a holistic view of organisational systems, emphasising the interdependence and interaction among the key components (people, tasks, structures, technologies) and their external context. This approach aims to provide a comprehensive understanding of how organisations function and evolve, highlighting the need for integrated consideration of all system elements for effective management and strategic decision-making. This foundational model served as a precursor to Davis et al. (2014) socio-technical systems framework. Building on Leavitt's insights, Davis et al. (2014) expanded the model to incorporate six interdependent elements within an organisational context: people, processes and procedures, goals, culture, technology, and physical infrastructure (as cited in Challenger & Clegg, 2011).

While the fundamental philosophy has remained consistent, the specific principles and applications have evolved to align with contemporary work, technology, and design practices (Davis et al., 2014). Davis et al. (2014) have expanded Leavitt's framework through a combination of action research and retrospective case study analysis, resulting in a model that identifies six interrelated elements; (1) people, (2) infrastructure, (3) technology, (4) culture, (5) processes/procedures, and (6) goals within organisational systems. These elements are situated within and influenced by the macro-level environment. The central concept is that any complex organisational system can be depicted as a hexagon, as detailed in Challenger and Clegg's work from 2011. This is illustrated in Figure 2.

Figure 2: Socio-Technical Systems Perspective (Davis et al., 2016)



Based on the STS model by Davis et al. (2014), Table 1 outlines the components and their relevance to the research study.

Table 1: Components of STS by Davis et al. (2014) and Their Relevance to the Study

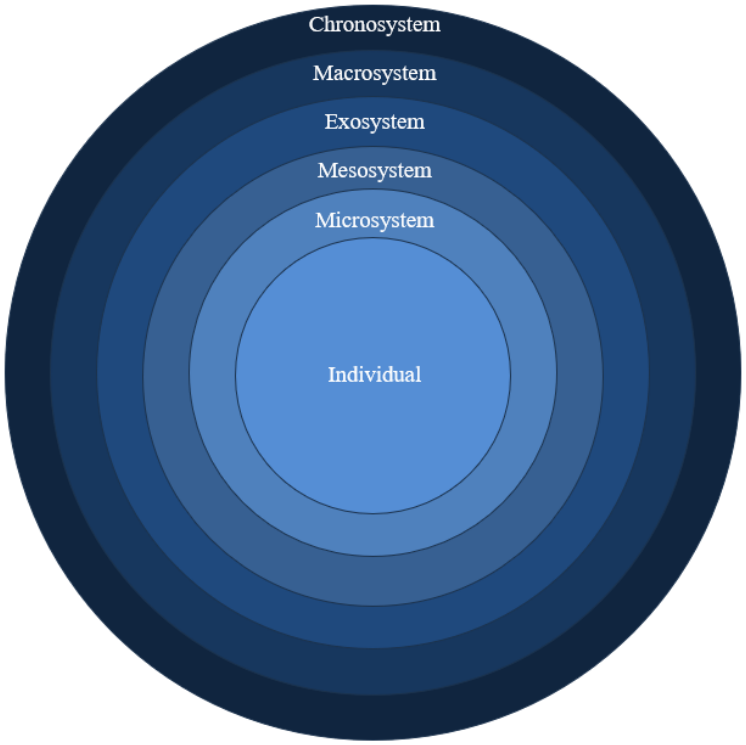
Component	Description	Application to Study
People	Represents all individuals involved in an organisational system, including employees, managers, and stakeholders. It encompasses their skills, knowledge, attitudes, behaviours, and social interactions. The focus is on how individuals contribute to and are affected by the system.	Includes students, academic educators, administrative staff, and technical support encompassing their skills, knowledge, attitudes, and interactions. In the context of this study, it involves considering competencies, diverse backgrounds, language barriers, and varying levels of digital literacy among students and academic educators.
Infrastructure	Refers to the physical and organisational structures and facilities needed for the operation of an organisation. This includes buildings, machinery, communication networks, and other physical assets that support an organisation's activities and processes.	Includes the digital technologies and resources needed for virtual teaching and online learning. This includes internet connectivity, hardware (such as laptops, computers and mobile devices), software platforms (such as learning management systems), and physical workspaces. In the context of this study, it also involves addressing the digital divide and ensuring equitable access to necessary resources for all students and academic educators.
Technology	Includes all the technological tools, systems, and software used within an organisation. Technology enables and supports the execution of tasks, the management of information, and the enhancement of productivity and efficiency.	Includes all digital technologies and online platforms used to deliver and support virtual teaching and online learning. It encompasses learning management systems and their affordances, communication and video conferencing tools, and software used for educational purposes. In the context of this study, the effectiveness of these technologies can be influenced by the availability and stability of internet services across different areas within South Africa.
Culture	Represents the shared beliefs, values, norms, and practices that shape an organisational environment. It influences how people interact,	Represents the shared values, beliefs, norms, and practices within the higher education institution and broader society. It includes attitudes towards

Component	Description	Application to Study
	make decisions, and approach their work. Organisational culture affects motivation, satisfaction, and overall performance.	online learning, openness to technological adoption, and the overall educational ethos. In the context of the study, consideration of cultural diversity and inclusivity in the virtual learning environment is needed.
Processes/ Procedures	Represents the formalised methods and sequences of actions required to accomplish specific tasks and objectives. This includes workflows, standard operating procedures, and organisational routines that ensure consistency, quality, and efficiency in operations.	Refers to the formalised methods and workflows for delivering virtual teaching and online learning. This includes the application of learning theories, digital pedagogies to course design and structure, content delivery, student assessment and feedback mechanisms, and administrative processes. Effective processes ensure quality and consistency in online learning experiences.
Goals	Refers to the objectives and desired outcomes that the organisation aims to achieve. These can be strategic, operational, or individual targets that guide decision-making and resource allocation. Clear goals provide direction and purpose, aligning the efforts of various components of the system.	Signifies the objectives and desired outcomes of virtual teaching and online learning. This includes academic goals such as student learning outcomes, knowledge acquisition, and skill development, as well as broader goals like educational continuity during times of disruption and increasing access to equitable education and promoting lifelong learning. In the context of this study, the goals focus on addressing historical inequalities, improving education quality, and preparing students to thrive in contemporary society.

2.3.2. Ecological Systems Theory

The Ecological Systems Theory (EST) was developed by Urie Bronfenbrenner in 1979. This theory posits that an individual's development is influenced by a series of interconnected environmental systems, ranging from immediate surroundings to broader societal structures (Bronfenbrenner, 1979). Bronfenbrenner believed that an individual's growth is shaped by everything in their environment and the social interactions within it. EST emphasises that individuals are moulded by their interactions with others and their contextual environment. The theory focuses on human development, viewing it as influenced by a series of interconnected systems. According to Bronfenbrenner (1979), an individual's development is shaped by a complex interplay of personal relationships and broader environmental factors, including cultural values, laws, and customs. To study an individual's development, it is essential to consider both the individual's immediate environment and the larger environmental context. EST highlights the interplay between individuals and their environments across five different levels: (1) the microsystem (individual level), (2) the mesosystem (interactions between different microsystems), (3) the exosystem (external environments indirectly affecting individuals), (4) the macrosystem (cultural context), and (5) the chronosystem (time context). This is illustrated in Figure 3.

Figure 3: Ecological Systems Theory (Bronfenbrenner, 1979)



Based on the EST by Bronfenbrenner (1979), Table 2 outlines the components and their relevance to the study.

Table 2: Components of EST by Bronfenbrenner (1979) and Their Relevance to the Study

Environment	Description	Application to Study
Microsystem	Represents the immediate environment in which an individual directly interacts. This includes family, school, peers, neighbours, and other immediate social settings. The individual influences and is influenced by their environment at this level.	Includes the immediate environments where students and academic educators directly interact. This also involves the technological tools and virtual teaching environments. The quality of these interactions, the availability of support, and the engagement within these immediate settings directly impact the students' learning experience.
Mesosystem	Encompasses the interactions between the different microsystems. It involves the relationships between various settings in which the individual actively participates.	Involves the interconnections between various microsystems. For instance, the online interactions with peers and online interactions with academic educators, the relationship between the workspace, resources and online learning environment. If students have access to the necessary resources, it positively impacts their online learning experience. Conversely, challenges such as a lack of internet access or a conducive learning environment can hinder their ability to engage effectively in the virtual and online learning space.
Exosystem	Refers to the broader social systems that indirectly influence an individual. These are external environments that the individual does not directly interact with but that still have an impact on their development. Changes or decisions made in these settings can affect the individual indirectly.	Refers to broader social structures that indirectly affect virtual teaching and online learning. This includes the availability and quality of internet infrastructure in different areas, educational policies set by institutions, and resources like libraries or institutional learning centres or internet cafes offering internet access. These factors can significantly influence the accessibility and quality of virtual teaching and online learning experiences.
Macrosystem	Encompasses the broader cultural, economic, and societal influences that shape an individual's development. This includes cultural values, laws,	Involves the broader cultural, economic, and societal contexts that shape virtual teaching and online learning. This includes national policies on education, cultural attitudes towards online learning, socio-economic disparities affecting access to

Environment	Description	Application to Study
	customs, and economic conditions. The macrosystem sets the overarching context within which the microsystem, mesosystem, and exosystem operate.	technology, and societal values regarding education. In South Africa, issues like digital inequality, economic challenges, and cultural diversity play a crucial role in shaping online learning.
Chronosystem	Signifies the dimension of time and how it influences development. This includes the timing of life events. The chronosystem highlights the evolving nature of the other systems over time.	Refers to the dimension of time, including the impact of historical events and transitions on online learning. This could include the ongoing effects of the pandemic, which has accelerated the adoption of virtual teaching and online learning, the current increase in the frequency of student unrest, pandemics, warfare, political instability, climate change, natural disasters and the long-term evolution of educational technology. It also encompasses individual life events, such as a student transitioning from secondary to tertiary education or changes in personal circumstances that affect their ability to participate in online learning.

The research study leverages EST by exploring the interconnected factors that influence the successful design, development, and implementation of virtual teaching and online learning within the area of higher education. Considerations of how individual characteristics, interpersonal relationships with academic educators and peers, engagement with the technological tool (LMS) and course, organisational structures, socio-economic disparities and structural and systemic factors shape the process of providing students with ubiquitous and equitable access to online education.

2.3.3. Transactional Distance Theory

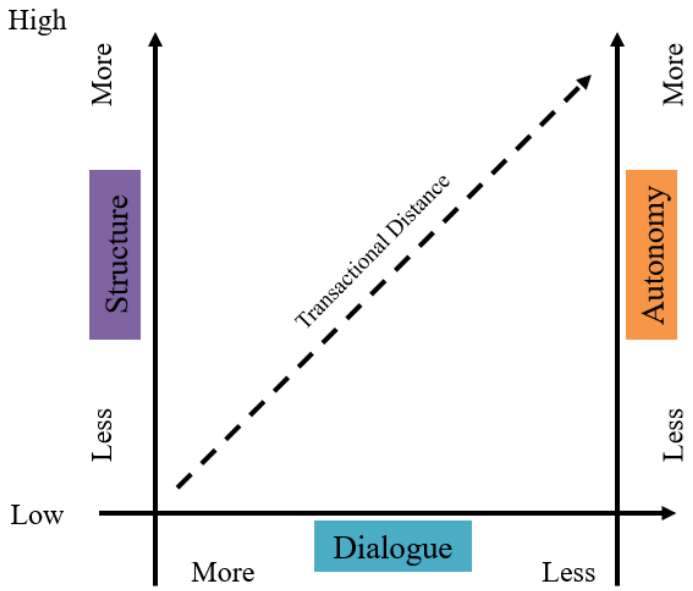
The Transactional Distance Theory (TDT), formulated by Michael G. Moore in the early 1970s, examines the dynamic relationship between students and academic educators in distance education, emphasising how the spatial separation influences the educational process (Moore, 1997). The theory is rooted in communication theory and distance education research, examining how course structure, interaction, and learner autonomy impact communication and learning effectiveness. TDT transcends mere physical distance, focusing on the psychological and communicative components that may constrain interaction and dialogue (Moore, 1973), increasing transactional distance and making students feel lonely, thereby influencing the outcomes of learning. Transactional distance can be defined as "A psychological and communication space to be crosses, a space of potential misunderstanding between the inputs of instructor and those of the learner" (Moore, 1991, p. 2). There are three main components that the TDT entails to overcome this inherent problem: (1) Dialogue, (2) Structure, and (3) Learner Autonomy (Moore, 1997).

Dialogue extends beyond mere communication, it encapsulates a reciprocal interchange of words, actions, ideas, inquiries, feedback and any other positive interactions between the academic educator and their students, as well as students and students that enable the students to learn (Moore, 1997). This is crucial in cultivating a sense of community and critical analytical skills. Structure pertains to the systematic design of a course and the organisation of learning resources, tasks, and anticipations outlined within the course that can accommodate students' individual needs (Moore, 1997). A clear structure affords direction in facilitating learner autonomy. Learner Autonomy and the control that students have promote students' active involvement and agency within the learning process (Moore, 1972). It signifies the student's capacity to determine the goals, self-direct their learning experiences and educational journey, manage time aspects, complete assessments, and exercise discretion within the confines of a course framework. This aids engagement levels and promotes an environment conducive to active learning (Moore, 1997).

TDT suggests that the three components of structure, dialogue and learner autonomy collectively determine the level of transactional distance in educational settings. The more structure and less dialogue that a course has leads to the increase in the transactional distance. This implies that the more structured a course is, the less communication is needed.

Consequently, when transactional distance increases, a higher autonomy is required from the student. On the other hand, if a course has less structure and more dialogue, then the transactional distance lessens, leading to the level of autonomy required by the student to decrease. High transactional distance is marked by restricted interaction, a fixed structure, and diminished learner autonomy, as seen in conventional self-paced learning with minimal academic educator engagement (Moore, 1997). In contrast, low transactional distance is evident in environments with regular interaction, adaptable structures, and elevated learner autonomy, such as interactive online courses featuring consistent communication and tailored feedback (Moore, 1997). This is illustrated in Figure 4, which demonstrates the components of TDT and their interrelationships.

Figure 4: Moore's (1997) Theory of Transactional Distance



In relation to the study, TDT is a classic and all-around theory of distance learning, as a relevant theoretical framework for distance teaching and learning. TDT is an educational theory that looks at the concepts of distance learning (Moore 1973; Moore 1997). The separation of the academic educator and student can be seen through its definition of distance education. The theory does not limit distance to geographic locations but includes distance as a pedagogical concept as well, which results in the inclusion of education as a programme where communication is solely through technology and where technology acts as an enhancer for communication (Chen, 2001).

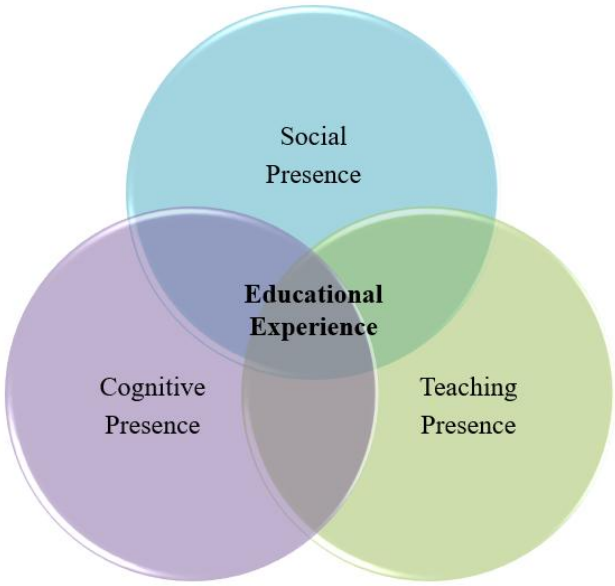
TDT provides a framework for designing effective distance learning experiences, emphasising customisation, interaction, and autonomy to optimise learning (Chen, 2001; Moore, 1997). Additionally, the theory acknowledges the varied needs of students, advocating for adaptable and flexible instructional strategies. TDT has its limitations, as it does not directly account for the technological influences on learning within distance education contexts. Additionally, it may not comprehensively encompass the complex dynamics of social interaction and collaboration in online learning environments. Furthermore, its primary emphasis on the student-academic educator relationship might overlook other essential aspects of the learning environment. Despite its limitations, TDT continues to serve as a valuable framework in this research study for comprehending and enhancing learning within distance education contexts.

2.3.4. Community of Inquiry

Scholars Garrison, Anderson, and Archer developed the Community of Inquiry (CoI) framework (Garrison et al., 2000). Drawing upon John Dewey's pragmatic inquiry model (Dewey, 1938), which encapsulates key tenets of social constructivist theory, highlighting the importance of dialogue, collaboration, and shared meaning-making. The foundational premise posits that knowledge construction manifests as a collaborative and ongoing effort. Initially conceptualised in the late 1990s, the CoI framework primarily targeted the evaluation of pedagogical and learning processes within synchronous settings predominantly characterised by text-based interactions (Garrison et al., 2000). This highlights the importance of interaction and dialogue in facilitating learning within online environments. Central to its conceptualisation is the examination of collaborative online learning processes, emphasising the collective sharing and construction of knowledge among participants (Garrison et al., 2000). Consequently, the framework has evolved into a valuable instrument for scrutinising pedagogical dynamics within higher education contexts. This encompasses blended learning scenarios, where instruction occurs both online and in-person, asynchronous interactions, as well as web-based synchronous modalities facilitated through video conferencing, virtual platforms, and traditional face-to-face settings (Garrison, 2012).

The CoI framework is collaborative and constructivist in nature (Garrison, 2012) and is made up of three fundamental components essential for cultivating successful online learning experiences: (1) social presence, (2) cognitive presence, and (3) teaching presence (Garrison et al., 2000). This is illustrated in Figure 5.

Figure 5: Garrison, Anderson, and Archer (2000) Community of Inquiry Model



Teaching presence outlines the instructional role in organising educational experiences, encompassing the articulation of clear objectives, the provision of constructive feedback, and the cultivation of a conducive learning environment (Garrison et al., 2000). Academic educators can develop curricular content, provide resources, and guide students' academic progress through course activities and assignments. The teaching presence is the design and facilitation of the learning experience with the intentional design and adept facilitation of the learning journey (Garrison et al., 2000). Interacting with the other components of the framework, teaching presence guides students, provides feedback, and cultivates both the social presence and cognitive presence within the educational community. The teaching presence component orchestrates the cognitive and social presences, aiming to realise stipulated learning objectives and outcomes within online instructional contexts. Indicators of effective teaching presence encompass engaging instructional delivery, timely and personalised feedback, facilitation of enriching discussions, modelling of critical thinking skills, discourse facilitation and instructional design and organisation (Garrison et al., 2000).

Social presence pertains to the cultivation of interpersonal connections and affiliations among students, as well as between students and the academic educator (Garrison et al., 2000). This element focuses on creating a sense of community, inclusivity, and support, which ultimately enhances engagement and motivation. A strong social presence entails students collaboratively building an environment underpinned by trust. The indicators reflective of social presence encompass online discussion forums, collaborative initiatives, group-based activities, and

opportunities for informal yet meaningful interactions (Garrison et al., 2000). Social presence is further demonstrated when students proactively introduce themselves, engage in supportive and transparent communication, and prioritise interpersonal rapport. Within the construct of social presence, engagement dynamics become apparent, particularly in delineating how pedagogical discourse is scaffolded and students are involved with content (Garrison et al., 2000). These aspects inherently feed into cognitive presence. Going deeper into the conceptual components of social presence, students can engage in their community and project their own personal characteristics into that learning environment. This transcends mere virtual interaction, acknowledging the tangible presence and authenticity of students within the virtual environment. Overall, social presence within the educational community facilitates knowledge sharing, collaborative learning, and peer-mediated support, which ultimately contribute to cognitive presence and deeper understanding (Garrison et al., 2000).

Cognitive presence signifies the cultivation of critical thinking, reflective practices, and the facilitation of knowledge construction through interactive learning modalities, problem-solving activities, and opportunities for deliberative discussions and debates (Garrison et al., 2000). The relationship between social presence and cognitive presence connects students' work within a course. The students' academic role is the cultivation of their cognitive presence by necessitating proactive engagement with learning materials and activities developed by the academic educator, thinking critically about concepts, and making connections between disparate ideas. Some indicators of cognitive presence encompass the application of acquired knowledge, thoughtful reflection, and the advancement of comprehension, analytical skill, and the ability to apply knowledge in pragmatic contexts. Examples of cognitive presence are completion of research assignments, analytical case studies, deliberative debates, and peer evaluation initiatives. These cognitive pursuits may transpire either individually or collaboratively with peers in a course. In collaborative learning environments, students' cognitive presence is further enriched through knowledge dissemination, intellectual exchange, and assisting peers' cognitive thinking through thoughtful questioning. The essence of cognitive presence resides in the student's collective capacity within the community of inquiry to construct and refine meaning through purposeful communication, often encapsulated by higher-order thinking (Garrison et al., 2000).

The interactions and interrelationships among the components of the CoI framework transpire within a multifaceted context characterised by a communication medium, educational context,

standards of an academic discipline, and applications of acquired knowledge. The overarching framework aligns seamlessly with the values and objectives of education, emphasising the main goal of deep learning and meaningful inquiry. Therefore, the underlying premise posits that the most optimal educational experience occurs when these three components overlap.

2.3.5. Theoretical Framework

The research study considers how Socio Technical Theory (Davis et al., 2014), the Ecological Framework (Bronfenbrenner, 1979), the Theory of Transactional Distance (Moore, 1997) and the Community of Inquiry Framework (Garrison et al., 2000) differ, intersect, and complement each other assisting in potentially constructing a strong theoretical framework that provides a comprehensive and multi-dimensional understanding of virtual teaching and online learning in higher education aimed at advancing virtual teaching and online learning equitable educational experiences.

The Ecological Systems Theory (EST) offers a holistic view of the educational environment by examining multiple levels of influence, from immediate interpersonal interactions to broader societal factors. It highlights how learning is shaped by interactions across and within different environmental systems (microsystem, mesosystem, exosystem, macrosystem, and chronosystem). Applying EST allows the researcher to explore the influences across the environmental systems on students' educational experiences within the virtual teaching and online learning environments. Socio-Technical Systems Theory (STS) focuses on the interplay between the social and technical aspects within organisations. It advocates for optimising both social and technological elements to enhance overall system performance. STS is crucial for effectively integrating technology into educational settings, ensuring that technological solutions enhance rather than disrupt student interactions and their learning processes. This theory helps strike a balance between the technical functionality and social dynamics to create an accessible and equitable virtual teaching and online learning environment. Transactional Distance Theory (TDT) addresses the pedagogical gap between students and academic educators in online learning. It considers factors such as structure, dialogue and learner autonomy, emphasising the reduction of transactional distance to improve learning effectiveness. Incorporating TDT into the theoretical framework addresses challenges associated with online learning, where physical separation can lead to decreased engagement. With a focus on structure, dialogue and student autonomy, the researcher explores how academic educators can design online courses that minimise transactional distance and

encourage active learning and interaction. The Community of Inquiry (CoI) framework highlights three core elements: social presence, cognitive presence, and teaching presence, which together create a supportive learning community. This framework is essential for creating an engaging, cognitive and collaborative online learning environment. The social, cognitive, and teaching presence enables academic educators to cultivate a sense of community that supports deep learning and critical thinking among students.

The research study integrates these four frameworks/theories to construct a comprehensive theoretical framework. At the core is the student's virtual teaching and online learning equitable educational experience. At a microsystem level, it includes the immediate online environment where people (students and academic educators) directly interact and engage with technology (learning management systems, online platforms, video conferencing and other technological instruments). At this level, the people element also includes their skills, knowledge, competencies, attitudes and interactions.

At a mesosystem level, the focus is on the interactions between the different microsystems. This involves the interactions between the people, technology, processes/procedures and how these interactions affect the effectiveness and efficiency of the design of virtual teaching and online learning systems. At this level, we consider the interrelationships between students, academic educators, and the technological platforms they use. The elements of social presence, cognitive presence and teaching presence become applicable as they contribute towards the design and delivery of the course within the virtual teaching and online learning environment. Social presence allows students to identify with their peers, communicate with a clear objective, and establish relationships. This can be tied to people (student-student interactions and student-academic educator interactions) and technology (the use of social tools and communication platforms). Cognitive presence enables students to engage in deep learning processes through reflective thinking and discourse. This can be tied to the technology (online discussion forums and interactive content) and processes/procedures (structured online activities) components. Teaching presence affords the design, facilitation, and direction of cognitive and social processes to achieve meaningful learning outcomes. This involves the role of the academic educator in structuring the virtual teaching and online learning environment. The elements of dialogue, structure, and student autonomy become applicable as they contribute towards reducing the transactional distance and the pedagogical gap between the institution, academic educators and students for a successful virtual teaching and online

learning environment. The dialogue element encourages interactions between students and academic educators and between students and peers. The structure element influences the design of the courses and the flexibility within the curriculum. The student autonomy element takes into consideration the degree of control students has over their learning process.

At an exosystem level, the broader social systems that indirectly influence students are considered. This involves the organisational, infrastructural and support aspects at an institution level, such as institutional infrastructure availability (access to internet and technological tools) and student support (induction, orientation and IT support services), institutional policies, (university rules and guidelines), and institutional enabled resources (community learning and regional centres), which fit well within the exosystem. These elements shape the conditions and resources available to people (students and academic educators) for virtual teaching and online learning.

At a macrosystem level, the contextual realities of the broader social climate, economic conditions (current imbalances), policy (national education policies), cultural context (attitudes towards technology, distance and online learning), curricular considerations and national infrastructure (infrastructure for equitable access) are considered. The extrinsic factors are important to consider as they shape the design, development, implementation, and successful delivery of courses through virtual teaching and online learning systems.

At a chronosystem level, consideration is given to the evolution of technology and institutional practices over time. Changes in technology and shifts in educational practices, driven by historical events such as the Covid-19 pandemic, influence the long-term development of virtual teaching and online learning environments.

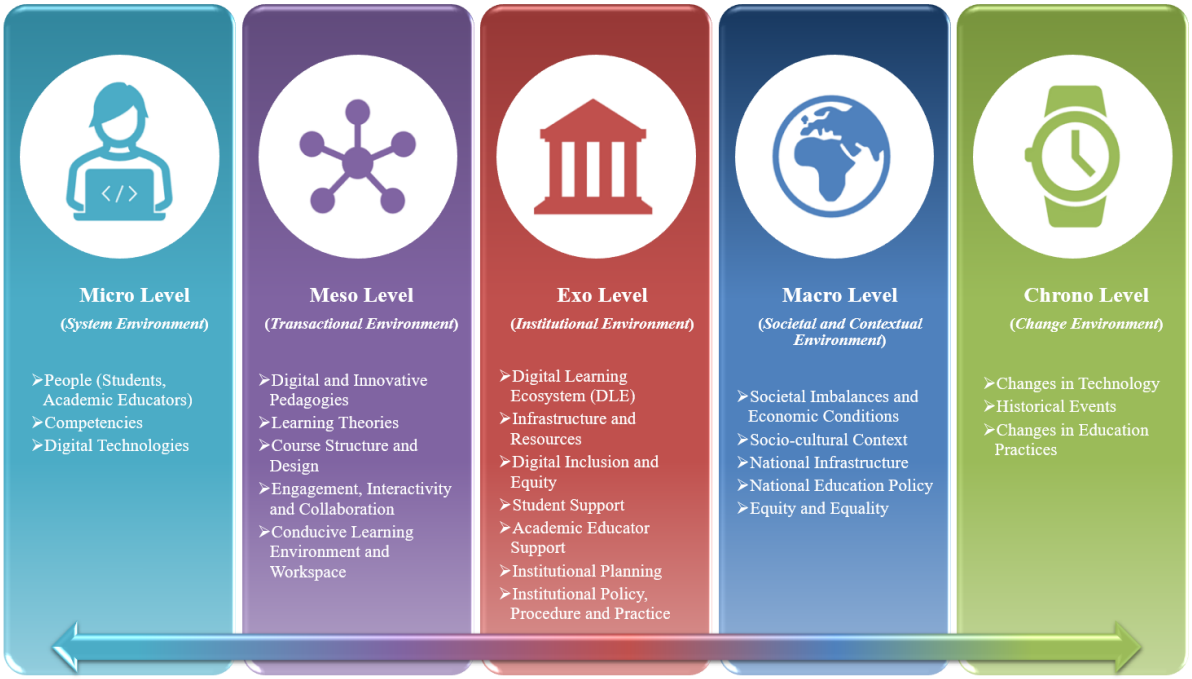
In summary, integrating Socio Technical Theory (Davis et al., 2014), the Ecological Framework (Bronfenbrenner, 1979), the Theory of Transactional Distance (Moore, 1997) and the Community of Inquiry Framework (Garrison et al., 2000) provides a comprehensive approach to understanding the influences of virtual teaching and online learning environments. CoI guides the design of online courses and learning activities that stimulate dynamic learning communities for deeper engagement. TDT informs strategies to reduce transactional distance and promote active student participation. STS optimises the relationship of technological and social systems to support educational and institutional goals, while EST considers broader ecological contexts for inclusive, accessible and equitable educational practices. Together,

these theories address the “what”, “why”, “where”, “when”, and “how” of virtual teaching and online learning, enhancing its accessibility, effectiveness, and transformative potential to equitable education. The research study integrates these four frameworks/theories to construct a comprehensive theoretical framework that enables a thorough guide and analysis of the intrinsic and extrinsic factors influencing virtual teaching and online learning environments. Each framework/theory contributes a unique perspective, supporting a multi-layered approach to understanding how we can harness the affordances of digital education while considering the structural factors, systemic barriers, and contextual realities in South African higher education aiming to provide students with ubiquitous and equitable access to education within virtual teaching and online learning environments.

2.4. Review of Literature

To comprehend how the power of digital education can be harnessed and identify the essential factors for the design, development and implementation of virtual teaching and online learning in a way that it can contribute to equitable and accessible educational experiences, it is imperative to engage with literature across the different ecological levels. By applying the micro, meso, exo, macro and chrono perspectives to virtual teaching and online learning, the researcher gained a comprehensive understanding of the various factors at play and how they interact to shape the overall educational experience and provide students with ubiquitous access to equitable education within an online learning ecosystem. A summary is shown in Figure 6, and each component is further explored in the review of literature.

Figure 6: Virtual Teaching and Online Learning Across Micro, Meso and Macro Levels



2.4.1. Microsystem Level

At the micro level, the research study looks at the individual components of virtual teaching and online learning. This involves students and their competencies, academic educators and their competencies, and the digital technologies used for teaching in a virtual teaching and online learning environment.

2.4.1.1. Students in the Digital Age

The digital age has precipitated a marked shift in student learning preferences and needs. Traditional passive learning models, dominated by academic educators and rote memorisation,

have given way to an expectation of active, interactive engagement. There is a growing preference among students for learning materials that incorporate a variety of media formats (Mayer 2002; Mayer, 2003). Moreover, the contemporary student thrives on immediate feedback and personalised learning paths, requiring educational platforms to adapt accordingly. The rise of technology has also enriched collaborative learning environments, with students seeking opportunities for social interaction and knowledge sharing through online platforms (Garrison et al., 2000).

Despite the long history of online learning, challenges persist. Many academic educators resist adopting online teaching methods, and students often struggle to adapt to virtual environments. There are various strategies to enhance online learning, including technology integration and academic educator training, but student engagement and participation remain significant hurdles. The emergence of live online learning has introduced new complexities, as it requires both academic educators and students to adapt to real-time interactions in a digital space. To effectively implement live online learning, it is crucial to understand students' preparedness, which involves factors like technology proficiency, self-confidence, and motivation (Alenezi et al., 2023). Faloye and Faniran (2023) found that prior computer exposure significantly influences technological competence among university students. Those with prior computer access tend to demonstrate higher proficiency. Moreover, the availability of supportive resources within a technology-rich academic environment positively correlates with students' technological abilities.

Students need a diverse skill set beyond basic computer literacy. Essential 21st century competencies include curiosity, creativity, critical thinking, entrepreneurship, communication, collaboration and a growth mindset (Chomunorwa et al., 2023). Providing ICT infrastructure is essential but insufficient for ensuring student achievement (Bekker & Carrim, 2021). Cognitive development is a complex process that requires more than just access to tools, and simply equipping students with technology does not automatically translate into improved learning outcomes (Dlamini & Nkambule, 2020). Access expands further than access to the device, but the ability to use it. Digital literacy provides access to using the tools and is essential for success in today's digital age. It encompasses the ability to find, evaluate, create, and share information using technology. Students need strong digital literacy skills to thrive in online learning environments (Alenezi et al., 2023).

Digital literacy emerges as a cornerstone, extending beyond mere technological familiarity to include the ability to critically evaluate information, discern credible sources, and effectively communicate digitally. Technological proficiency, encompassing the adept use of various software applications and online platforms, is essential for navigating the digital era. Furthermore, students must possess critical thinking and problem-solving skills to apply their digital knowledge to complex challenges (Chomunorwa et al., 2023). Effective communication and collaboration, facilitated by digital tools, are paramount for the success of virtual teaching and online learning in the digital age (Garrison et al., 2000).

The digital age has significantly influenced the dynamics of education, particularly with the rise of virtual teaching and online learning. Central to this shift are the concepts of student efficacy, agency, and autonomy. Self-efficacy refers to an individual's belief in their capacity to execute behaviours necessary to produce specific performance attainments and is crucial for student achievement (Bandura, 1977; Bandura, 1986; Bandura, 2006). It influences self-regulated learning, a process involving self-observation, self-judgment, and self-reaction (Bandura, 1977; Bandura, 2006). In the context of online learning, self-efficacy reflects a student's confidence in their ability to manage their own motivation, behaviour, and social environment to achieve academic success. Academic success is often tied to a student's capacity for self-directed learning, which is influenced by self-efficacy. Essentially, students who believe in their capabilities are more likely to engage in effective learning strategies, leading to improved academic outcomes. Academic educators must provide ample opportunities for success, clear learning objectives, and constructive feedback to increase self-efficacy (Bandura, 1997; Brandt, 2020). Pham T. (2021) states that students with high internet self-efficacy exhibit greater engagement, achieve better academic results, and demonstrate strong self-regulation in online learning environments. It is a key factor in developing a strong sense of presence and engagement within the online learning community (Palloff & Pratt, 2007; Shea & Bidjerano, 2010). Self-directed learning is essential for empowering students to take charge of their education. It cultivates engagement, independence, and decision-making (Sadhukhan, 2023).

Complementing self-efficacy is student agency, which is the capacity to act independently and make choices. Student agency involves a student-centred approach where students actively engage in meaningful and relevant activities aligned with their personal interests, guided by appropriate academic educator support. (Marín et al., 2024). Essentially, student agency empowers students by giving them a choice in how they learn. Virtual teaching and online

learning promote self-directed learning while encouraging self-reliance, equipping students with the ability to set goals, manage their time, and take ownership of their learning. These are essential skills for navigating the contemporary dynamic world (Dhurve et al., 2023).

2.4.1.2. Academic Educators in the Digital Age

The digital era has changed the world with emerging digital education, digital technologies and digital pedagogies, which continue to transform the delivery and the quality of education. Subsequently, the role of academic educators has naturally changed as the learning environment has transformed. The role of academic educators has undergone a significant transformation in the digital age. They are no longer confined to the traditional role of knowledge dissemination but are now expected to be adept at integrating technology into their teaching, designing engaging online learning experiences, and encouraging student autonomy (Singh et al., 2023). The demands of balancing traditional classroom teaching with online instruction, coupled with the need to continually upgrade digital skills, present significant challenges. However, these challenges are offset by opportunities to create more student-centred and interactive learning environments. Like learning designers, online facilitators, and technology mentors, academic educators are at the heart of shaping the future of education.

Students need to be prepared to function in the digital era and the fourth industrial revolution (4IR). The widespread adoption of digital technologies has transformed higher education. While these digital tools offer immense potential to enhance teaching and learning, their effective integration is contingent upon several factors. One of which is academic education programmes, which play a crucial role in equipping academic educators with the necessary skills and confidence to leverage technology effectively (Elliott, 2010). Ally (2019) identified nine themes with 105 competencies that fall within these themes, which all indicate key responsibilities for digital educators. The nine themes are: (1) general – general qualities that digital educators should possess that assist them in providing quality virtual support, (2) use digital technology – educators need to be digitally literate in using technology to deliver education during the digital era, especially in the 4IR, (3) develop digital learning resources – by using technology educators need to be able to design and develop digital learning resources for their learners, (4) re-mix learning resources – as there is a variety of open education resources that are available, the educator needs to be able to select the learning materials that are most appropriate to achieve the learning outcomes, (5) communication – educators need to have the ability and capability to communicate to their students using technology (6) facilitate learning – this is considered to be one of the major roles of a digital educator as students are

learning virtually with physical separation, (7) pedagogical strategies – to achieve the learning outcomes, the educators needs to make the correct selection and use of appropriate pedagogical strategies, (8) assess learning – the educator needs to be able to assess their students' performance to achieve academic credit and also provide feedback to them, and (9) personal characteristics – the educator should be a good role model, provide quality education and support their students (Ally, 2019).

Grammens et al. (2022) describe twenty-four competence clusters for synchronous online teaching via videoconferencing, categorised into five primary educator roles: (1) instructional, (2) managerial, (3) technical, (4) communicational, and (5) social. The growth of academic educators' digital competencies assists them in using the appropriate and relevant technology as a pedagogical tool. Academic educators' development of digital competencies cultivates the digital competencies in their students (Aslan & Zhu, 2015). Academic educators need to develop technological proficiency, online classroom management skills, and effective online interaction abilities to excel in virtual teaching (Moorhouse et al., 2023). In the existing knowledge society, digital competencies are essential (Cabero-Almenara et al., 2020). Without this skill and knowledge regarding technology integration, academic educators are deemed to be incompetent to drive the knowledge economy (Mashile, 2017).

One of the main components within the TPACK model is subject content knowledge, portraying its crucial importance for all academic educators. Subject knowledge is the actual knowledge of the academic educator concerning the subject that they are teaching (Koehler and Mishra, 2009). Shulman (1986) described knowledge to include concepts, theories, ideas, frameworks and established practices. Metzler and Woessmann (2012) found a significant effect of educator subject knowledge on student achievement. Subject matter knowledge acts as a basis for educators' instructional practices in their teaching environment (Lee et al., 2018). Valanides (2000), as cited in Lee et al. (2018), found that when educators have insufficient subject knowledge, they can create misconceptions and misunderstandings for their students concerning the subject matter. A core infrastructural element is educator knowledge (Walshaw, 2012). Academic educators need sound content knowledge to help their students in their conceptual understanding of the subject content. If an academic educator's subject knowledge is exceptional, then it allows them to extend and challenge their students' conceptual ideas and mediate tasks and activities (Walshaw, 2012). It is imperative to first have sound subject knowledge before considering what different tools and technologies can be applied to teaching

and learning, because if an academic educator does not know what to teach, how can they truly consider how to teach it?

Another component of importance is the pedagogical knowledge, which is essential for effective teaching in virtual environments. It involves academic educators understanding how to teach specific subject matter, considering student learning styles, and using appropriate digital tools (Singh et al., 2023). By grasping student misconceptions and tailoring instruction accordingly, academic educators can create engaging and effective online learning experiences. Pedagogical knowledge is instrumental in bridging the gap between subject matter knowledge and student understanding in the virtual classroom. Another important component is the academic educators' technological knowledge, which encompasses proficiency in using various digital tools and platforms. It involves understanding hardware, software, and digital literacy, as well as effective online communication. Technological knowledge and digital literacy are essential for integrating technology. Monteiro and Leite (2021) states, as mentioned by Martin and Grudziecki in 2006, the concept of digital literacies applies to three levels: (1) digital competence – skills, concepts, approached, attitudes, (2) digital usage – professional/discipline application, and (3) digital transformation – innovation/creativity. Each of these is a prerequisite to the next level (Monteiro & Leite, 2021).

When academic educators' subject knowledge is sound, they can consider what pedagogical styles and digital tools they can use that will best suit their students' learning needs. Effective teaching and learning do not occur because academic educators have access or skills in digital technologies; they need to consider the pedagogical approach to its use, they need to use technology skilfully and not just as a delivery tool (Ally, 2004). In addition to this, academic educators need to keep up to date, as technological knowledge can become outdated. However, having said that, working with most technologies can apply to working with others (Koehler & Mishra, 2009).

As academic educators navigating the digital age, they are lifelong learners and must continually adapt and evolve, making reflection and introspection an integral part of their professional development. Benade (2016) explains the complexity of reflective practice in contemporary education. He posits that while educators increasingly recognise the importance of reflecting on their practices to navigate the demands of 21st century learning, the process is often influenced by external pressures such as high-stakes testing and bureaucratic demands. Additionally, the research suggests that reflective practice can be both a solitary and

collaborative endeavour, with the impact on student outcomes being multifaceted and difficult to isolate.

2.4.1.3. Digital Technologies

Digital technologies have developed over the decades and the effective integration of these tools into teaching has positive effects on access to education and what students learn. Examples of digital technologies include the use of computer devices, video conferencing tools, virtual reality, augmented reality etc. Digital technologies enhance student engagement, critical thinking, and collaboration, preparing students for the complexities of the modern world. By offering flexibility, personalisation, and access to a wider range of resources, technology empowers students to become active participants in their education (Haleem et al., 2022). Digital technologies can be a powerful tool for reducing educational inequality by providing access to innovative curricula and resources, which can level the playing field for students from disadvantaged backgrounds. Increased connectivity and the growth of online platforms can bridge the digital divide and create more equitable learning opportunities (Alenezi et al., 2023). Furthermore, technology in virtual teaching and online learning can bridge the geographical divide.

Digital tools and online platforms provide students, particularly those in remote areas, with access to a wealth of information and learning materials that were previously unavailable (UNESCO, 2018). Tinio (2002) as cited in Raja and Nagasubramani (2018) states that digital technologies impacts education through promoting (1) active learning – as appose to rote and memory-based learning, the use of digital technologies can promote student engagement, (2) collaborative and cooperative learning – the use of digital technologies promote interaction and cooperation amongst students. Additionally, it affords students the opportunities to interact with other students globally and from other cultures resulting in better communication skills and global awareness, (3) creative learning – digital technologies encourage students to manipulate current information and knowledge to create their own, (4) integrative learning – digital technologies can assist in closing the gap between theoretical knowledge and practical knowledge, and (5) evaluative learning – through the use of interactive features that digital technologies have, learning is more student centred as students receive feedback through these tools.

The use of digital technologies is transforming the way academic educators and students deal with knowledge (Tondeur et al., 2007). Effective technology integration can transform virtual

classrooms. Liang et al. (2020) found that online learning environments offer distinct advantages, including flexible pacing, clear demonstration of procedural knowledge, varied communication channels, and valuable performance data.

The International Society for Technology in Education (ISTE) states that technology should be integrated by educators into the curriculum. There exists a variety of digital technologies which can be used within the education sector. The research study completed a very concise analysis of a few digital technologies, which are discussed briefly in the current section. This description only consists of a few possible digital technologies that can be used for virtual teaching and online learning and are described as follows:

Virtual Learning Environments (VLEs)

Virtual learning environments (VLEs) are digital platforms that support teaching and learning. They offer tools for collaboration, assessment, and content management. The goal of VLEs is to enhance teaching, learning, and assessment through improved communication, interaction, and knowledge sharing (Alenezi et al., 2023).

Learning Management System

Digital tools, in particular learning management systems (LMS), have become indispensable in modern education, offering a range of functionalities to enhance teaching and learning. From content delivery and communication to collaboration and assessment, the LMS provides academic educators with the flexibility to create engaging and interactive learning experiences. While the potential benefits are significant, effective integration requires careful planning and consideration of how these tools can best support student learning outcomes (Simelane-Mnisi, 2023). Online education consists of virtual and online teaching and learning with either synchronous or asynchronous means of communication. Students in an online environment are said to be in a different learning environment compared to a classroom setting, and therefore, the teaching styles need to be adapted in terms of progress and flexibility to accommodate this (Careaga-Butter et al., 2020). Examples of LMSs are, inter alia, Moodle, Canvas, Schoology and Google Classroom. These provide academic educators with the opportunity to organise their subject's course content, tasks, activities, communications, and assessments in a central location. Academic educators use this platform to provide students with assignments, surveys, and quizzes, grade students' work etc. Shaharanee et al. (2016) found that Google Classroom can be used as a pedagogical/cognitive tool to help change from educator-centred to more

student-centred. So, from a controlled classroom to one with more dialogue, inquiry, and creative thinking through active students.

Virtual Conferencing Tools

Video conferencing has become a foundation of modern education, enabling real-time interaction and collaboration among students and academic educators. Its versatility accommodates diverse learning styles and overcomes geographical constraints, making it an indispensable tool in contemporary higher education (Al-Samarraie, 2019). Virtual conferencing tools leverage internet technology to facilitate real-time communication, combining verbal presentations with visual and interactive elements. Examples of video conferencing tools are, inter alia, MS Teams, Zoom, Google Meet and Skype. These platforms cultivate diverse perspectives and interactions by enabling virtual discussions and breakout groups, transcending geographical limitations (Mhlongo et al., 2023).

Interactive Whiteboards

Interactive whiteboards, once confined to physical classrooms, have transitioned seamlessly into the virtual teaching environment. Online whiteboard platforms replicate the collaborative and dynamic nature of their physical counterparts. These digital canvases facilitate real-time interaction among students and academic educators, enabling shared document editing, annotation, and brainstorming (Phan & Huynh, 2021). Academic educators can provide a visual and interactive space; online whiteboards enhance student engagement and understanding. They can also share content, demonstrate processes, and control the whiteboard remotely, enabling flexibility in lesson delivery.

Online Discussion Boards

Online discussion boards have emerged as powerful tools for enhancing student learning. These digital platforms provide a flexible environment where students can engage in thoughtful conversations about course content, share ideas, and learn from their peers (Dlamini & Makda, 2024). Students develop critical thinking skills, improve their communication abilities, and deepen their understanding of the subject matter when participating in discussion forums. Moreover, the asynchronous nature of these forums allows students to contribute at their own pace, promoting inclusivity and accommodating diverse learning styles (Aloni & Harrington, 2018). Wekerle et al. (2022) found that students who actively participated in constructive and interactive activities demonstrated improved learning outcomes. Aloni and Harrington (2018) advise that in order to maximise student participation and the quality of online discussions,

academic educators should focus on four key areas: (1) clearly communicating expectations, (2) establishing a structured discussion format, (3) crafting effective prompts, and (4) actively guiding the conversation.

Digital Resources

Academic educators must be able to identify quality resources and have the ability to modify these resources in order to meet their objectives, adapt to their students' learning styles and their very own teaching styles (Redecker & Punie, 2017). Online resources need to include activities that accommodate different learning styles to enable students to select appropriate activities based on their preferences. The different learning theories contribute to the design of different online resources and materials. Behaviourism assists in teaching the facts (what), cognitivism the processes (how) and constructivism the real-life and contextual learning (Alzaghoul, 2012).

It is important to look at the online support and resources needed to promote students to engage with meaningful learning (Khan, 2003). Digital technologies continue to evolve and are shaping how academic educators are teaching their courses and subjects. Many textbooks now have electronic versions. Some of the advantages of this are the portability, the reduction in costs and the increase in access (Akbar, 2016). The internet helps to facilitate students' access to a variety of educational resources (Careaga-Butter et al., 2020). Ally (2004) suggests developing online learning materials as objects in electronic repositories, allowing students to access them from anywhere using mobile devices at any time. He further states that these learning objects should be designed and developed in such a way that they can be reused in different courses or lessons. Each learning object should be tied to a specific learning outcome, resulting in appropriate content and assessment – the aim is to use each learning object to promote learning and improve students' performance (Ally, 2004).

Herrington et al. (2001) identified some items that can be used to assess the quality of online resources. These items are (1) accessibility – students should be able to locate the resources easily, (2) currency – use of age and primary resources that are appropriate to the topic/subject at hand, (3) richness – the resources developed contains a variety of perspectives, (4) purpose use of media – the media is correctly selected and suitable for the intended purpose, and (5) inclusivity – developed resources should consider student diversity and inclusivity.

Media and Student-Created Media like Podcasts, Videos, or Slideshows

Academic educators can make use of blogs, videos, podcasts, eBooks, flyers, and other digital artefacts for their students. With students becoming the creators and not just the vessels taking in information, it can result in the promotion of digital literacy within South Africa. Therefore, academic educators should allow their students to create blogs, videos, podcasts, and slideshows. This allows students to build on their expertise through research, comprehension, evaluation and creation through the activity of creating videos (Engin, 2014).

Virtual Environments and Virtual Reality

Academic educators can make use of virtual environments to promote student learning. Some already make use of "Digital Field Trips". It is a more cost-effective tool and can be useful. An example is the use of Google Street View or similar apps that allow for virtual exploration. The use of Collaborative Virtual Environments can also offer possibilities for supporting social awareness (Prasolova-Førland & Divitini, 2003). Virtual labs offer advantages such as cost-effectiveness, safety, and flexibility, addressing challenges faced by traditional laboratories (Raman et al., 2022). Additionally, virtual labs can provide educational opportunities to students in remote areas with limited access to physical laboratories (Raman et al., 2022).

Podcasts

Hill and Nelson (2011) found that podcasts were effective in supporting teaching and learning as they offer a flexible learning experience. Students of the course perceived the podcasts as a useful resource for revision and assessments, as they assisted with recalling information and highlighting existing knowledge gaps. An aspect that they added to the podcasts was the joining of individual learning experiences with group exploration and collaborative discussion.

Video/Multimedia Lessons and Presentations

Multimedia technologies can assist students in their understanding and learning of content (Careaga-Butter et al., 2020). Coll (2015), as cited in Careaga-Butter et al. (2020), states that the combination of the internet and multimedia technologies makes learning possible anywhere. There has also been an increase in the use of presentation software like Microsoft PowerPoint, and this is changing the way academic educators are presenting content. Furthermore, the evolution of visualisation technologies aids in demonstrating new concepts visually as it allows academic educators to use simulation and animations to demonstrate to their students with visual elements (Akbar, 2016). Academic educators can make presentations lively by incorporating a variety of visual effects, images, videos, and music into them. They

can even make use of virtual guest speakers to engage with their students via conference calls using platforms such as MS Teams, Zoom, Skype etc.

Collaborative Online Tools

Collaboration is important for effective learning, and its significance is amplified in the context of virtual teaching and online learning education. The role of social interaction in knowledge construction and collaborative learning provides a platform for students to co-construct knowledge through dialogue, shared problem-solving, and peer support (Garrison et al., 2000). By engaging in collaborative activities, students actively participate in the learning process, building on each other's ideas and developing a deeper understanding of the subject matter. Additionally, collaboration assists in developing essential 21st century skills such as communication, critical thinking, and teamwork, preparing students for success in a globally interconnected world.

Collaborative online tools help to promote communication and information sharing. While engaging with collaborative learning, students develop stronger analytical skills for interpreting information and acquiring further knowledge (Chu & Kennedy, 2011). Online forums and discussion boards serve as virtual platforms for students to engage in asynchronous dialogue, share ideas, and seek clarification. Video conferencing tools, such as MS Teams, Zoom or Google Meet, enable real-time interaction, group projects, and virtual classrooms (Correia et al., 2020).

2.4.2. Mesosystem Level

At the meso level, the research study looks at the interactions and interconnections between the different individual components of the microsystem. This involves the structure and course design through student-centred development with considerations of academic educator presence, cognitive presence, social presence and dialogue while being cognisant of digital pedagogies and learning theories. It involves the students' educational experience within these frameworks, including their efficacy and autonomy, their engagement with content, participation with peers and communication with academic educators.

2.4.2.1. Digital and Innovative Pedagogies

Digital pedagogy can be described as skilfully integrating digital tools and designing and implementing effective digital strategies throughout the teaching process to cultivate student-centred learning experiences (Redecker & Punie, 2017). Archambault et al. (2022) state that online pedagogy is a specialised approach to teaching that requires a unique set of skills. The

authors outline five essential components grounded in student-centred, constructivist, and situated learning theories for effective online teaching: (1) building relationships, (2) incorporating active learning, (3) empowering students, (4) focusing on mastery, and (5) personalising learning.

Digital pedagogy effectively integrates technology into education to cultivate environmental awareness and responsible citizenship, serving as a catalyst for sustainable learning (Nanjundaswamy et al., 2021). Digital pedagogy shifts education from a passive model of knowledge transmission to an interactive, collaborative environment. It leverages technology to empower students, promote creativity, and encourage open knowledge sharing. Digital pedagogy is transforming the educator-student dynamic into a collaborative and student-centred partnership. Leveraging digital technologies and ICT tools affords a vibrant learning culture characterised by new literacies, critical thinking, and creativity (Nanjundaswamy et al., 2021).

Rather than simply adopting technology for the sake of using technology, HEIs and academic educators should prioritise pedagogical innovation and design learning experiences that effectively integrate digital tools (Rapanta et al., 2021). The effectiveness of digital technologies is highly dependent on the pedagogical styles of academic educators. When academic educators change from the traditional classroom method to an online learning environment, their roles change too to a more facilitation, coaching and support role to students (Ally, 2004). In other words, from an instructional role to a more supportive role. Having said that, the basis of teaching remains the same in terms of the content and assessments, however, the forms of teaching interaction may change. The academic educator and students are not physically with each other in the same location or time. Consequently, the academic educator must adjust his/her pedagogical styles to compensate for the lack of synchronous and face-to-face contact. The academic educator needs to be able to teach their students in online environments using emerging digital technologies and digital pedagogies to remain relevant and helpful to their students.

As digital technologies develop, pedagogical styles need to evolve to adopt these changes while tracking the impact of such technologies (Akbar, 2016). Valverde-Berrocoso et al. (2020) identified several characteristics of this generation of pedagogies to be (1) student centred, (2) technically, socially, and organisationally distributed, (3) crowd-driven support, (4) integrated and authentic, (5) courses playing a less significant role and, (6) learning separated from

accreditation. With the acceptance of using technologies, there are also challenges to face. Sometimes the adoption of technologies in education can be time-consuming and technologies can be perceived as difficult to use. HEIs need to provide incentives, support and training opportunities for technology adoption and integration.

The pandemic accelerated the shift to digital technology use, emphasising the importance of technology-enabled, student-focused learning environments within the virtual teaching and online learning environment. The online environment requires different pedagogical styles than those of face-to-face learning environments (Gurley, 2018). Traditional teaching methods are not appropriate for online learning environments as educational instructional delivery is no longer passive and reactive but has transformed to being interactive (Nanjundaswamy et al., 2021; Raja & Nagasubramani, 2018). Education is now about curiosity for students and the use of technology can assist students in bettering their understanding. With the vast information and learning resources that have become available, the classroom or lecture hall is no longer the centre of learning. There is now a shared responsibility between academic educators and students. With this shift in responsibilities, use of digital technologies, virtual teaching and learning, there needs to be more consideration given to the pedagogical styles of teaching and learning.

Academic educators also need to understand that a technological pedagogical method that works for one subject may not work the same for another (Crompton, 2014). Berk (2009) identified teaching strategies for the 'net generation'. He suggested that for tech savvy individuals they should incorporate technology meaningfully into their learning environments, activities, and try to make use of the different digital tools that are not limited to a specific location but that can be accessed easily from any place like the incorporation of videos, blogs, research databases, search engines and virtual environments. Those that rely on search engines to provide their students with activities that draw on their research ability, with guidance on how to get the most out of the value of the search results. The author further suggests that those who are interested in multimedia make use of videos, pictures, and games that students are familiar with to allow them to connect with the content, with each other and with the educator. For those who create internet content to make use of opportunities that afford their students to write blogs and wikis, add content to the webpages on the internet and create videocast, podcasts and even YouTube videos (Berk, 2009). The use of open educational resources (OERs) and multimedia also offers a variety of affordances. Some examples of digital media can include the use of YouTube, Khan Academy, Udemy, OpenStax etc. and existing OERs

include MITOpenCourseware or OER Commons. With the increase in OERs, students can gain knowledge through information from digital sources rather than relying on a single educator (Ally, 2019).

A variety of pedagogical styles will help to improve the use of digital tools and resources to support online teaching and enhance learning. Open pedagogy in online community settings demonstrates potential for enhancing student success. By encouraging student engagement through collaborative learning and content creation, open pedagogy can increase student involvement and persistence. Additionally, the use of OERs and practices promotes equitable access to learning for students from diverse backgrounds, promoting equity in education (Gilpin et al., 2023). In the digital era, a more collaborative approach is encouraged with the perspective of individuality in learning – personalised learning (Zhu et al., 2016). With the concept of individuality, education needs to reform, new approaches like the notion of a flipped classroom or knowledge community, as this will change the organisational structure of education and the way students participate (Zhu et al., 2016). Even though individuality is predominant, the collective in learning still plays a major role, as students can still learn from peers through collaboration.

Chigbu et al. (2023) advocate for innovative pedagogy necessitating a synergistic blend of traditional and digital teaching methods. While South African higher education is gradually adopting these approaches, student-centred models like flipped classrooms and blended learning are gaining prominence (Chigbu et al., 2023). Careaga-Butter et al. (2020) found that for virtual education systems to work effectively, the flipped classroom approach is advisable. The flipped classroom model reverses traditional teaching by delivering content outside of class (often through videos) and dedicating in-class time to active learning activities. While creating videos can be time-consuming, it offers academic educators control over content and engagement (Liang et al., 2020). Students generally prefer videos over text and benefit from short, engaging content. In-class activities should build critical thinking, collaboration, and problem-solving skills. Technology can enhance both pre-class and in-class experiences, but flexibility is key to adapting the model to different teaching styles and student needs (Liang et al., 2020). Essentially, the flipped classroom aims to shift the focus from passive learning to active engagement with course material. It facilitates a smooth transition from traditional classroom teaching to virtual environments (Flores-Alarcia et al., 2022). Tiejun (2017) suggests that effectively integrating online platforms and flipped classrooms can be a powerful strategy to enhance learning in theoretical subjects, particularly for design students. The author

also highlights the potential of this approach to improve student engagement and critical thinking skills. This method works best as it is centred around the sharing of information and managing of knowledge. Digital environments are technologically and pedagogically designed to allow communication to occur. The use of collaborative online tools promotes the teaching and learning pedagogy of constructing knowledge as a group over the traditional rigid teaching methods. All the various stakeholders access the virtual system for (1) sharing content, (2) using digital resources to complete activities, (3) developing skills for the 21st century, and (4) developing learning competencies (Careaga-Butter et al., 2020). Herrington et al. (2001) identified some items that can be used to assess the quality of online pedagogies. These items are (1) authentic tasks – activities contain settings of real-life knowledge, (2) opportunities for collaboration – students can work together to create knowledge, (3) learner-centred environments – more emphasis is on student learning rather than teaching, (4) engaging – activities and tasks that are developed motivate students and challenge their thinking, and (5) meaningful assessment – well integrated assessments to evaluate students' achievement.

Academic educators also recognise mobile learning with the use of mobile devices as a teaching and learning tool in distance learning environments. Even though distance prevails, the use of mobile devices supports effective face-to-face communication (Park, 2011). Mobile devices have unique attributes which provide positive pedagogical affordances and mobile learning. Mobile learning can be defined as using mobile devices for learning whilst on the move (Park, 2011). Crompton (2014) defines mobile learning as learning that occurs across multiple contexts, through various social and content interactions whilst using electronic devices. Some examples of these devices are the use of smartphones, laptops, tablets etc. The use of social media and social software using Web 2.0 tools has led to mobile devices being more dynamic and widespread (Park, 2011). The definition by Crompton (2014) indicates pedagogies, context, social interactions, and technology as underpinning constructs of mobile learning. Crompton (2014) found that there are three main resources required for the effective integration of mobile learning: (1) training for educators, (2) access to mobile devices, and (3) technical support. Ozdamli (2012) found that there are four aspects for a mobile learning pedagogical framework: (1) integration of tools, (2) pedagogical approaches, (3) assessment techniques and (4) educator training. These requirements from previous research also indicate that when intending to use mobile devices, the consideration of pedagogies, access, training, and support play an important role too. Another factor to consider is the changing demographics in the last decade – the existence of digital natives, those who are born in a

technological world and use technology within their daily lives. This further emphasises the point of strategically integrating and implementing technology in teaching (Zhu et al., 2016).

2.4.2.2. Learning Theories

"A theory is a comprehensive coherent and internally consistent system of ideas about a set of phenomena." (Knowles et al., 2005, p. 10). Austin et al. (2001) define a theory as "a way of thinking and a model of how things work, how principles are related, and what causes things to work together." The authors further describe learning theories as addressing key questions like "how does learning happen? How does motivation occur? What influences students' development?" (Austin et al., 2001).

Educational learning theories help to understand why and how people learn. They also provide an approach for instructional design which aids academic educators in creating a successful learning environment. There are three main learning theories: (1) Behaviourism, (2) Cognitivism, and (3) Constructivism (Bélanger, 2011). These theories were developed in a period when teaching and learning were not influenced by technology (Siemens, 2004). A later developed learning theory is connectivism (Siemens, 2004).

Behaviourism focuses on what is observable; it views the mind as a black box and is centred around contingencies and reinforcement. In other words, the behaviour and the consequences of the behaviour (Skinner, 1954). The idea of behaviourism is that there are certain behavioural responses associated with automatic and constant stimuli; a particular stimulus results in a particular response. The emphasis of this theory is on rewards and punishments as key drivers of learning and pre-defined measurable outcomes. One of the key issues with the behaviourism theory is the black box concept, whereby the human mind is not considered. Behaviourism is limited to only that which could be observed – stimulus and response (Harasim, 2012). Additionally, behaviourism theory focuses on moving forward, however, learning should encompass how what we learn today can change what we have learnt yesterday.

Cognitive psychology looks at the relationship between the mind and its involvement in thinking, motivation, reflection, memory, and metacognition. Cognitivism focuses more on internal processes, in uncapping the black box of the mind to understand how students learn. Cognitivism emphasises that the role of mental processes in learning has been shaped by several key authors. Jean Piaget's work is foundational, focusing on the developmental stages of cognitive growth in children. He proposed that children actively construct knowledge through interactions with their environment, with his stage-based theory highlighting the

qualitative changes in thinking as they mature (Piaget, 1952). In contrast, Jerome Bruner emphasised the importance of structure in learning and advocated for discovery learning. Bruner (1960) introduced concepts such as scaffolding, wherein students revisit topics at increasing levels of complexity, thereby enhancing their understanding over time (Bruner, 1960). Ulric Neisser, often regarded as the father of cognitive psychology, focused on defining the field by studying the processes of perception, memory, and attention. His work demonstrated the importance of scientifically investigating how mental processes influence behaviour, thus broadening the scope of cognitive psychology (Neisser, 1967). During the cognitive revolution, between 1945 and 1965 (Johnson & Erneling, 1997), the notion of the mind being a black box was replaced by the idea of information processing taking place in the mind – the student's mind can be seen as an information processor. In cognitivism, knowledge can be seen as a schema and learning is said to take place when there is a change in a student's schemata (Floden, 1981). The emphasis of this theory is on relationships that exist in processing new information and the integration of new information with previously acquired knowledge (Floden, 1981). Thus, cognitivism focuses on recognising and describing the mental processes that affect learning and the conditions that influence mental processing.

Constructivism emerged when researchers realised that people cannot be programmed like a computer, or they do not always respond in a particular manner to a particular stimulus. Constructivists emphasise consciousness and social influence on learning. They believe the mind plays a huge role in the way students learn (Harasim, 2012). From a constructivist view, knowledge is seen to be socially constructed. Therefore, it is mainly acquired from social processes or institutions that are socially constructed. These include HEIs, schools and in a more modern time through online communities (Harasim, 2012). Constructivists view the process of learning as active rather than passive and constructivist theory highlights that students create knowledge by interpreting and processing information received through their senses. This makes the student the main person involved for learning to take place and the educator merely acts as a facilitator (Anderson, 2004a; Anderson, 2004b). Mental representations of students are subjective, as new information is linked to previously acquired knowledge. A constructivist theory by Piaget indicates that a student does not require an expert in constructing his/her own knowledge, whereas Vygotsky (1978) believed that knowledge should be mediated by someone who knows more than the student. The emphasis of this theory is that students learn by actively engaging with the world and reflecting on their experiences to develop their understanding. Constructivism is seen as a social process, meaning that

communication between student and educator is required. Therefore, the role of technology is to facilitate the social process (Harasim, 2012).

These historical theories were developed in a different technological context, eras where technology did not influence teaching and learning. Technology has evolved and changed how we teach and learn. Therefore, these learning theories need to reflect this change (Siemens, 2005). Connectivism describes the link between human learning and access to knowledge enabled by technology (Corbett & Spinello, 2020). Connectivism theory is for this era, the digital age, where students and educators work in a networked environment and are influenced by new technologies. As Siemens (2005) states "connectivism is the integration of principles explored by chaos, network, and complexity and self-organization theories." With this in mind, we can see that learning transpires in unclear and indefinite environments. Therefore, the student is not entirely in control. The theory of connectivism is motivated by the view that learning is based on indefinite environments, thus, the student's ability to distinguish between significant and insignificant information is important. Additionally, it is important that students can see when new information changes old information. Students' learning is influenced by a network of personal knowledge that interacts with communities. These communities, in turn, provide feedback and new learning opportunities, creating a self-sustaining cycle.

The learning theories that were discussed can be categorised based on their focus. Behaviourist theory is well-suited for teaching factual knowledge (the what), cognitive theories emphasise teaching processes and underlying principles (the how), while constructivism prioritises teaching for deeper understanding and personal meaning (the why) (Anderson, 2004a; Anderson, 2004b).

2.4.2.3. Course Structure and Design

Online course design is a complex, iterative process that begins with a broad framework and gradually develops through cycles of refinement (Bennett et al., 2017). Effective online course design necessitates a structured approach. Clear course organisation, including well-defined learning outcomes, content modules, and assessment criteria, is crucial for student success. A well-structured course provides a roadmap for students, assisting in independence and reducing confusion (Makda & Dlamini, 2022). While flexibility is essential in online learning, a solid course foundation ensures that students can access and navigate content effectively (Kim et al., 2022).

Makda and Dlamini (2022), whose work build from the framework of Quality Matters (2014) and the Online Learning Consortium (2014) developed a framework that suggests five dimensions for quality design of online courses: (1) course information, structure and organisation, (2) interaction and communication, (3) multimedia design, (4) assessment and feedback, and (5) effective use of technology. Sun and Chen (2016) concluded that effective online instruction hinges on three key factors: (1) well-designed course content with instructor-student interaction, (2) a thriving online learning community, and (3) the continuous evolution of technology. Student-centred course design is imperative as student-centred learning empowers students to construct knowledge based on their experiences, rather than passively receiving information (Kumbo et al., 2023). This personalised approach accommodates diverse learning styles, interests, and backgrounds. Modern technology facilitates this model by providing students with interactive tools to explore and demonstrate their understanding (Annansingh, 2019).

Synchronous and Asynchronous Teaching and Learning

Synchronous learning is real-time online instruction, mirroring a traditional classroom with live interaction between students and academic educators. It facilitates immediate interaction and feedback between students and academic educators, enhances student engagement and motivation through real-time discussions, and builds a sense of community (Amiti, 2020). Some examples of synchronous sessions are live video conferencing using MS Teams or Zoom, online webinars, virtual classrooms and even real-time chat sessions. On the other hand, asynchronous learning provides students with flexibility by enabling them to engage with course materials and complete assessments at their convenience, without requiring synchronous interaction with the academic educator. Video lectures have transformed traditional teaching. Online learning offers flexibility, allowing students to learn at their own pace and review material as needed. This personalised approach reduces stress and accommodates diverse learning styles. Liang et al. (2020) found that students appreciate the ability to access content anytime, anywhere, and benefit from features like subtitles and the option to rewatch videos.

This provides flexibility for students with varying schedules and time commitments, allows for in-depth study and reflection on course materials and promotes self-directed learning and autonomy (Dhurve et al., 2023). Some examples include the use of pre-recorded lectures or video tutorials, online discussion forums, email communication, self-paced modules and assignments. Chung et al. (2020) found that pre-recorded lectures were the most popular online

learning format among students and Lapitan et al. (2021) found that pre-recorded lectures have significantly enhanced student learning. The use of pre-recorded videos is supported by Dhawan (2020). Combining both methods creates a balanced learning experience, catering to diverse needs (Amiti, 2020). Synchronous sessions are ideal for real-time interaction and discussions, while asynchronous platforms deliver content and independent tasks. Clear guidelines and regular assessment ensure an effective blended learning approach.

Combining a balance between asynchronous and synchronous learning approaches is most effective for supporting student success in online environments (Moorhouse & Wong, 2022). The effectiveness of online learning hinges on encouraging active student engagement and meaningful interactions. While asynchronous tools provide access to content, synchronous methods like webinars offer real-time engagement and interaction. The Community of Inquiry framework emphasises the importance of cognitive, social and teaching presence for successful online learning (Garrison et al., 2000). The significance of student-student, student-educator, and student-content interactions. While a strong presence in one area can compensate for weaker areas to some extent, a balanced approach is generally preferred. Creating a sense of community and immediacy through various strategies, such as welcome messages and student profiles, is crucial for enhancing the overall online learning experience. Essentially, the success of online learning depends on a combination of factors, including active student participation, effective communication, and a supportive learning environment (Cong, 2020).

Assessment and Evaluation

Assessment has always been fundamental to education. Traditionally, academic educators imparted knowledge to students. However, contemporary education has evolved, incorporating collaborative learning and student-centred approaches. These shifts emphasise the role of social interaction and shared knowledge building in learning. Regardless of the teaching model, assessment is crucial for tracking student progress and identifying areas for improvement. In recent times, the pressure to demonstrate educational effectiveness has intensified, with increased scrutiny from various stakeholders. This has led to demands for more frequent, rigorous, transparent, and accessible assessments (Perera-Diltz & Moe, 2014).

The emergence of online learning has further complicated the assessment space. While students appreciate the flexibility of online education, they expect similar learning outcomes as in traditional classrooms. This places greater demands on academic educators to be accessible, provide timely feedback, and build rapport with students in a virtual teaching and online

learning environment (Perera-Diltz & Moe, 2014). Mandernach (2018) highlights the crucial role of academic educators in providing timely and actionable feedback to enhance student learning and progress. Academic educators can actively participate in discussions, offering regular guidance to significantly impact student outcomes. To further meet these challenges, academic educators must re-examine assessment practices. They can deepen their understanding of assessment principles and can better support student learning and demonstrate programme/course effectiveness in an increasingly complex educational environment.

South Africa's national policy recommends that HEIs follow specific guidelines when designing and implementing assessments. The assessments should be: (1) valid – it measures that which it sets out to measure, (2) reliable – measures or produces similar results under consistent conditions, (3) integrity – honesty in the assessment process, (4) transparent – all parties clearly understand the processes, (5) accountability – the stakeholders acknowledge and account for their responsibilities, (6) fairness – students are assessed on what they know and have been taught, (7) absence of bias – assessments do not in any way advantage or disadvantage particular students or groups of students, (8) sensitivity to language – avoid causing language to come with variants in learning, and (9) credibility – the physical and other conditions under which assessment is conducted do not unfairly prejudice assessment activities and outcomes (SAQA, 2014, pp. 11-12).

Biggs (1996) introduces constructive alignment, a pedagogical approach that emphasises the interconnectedness of learning outcomes, teaching activities, and assessment. By aligning these three components, academic educators can create a coherent and purposeful learning experience. This framework promotes student-centred learning, encouraging active knowledge construction rather than passive knowledge acquisition. Constructive Alignment ensures that teaching and assessment directly support the achievement of desired learning outcomes, ultimately enhancing student success.

Mphahlele (2024) found that effective communication, timely feedback, and appropriate technology are essential components of successful collaborative assessments. These elements increase student engagement, motivation, and ultimately, improve learning outcomes. Bearman et al. (2023) offer a comprehensive framework for integrating digital technologies into assessment practices in higher education. Their research signifies the complexity of this integration, highlighting the need for a nuanced approach through categorising the use of digital tools into three primary purposes: (1) as a tool for improvement, (2) as a means to develop

digital literacies, and (3) as a means to develop uniquely human capabilities. The authors provide a clear roadmap for academic educators to design assessments that not only improve learning outcomes but also develop essential digital literacies and uniquely human capabilities. Huber et al. (2024) identify five core design principles for effective online assessments: (1) maintaining academic integrity, (2) providing high-quality feedback, (3) enhancing student learning experiences, (5) safeguarding student data, and (5) ensuring equitable assessment opportunities for all students.

Raynault et al. (2022) explore the challenges and benefits of implementing e-authentic assessment in higher education. The authors examine how technology can be used to create assessment tasks that more closely resemble real-world challenges. They share insights and examples of successful e-authentic assessment practices, such as video presentations, interviews, and e-portfolios, while also discussing the challenges and considerations involved in their implementation. Formative and authentic assessments are crucial for cultivating critical thinking skills and knowledge construction. Academic educators can encourage deeper learning and cognitive engagement through formative and authentic assessments to enhance critical thinking and problem-solving abilities (Hussin et al., 2019).

There is a growing significance of e-assessment in reshaping education. Technology is becoming an indispensable component of teaching and learning, necessitating a redefinition of roles for both academic educators and students (Ghouali et al., 2020). This digital era demands flexibility, adaptability, and a rethinking of traditional educational practices (Ortiz-Lopez et al., 2024). E-assessments offer a flexible and efficient way to evaluate student learning and provide academic educators with a versatile toolkit for the evaluation of learning. By incorporating a variety of assessment formats, academic educators can gain a comprehensive understanding of students' knowledge, skills, and abilities. This not only offers a holistic view of student performance but also enhances student engagement by catering to diverse learning styles (Bearman et al., 2023; Tinoca et al., 2014). Additionally, e-assessments often streamline the grading process through automated feedback, allowing academic educators to dedicate more time to providing personalised support. Furthermore, certain e-assessment methods, such as simulations and e-portfolios, offer opportunities to assess real-world skills and problem-solving competencies (Raynault et al., 2022). Tinoca et al. (2014) developed a framework for effective e-assessment in higher education, aiming to improve the quality and reliability of online assessments. The authors propose four key dimensions for evaluating e-assessment strategies: (1) authenticity, (2) consistency, (3) transparency, and (4) practicability. It should

also be noted that there is an increase in academic misconduct and cheating. Technology can hinder academic integrity; however, it can also facilitate it. While it can be used for cheating, it can also be employed to promote higher-order thinking skills through open-book exams and streamline administrative tasks. However, the effectiveness of technology in education is contingent upon equitable access to the necessary resources, including devices, internet connectivity, and academic educator training. Students from disadvantaged backgrounds may require additional support to fully participate in online learning and assessments (Haleem et al., 2022).

Equally important to assessment is the feedback provided on the assessment. Mandernach (2018) found four key areas that must be addressed for impact and efficiency of feedback in online courses: (1) course structure – design courses to incorporate automated feedback mechanisms that provide immediate responses to student submissions, (2) learning materials – develop instructional resources and activities that minimise the need for extensive post-assignment feedback, (3) feedback management – employ technology to streamline and automate common feedback, freeing up instructor time for more complex and personalised responses, and (4) student outcomes – focus on maximising the learning benefits of feedback to ensure the effective use of instructional time.

Universal Design for Learning (UDL)

Universal Design for Learning (UDL) offers a valuable framework for creating inclusive online learning environments (Rao, 2021). UDL is often associated with technology tools; however, while technology can be a valuable component, UDL is fundamentally about creating learning environments accessible to all students, regardless of their abilities or disabilities (King-Sears, 2009). UDL emphasises designing products and environments that are usable by everyone without requiring modifications. In education, this means creating instruction that accommodates diverse students from the outset. This involves both technological and pedagogical approaches (Capp, 2017; King-Sears, 2009). UDL is guided by seven principles: (1) equitable use, (2) flexibility, (2) simplicity, (3) perceptibility, (4) tolerance for error, (5) low physical effort, (6) size, and (7) space. These principles can be applied through technology, such as digital textbooks or virtual manipulatives. However, effective pedagogy is equally crucial. Clear explanations, varied presentation methods, and targeted feedback are examples of pedagogical UDL (King-Sears, 2009).

Basham et al. (2020) state that UDL is a transformative approach to education. The authors argue that by implementing UDL principles, educational systems can be redesigned to better meet the diverse needs of all students, including those with disabilities. The authors emphasise the role of UDL in addressing digital inequities and creating more inclusive online learning environments. UDL is a pedagogical approach that recognises the diverse needs of students by providing multiple ways to engage, represent, and express knowledge. With its three core principles: (1) multiple means of representation, (2) action & expression, and (3) engagement, which ensures that academic educators cater to diverse students by providing a variety of options and supports. Technology-based learning platforms and digital tools play a key role in implementing these principles (Rao, 2021). These tools, encompassing hardware, software, and learning environments, offer flexibility in presenting information (text, visuals, audio), allowing students to choose how they receive it. Similarly, digital tools empower students to express themselves in various ways, encouraging creativity and inclusivity. In other words, by focusing on flexibility and inclusivity, UDL leverages technology to create learning environments that cater to all students, including those with disabilities. Digital technologies are crucial for implementing UDL principles, as they offer opportunities for personalisation and customisation (Capp, 2017). It is important to create learning environments that cater to the diverse needs of all students (Espada-Chavarria et al., 2023). Integrating UDL principles during instructional design allows academic educators to leverage digital tools and formats to create inclusive online learning experiences that meet the needs of all students. Furthermore, online learning environments can be inherently engaging due to their ability to provide authentic learning opportunities and promote interaction and collaboration (Rao, 2021).

In simple words, UDL is about creating inclusive teaching and learning environments where all students can succeed. It's not just limited to adapting materials for students with disabilities but designing instruction that benefits everyone. Academic educators should combine technology and effective teaching practices to create learning experiences that are engaging, accessible, and effective for all students.

Instructional Design

Instructional design is the systematic process of creating effective learning experiences (Reigeluth, 2013; Reigeluth, 1983; Reiser, 2001). It involves designing engaging and structured courses that cater to the unique needs of digital students in virtual teaching and online learning environments. This process encompasses identifying student objectives, selecting appropriate media, developing interactive activities, and designing assessments that

align with course goals. Academic educators need to carefully consider factors such as student characteristics, technology capabilities, and accessibility. Instructional designers can create online learning environments that promote student engagement, motivation, and knowledge acquisition (Reigeluth, 2013).

Depending on the distribution of the course, academic educators may adopt synchronous (occurring collaboratively at the same time across different locations) or asynchronous (occurring at any time) methods and communication to provide teaching and support to their students. Zhu et al. (2016) introduce a smart education framework where one of the elements emphasises the importance of instructional design. It includes the creation of learning objectives, learning activities and the provision of rules and guidance for students.

With globalisation, good design strategies must be implemented in the development of online learning materials (Ally, 2004). Makda and Dlamini (2019) developed a framework that contains a set of benchmarks which assists academic educators, instructors and course designers in one of two ways; (1) as a self-evaluation tool for an online course thus advising the appropriate stakeholder on how to revise their current online course, and (2) as a best practice guideline to design a new course within the online environment. The framework found five dimensions (1) course information, course structure and course organisation, (2) interaction and communication, (3) multimedia design, (4) assessment and feedback, and (5) effective use of technology with a total of 62 components that are indicators of quality course design and development. Ally (2004) states that educators need to consider language skills, technology abilities, the different time zones etc. whilst they are developing the various online learning materials. Students can access course material from any location to communicate and interact with the course material using mobile devices. Therefore, academic educators must consider the support affordance on these devices so that students can engage at any time from any location (Ally, 2011).

Integrating digital technologies effectively involves carefully selecting and incorporating digital tools to enhance specific learning objectives. This requires a thorough understanding of the curriculum, identifying suitable digital technology resources, and strategically planning their use within lessons. Academic educators can align technology with learning goals and optimise student outcomes to create more engaging and dynamic learning experiences. Aligning instructional design with student learning needs and ensuring efficient delivery of course content is important (Bao, 2020). While technology provides numerous tools for

teaching and assessment, it is the careful integration of these tools with sound instructional design that truly maximises the potential of online learning (García-Morales et al., 2021).

2.4.2.4. Engagement, Interactivity and Collaboration

Engagement, interactivity and collaboration are the foundation of effective online learning, cultivating knowledge creation and sharing among students. Collaborative learning is believed to stimulate active engagement and critical thinking, a vital 21st century skill. To cultivate these skills, learning environments must prioritise higher-order thinking activities. Technology has transformed how students learn and interact, particularly in online settings, where social learning thrives (Hussin et al., 2019). Murphy and Cifuentes (2001) provide an understanding of effective online course design, emphasising a balance between structured learning and dialogue, emphasising the importance of developing a sense of community.

Jones-Roberts (2018) offers five practical strategies to cultivate a stronger sense of community and connection among students in a virtual teaching and online learning environment. These are: (1) structured icebreakers – carefully designed introductory activities can help students feel comfortable and engaged from the start, (2) encouraging personal connection – regular opportunities for students to share personal reflections and insights can deepen relationships, (3) leveraging video – incorporating video content, from instructor introductions to student discussions, can create a more personal learning environment, (4) video discussion board – using video discussion boards as it enhanced student interaction and engagement compared to traditional text-based forums, and (5) audio feedback – providing audio feedback on assignments can enhance student engagement and satisfaction.

Student engagement in virtual teaching and online learning is a complex interplay of behavioural, cognitive, and emotional factors (Draxler-Weber et al., 2022). Active participation, critical thinking, and positive attitudes are essential components. Course design plays a vital role in creating engagement through providing opportunities for interaction, collaboration, and meaningful learning experiences. To maximise student engagement, it is crucial to consider these interconnected dimensions and create a supportive teaching and learning environment (Dubey et al., 2023; Simelane-Mnisi, 2023).

Effective teaching involves collaboration, care, and a democratic, inclusive approach (Carrillo & Assuncao Flores, 2023). Simelane-Mnisi (2023) found that academic educators employed a combination of LMS features and third-party tools to encourage student interaction and engagement in online learning. These tools include discussion forums, group projects, video

conferencing, and instant messaging platforms. Jeong and Hmelo-Silver (2016) identifies seven core functions technology can provide to support collaborative learning: (1) shared tasks, (2) communication, (3) resource sharing, (4) effective collaboration processes, (5) knowledge co-creation, (6) learning management, and (7) community building. The authors propose design strategies and examples to enhance these functions in collaborative learning using technology. While technology is crucial for collaborative learning, it must be integrated with effective teaching methods and supportive learning environments. Importantly, technology should complement, not replace, the core goals of education.

2.4.2.5. Conducive Learning Environment and Workspace

A conducive learning environment is imperative for effective virtual teaching and online learning. It significantly impacts student engagement, focus, and overall academic performance. Ocloo et al. (2023) found that students identified significant distractions hindering their focus during virtual classes. Primarily, domestic disturbances from family members and household activities interfered with their learning. Additionally, external noises, such as music and generator sounds, created disruptions. The digital environment itself posed challenges, with constant temptations to multitask and the overwhelming presence of other students' background noise. Students also express difficulties adapting to the unstructured learning environment, managing technical issues, and coping with prolonged screen time. These factors collectively impacted student engagement and the overall learning experience.

Consequently, a dedicated and well-structured set-up or space is needed that minimises distractions and enhances concentration to create a positive learning atmosphere (Lao et al., 2021). Academic educators and students can create a conducive learning environment starting with a designated workspace free from clutter and interruptions. They should ensure adequate lighting (Coetzee & Matthee, 2021; Fathy et al., 2020) and invest in ergonomic furniture for comfort and productivity. Fathy et al. (2020) emphasise the critical role of physical workspaces in assisting academic educators and students' well-being and productivity. The study explains the importance of designing work environments that prioritise physical and psychological health, leveraging technology to monitor and optimise workspace conditions, and considering factors such as architecture and sensory elements.

All participants should isolate themselves when studying online (Coetzee & Matthee, 2021) as this assists in minimising noise disturbances. Both academic educators and students should find a quiet area or use noise-cancelling headphones. Eliminating distractions such as barking dogs,

notifications, and unnecessary background activity is essential for maintaining focus (Lao et al., 2021). Sim et al. (2023) found that many students struggled to concentrate and participate effectively during synchronous learning sessions due to the lack of a conducive learning environment. Additionally, the physical space, a reliable internet connection, functional equipment, and the necessary software are crucial for seamless online learning. Academic educators can develop a positive and supportive learning environment by setting clear expectations, providing regular feedback, and incorporating interactive elements into lessons. Effective time management is also vital for success in virtual teaching and online learning.

2.4.3. Exosystem Level

At the exo level, the research study looks at the broader higher education institution structures and processes involved in virtual teaching and online learning. This includes the institutional systems and planning, institutional policy, procedure and practice, student support, academic educator support through professional development and the availability of infrastructure and coordination of resources for both students and academic educators to ensure effective teaching and learning practices.

2.4.3.1. Digital Learning Ecosystem (DLE)

A Digital Learning Ecosystem (DLE) goes beyond just online learning platforms. DLEs are complex environments where people (academic educators and students), digital technologies, digital pedagogies, and practices interact to support learning. The concept is adapted from biology, emphasising interconnectedness and interdependence (Tammets et al., 2022). DLEs are an interconnected network of technologies, practices, and stakeholders that work synergistically to create a cohesive and supportive educational environment (Bojórquez-Roque et al., 2024). It's a dynamic and adaptable system that combines technology with the social aspects of learning. Effective DLEs balance of technological, pedagogical, and social elements. They support collaborative, competency-based learning and promote self-regulation (Bojórquez-Roque et al., 2024; Tammets et al., 2022).

It is a learning environment where students, academic educators, and even experts interact using various digital tools and resources. These tools can be anything from online platforms and educational content to communication tools like MS Teams, WhatsApp etc. that facilitate collaboration and communication (Almahasees & Qassem, 2022; Makhoere et al., 2020). Importantly, a DLE doesn't exist in isolation. It considers the social, economic, and cultural context of the users, ensuring the learning experience considers these broader influences. This

creates a holistic approach to learning where technology empowers people to learn together within a specific social, economic and cultural environment (Bojórquez-Roque et al., 2024; Väljataga et al., 2020).

2.4.3.2. Infrastructure and Resources

The digital divide persists despite the prevalence of technology; access to reliable internet and suitable devices remains unequal. While many students rely on mobile devices, limited connectivity and data constraints hinder full participation in online activities (Alenezi et al., 2023). The pandemic significantly exposed and worsened the existing digital divide within South Africa's higher education system, as highlighted by Woldegiorgis (2022). Students from disadvantaged backgrounds faced severe challenges continuing their studies due to a lack of access to crucial resources. This included limitations on digital devices, reliable internet connections, and suitable learning environments. Woldegiorgis (2022) emphasises the need for comprehensive strategies, advocating for a coordinated effort from both government and non-governmental organisations to bridge this digital gap and create inclusive digital learning opportunities for all students.

Access to Internet, Hardware and Software

Virtual teaching and online learning are emerging as key modalities; however, the efficacy of these approaches is contingent upon adequate access to the internet, hardware, and software for both academic educators and students (Makumbe, 2020).

Reliable internet speeds enable students to engage in online lectures, access course materials, participate in virtual discussions, and submit assignments (Bucăţa & Tileagă, 2024). Similarly, academic educators require stable internet connections to deliver engaging online content, interact with students in real-time, and manage administrative tasks efficiently (Prajveen et al., 2024).

Hardware, encompassing devices such as computers, laptops, and tablets, is another crucial component of virtual learning. Students with access to suitable hardware tend to exhibit higher levels of engagement and satisfaction with online courses (Nadeem & Blumenstein, 2021). The availability of devices empowers students to participate actively in online activities, conduct research, and collaborate with peers. For academic educators, appropriate hardware facilitates the creation and delivery of multimedia-rich content and the use of educational software, and the management of student assessments. Many higher education institutions, particularly those in under-resourced areas or with students from these areas who lack sufficient computers and

devices to support online learning struggle most (Makumbe, 2020). Students from low-income backgrounds often do not own computers or smartphones, limiting their ability to access educational materials and complete assignments. This lack of hardware access further exacerbates the digital divide and hinders students' academic progress (Azıonya & Nhedzı, 2021).

Moreover, the availability of appropriate software is a critical factor. Software applications play an important role in supporting virtual teaching and learning processes. Learning management systems (LMS), video conferencing platforms, and productivity tools have become essential for delivering and managing online courses. The effective use of software can enhance student motivation, facilitate collaboration, and improve learning outcomes (Ahmed et al., 2023). Academic educators benefit from software tools that streamline course design, content creation, and assessment processes. While there has been growth in the adoption of LMSs and other educational software, disparities persist. Some institutions lack the necessary licenses or infrastructure to support these tools effectively. Additionally, the digital literacy of academic educators and students varies significantly, impacting their ability to utilise software for teaching and learning purposes.

The importance of bridging the digital divide to ensure equitable access to education should not go unattended. HEIs need to provide academic educators and students with laptops or tablets that can significantly improve their academic performance. Furthermore, initiatives aimed at improving internet connectivity in rural areas are crucial for expanding access to online learning opportunities. The provision of internet, hardware, and software is essential for the successful implementation of virtual teaching and online learning in South Africa. Addressing the digital divide and ensuring equitable access to these resources is imperative for creating inclusive and effective educational environments (Chiemeke, 2010; Van Dijk, 2002).

Institutional Enabled Resources (Educational Technology Hubs, Community Learning and Regional Centres)

Educational technology hubs, community learning and regional centres have emerged as critical infrastructures given the contextual realities of South Africa. These structures play an important role in bridging the digital divide, enhancing access to education, and supporting higher education's virtual teaching and online learning initiatives.

Educational technology hubs, community learning and regional centres are physical spaces equipped with technological resources and personnel to facilitate learning and skill

development. They serve as community anchors, providing access to hardware, software, internet connectivity, and digital literacy programmes. These structures are instrumental in supporting virtual teaching and online learning initiatives, a modality that has gained prominence, particularly in light of the pandemic. LMSs have become essential tools in virtual environments, and educational technology hubs, community learning and regional centres can provide the necessary infrastructure for students to access and engage with these platforms (Netanda, 2020). The importance of educational technology hubs, community learning and regional centres extends beyond providing technological access. They are catalysts for social-political and economic development (Peters, 2023). These structures can offer opportunities for skill acquisition and digital literacy that empower students, particularly in marginalised communities, to participate fully in the digital age. Furthermore, they can serve as platforms for community engagement and collaboration, developing a sense of belonging and shared purpose.

In the context of South Africa, with its extensive geographical distances and socio-economic disparities in educational resources, educational technology hubs, community learning and regional centres are essential for ensuring equitable access to education. Pretorius et al. (2021) emphasise the role of real-world engagements and these hubs can provide opportunities for students to apply their knowledge in practical settings. Additionally, they can support the greening agenda in education, as explored by Pretorius et al. (2015), by promoting sustainable practices and resource management.

On the other hand, while the potential of educational technology hubs, community learning and regional centres is immense, challenges remain. Issues of technology accessibility, as discussed by Netanda (2020), and the need for skilled personnel to support students are ongoing concerns. Moreover, ensuring the sustainability of these initiatives requires careful planning and resource allocation. Wright et al. (2014) offer valuable insights into establishing successful learning centres, which can be applied to the South African context.

2.4.3.3. Digital Inclusion and Digital Equity

The concept of access to digital technologies is complex and multifaceted. While often narrowly defined as physical access to devices and infrastructure, a broader perspective encompasses the entire process of technology appropriation. This includes factors such as motivation, attitudes, skills, and social context. Academic educators and students must not only acquire technology but also develop the competence to use it effectively (Van Dijk, 2017).

Digital inclusion is ensuring everyone has equal access to and use of information and communication technologies (ICTs). It goes beyond simply providing internet access; it involves creating opportunities for individuals and communities to participate fully in this digital era. As Van Dijk (2017) highlights, the digital divide, characterised by unequal access, is a significant barrier to digital inclusion. To overcome this, digital inclusion in education aims to bridge the digital divide by ensuring equitable access, use, and outcomes of technology. This involves providing sufficient infrastructure, promoting digital literacy, and supporting the integration of technology into teaching and learning for equitable educational experiences.

Digital equity in education involves providing all students with the necessary digital skills and resources to fully participate in learning. This requires not only equal access to technology but also the effective use of these tools to support diverse learning needs (Dlamini, 2022). By leveraging digital technologies to provide additional resources and support, HEIs can work towards achieving equitable outcomes for all students. Beyond students' access to digital technologies or devices, epistemological access is important too. Epistemological access refers to students' ability to engage deeply with knowledge and develop understanding, beyond simply having access to educational resources (Bekker & Carrim, 2021). While traditional access focuses on enrolment and resources, epistemological access emphasises the quality of teaching and learning that enables students to construct knowledge. Online learning raises questions about whether access to digital platforms equates to genuine epistemological access (Bekker & Carrim, 2021). Effective online learning requires careful consideration of the knowledge presented, how it's taught, and how student understanding is assessed. It's essential to prioritise theoretical knowledge and provide opportunities for students to think critically and apply their learning. To ensure epistemological access in online environments, academic educators must prioritise student-centred learning, create opportunities for knowledge construction, and address the digital divide.

2.4.3.4. Student Support

Digital inequality in human digital capital is a significant challenge in Africa, hindering the effective implementation of digital education. Unequal access to technology and digital skills creates a divide that prevents many students from benefiting from online learning (Ragnedda et al., 2020). While some higher education institutions have embraced digital innovation, they often neglect user-centred design principles (Yu & Dlamini, 2024). To achieve inclusive and sustainable digital transformation, it is crucial to address these disparities and adopt a systematic, student-focused approach.

Induction and orientation programmes serve as critical gateways to higher education, shaping students' academic journeys (Floris et al., 2021; Herridge et al., 2020). To bridge the digital divide and empower students, these programmes must prioritise digital literacy development. HEIs can equip students with the tools necessary to navigate the digital space of higher education effectively by providing comprehensive digital skills training. This includes proficiency in using learning management systems, conducting online research and using digital communication tools. HEIs need to be creative in how they design their induction and orientation programme (Herridge et al., 2020). Equitable access to technology is another essential component. Providing students with devices and reliable internet connectivity is crucial for their success (Aldhafeeri & Male, 2016). Furthermore, offering mentorship and support systems can facilitate a conducive learning environment where students feel confident to explore and experiment with digital tools.

Effective online learning requires a holistic approach that prioritises not only academic success but also student well-being. Academic educators and students face multiple challenges that impact their well-being and mental health (Barbayannis et al., 2022). Students enrolled in instructor-led courses reported a higher sense of community (Epp et al., 2017). The transition to online education can be isolating, emphasising the need for effective support systems. Therefore, careful selection of online tools is crucial to prevent overwhelming students and to create a productive learning environment (Carambas & Espique, 2023). Moosa and Bekker (2022) found that the detrimental impact of the rapid shift to online learning on first-year students' well-being. The study revealed a decline in physical, emotional, psychosocial, and financial well-being among students during the Covid-19 pandemic. These findings highlight the urgent need for HEIs to prioritise student mental health and support services, especially within the context of virtual teaching and online education.

2.4.3.5. Academic Educator Support

The higher education sector has experienced a paradigm shift, marked by the increasing adoption of virtual teaching and online learning. To navigate this shift effectively, academic educators require professional development to equip them with the necessary competencies.

Professional development is paramount for academic educators to enhance their professional capital, stay abreast of pedagogical advancements and maintain the quality of education. Pham (2021) emphasises the critical role of professional development in uplifting the capabilities of academic educators in HEIs. For virtual teaching and online learning, this development is even

more crucial, as it demands a distinct skill set that encompasses technological proficiency, instructional design, and student engagement strategies. Queiros and de Villiers (2016) highlight the need for tailored professional development programmes to address the specific challenges of online learning.

The impact of professional development of academic educators on academic practices has a ripple effect. Guilbaud et al. (2021) emphasise the correlation between professional development and academic educators' perceptions of accessibility in online learning. Through targeted training, academic educators can develop the skills to create inclusive and engaging virtual teaching and online learning environments. Chi and Oanh (2023) propose a process for training online teaching competence, highlighting the potential of structured professional development to enhance academic educator capabilities. Moreover, Prasetyo et al. (2022) assert that professional development is instrumental in elevating academic educators' professionalism, which ultimately contributes to the overall effectiveness of HEIs.

Institutional support acts as a catalyst for successful academic educator professional development. Kaqinari et al. (2022) highlight the important role of institutional support in facilitating the transition to online teaching during the Covid-19 pandemic. By providing adequate resources, training, and mentorship, institutions can empower academic educators to confidently embrace virtual teaching and online learning. Clapp (2021) further emphasises the importance of institutional support in guiding academic educators through the transition from face-to-face to online teaching. Effective virtual teaching and online learning necessitate comprehensive training for academic educators to assist in overcoming barriers to successful online education. From technological proficiency to pedagogical skills, ongoing training is essential for maximising the potential of digital learning environments (Turnbull et al., 2021). Almada et al. (2014) found that training academic educators in digital technology use and guiding them in course development significantly enhanced their technological proficiency. HEIs also need to support academic educators in increasing their competencies for virtual teaching and online learning modes of instructional delivery. Johnson et al. (2019) stated that effective online education hinges on a strong foundation of instructional pedagogy, technological expertise, and collaborative support. Academic educator development, informed by student feedback, is crucial for optimising online learning experiences and outcomes. Stakeholders such as administrators, academic educators, students, and higher education institutions can elevate the quality and reputation of their online programmes by building a shared commitment to online education.

2.4.3.6. Institutional Planning and Support

Institutional acknowledgement of multiple stakeholders as integral contributors to teaching and learning is essential for the enduring success of online learning initiatives (Padayachee & Dison, 2021). Academic educators play an important role in the success of online education. While technology is essential, effective instruction depends on academic educator expertise (Pedro & Kumar, 2020). Transitioning to online teaching presents challenges, including increased workload and the need for new skills. Institutional support is crucial for a successful transition to online learning. Comprehensive institutional support is crucial for overcoming these obstacles. HEIs should provide training, resources, administrative assistance, peer support, and student support to empower academic educators (Pedro & Kumar, 2020). By aligning these support services with institutional goals and demonstrating strong leadership, institutions can enhance academic educator satisfaction, improve online teaching quality, and ultimately contribute to student success. Additionally, providing clear guidance, technical assistance and training for academic educators and students are necessary components of this support (Turnbull et al., 2021). Maphalala and Adigun (2021) suggest providing academic educators with prompt technical assistance to ensure positive e-learning outcomes.

At an institutional level, administration, academic affairs, and student-related services are dealt with (Khan, 2003). Educational institutions affect the economy through future output and income via human capital formation (Blackwell et al., 2002). Each HEI has a particular purpose in a student's education and learning process; thus, it impacts the way students learn. In the design and development of the virtual teaching and online learning framework, all types of HEIs need to be considered. It must be known that there is no one-size-fits-all; however, as much as possible, the design and development must accommodate all institutional types.

It is important for HEIs to conduct comprehensive planning and support for online students, rather than simply focusing on course design and delivery. Carefully planned online learning ecosystems can contribute to the overall resilience of educational institutions (Moore & Piety, 2022). Zhu and Liu's (2020) stresses the need for educational institutions to develop effective strategies for online teaching and learning, while also addressing the digital divide and ensuring equitable access to education. They highlight the importance of careful planning and preparation for the long-term implications of the pandemic on education. Dlamini (2022) also highlights the need for careful planning and implementation to ensure that digital education benefits all students, especially those in disadvantaged areas.

There exists a variety of cultures and quality academic educators across the different institutions. Institutions need to invest some time in exploring the quality of the academic educators before designing relevant training programmes. Training programmes may need to be improved or implemented at an institutional level to ensure that all academic educators have the necessary digital skills in this digital economy (Johnson et al., 2019). They can then assign specific individuals to monitor the implementation of training that is in place to improve the academic educator's knowledge and the overall quality of teaching (Fabrice, 2010).

2.4.3.7. Institutional Policy, Procedures and Practice

The technology adoption policies at an institutional level need to be considered as well. Policies are designed across the different institutes. Stewart (2020) found that educators find it difficult to implement technology policy due to the lack of time and resources. South Africa lacks a comprehensive national policy framework specifically addressing ICTs and digital technologies in higher education. While there are various ICT policies in place, these are fragmented and do not provide clear direction for the higher education sector. This lack of coordination hinders the effective integration of digital technologies into higher education (Czerniewicz et al., 2006). South African HEIs lack a clear national ICT policy framework. This has led to inconsistent and uneven ICT policies at the institutional level. Without a national guideline, HEIs struggle to align their ICT strategies with national priorities and often make reactive decisions based on immediate needs rather than long-term goals. This inconsistency is further compounded by varying levels of ICT expertise and resources across institutions, resulting in a diverse range of ICT policies and practices (Yu & Dlamini, 2024). Essentially, the absence of a national ICT policy has led HEIs to operate independently, leading to potential inefficiencies and disparities in ICT integration.

Clear and comprehensive digital transformation and ICT policies are essential for developing aligned and effective courses (Paudel, 2021). While digital education is gaining traction, a lack of institutional support, unclear ownership rights for digital content, and the absence of specific incentives for the additional workload involved in creating digital materials are hindering academic educators' adoption of digital teaching methods (Røe et al., 2022). Successful digital transformation requires strong leadership, effective governance, and continuous improvement. HEIs must embrace digital innovation to stay competitive globally (Bucăţa & Tileagă, 2024). Institutional policies and incentives significantly impact academic educators' willingness to adopt new teaching approaches (Røe et al., 2022). Academic educators' teaching methods are primarily shaped by their immediate work environment, subject matter, and social context.

Makhaya and Ogange (2019) found that academic educators are more likely to adopt online learning when supported by clear guidelines, knowledge-sharing platforms, and a strong institutional commitment to nurture a community of online academic educators.

The role of technology in education should be included as part of the curriculum. Academic educators can effectively leverage technology in education by transforming teaching methods beyond simple tool use. Creating digitally rich curricula that align with learning goals and engage students is essential (Kumbo et al., 2023). Stewart (2020) found that educators design lessons that make use of technology, but these technologies are moulded to fit the educators' existing conceptions and ideologies. She further discovered that educators find it difficult to implement technology policy due to the lack of time and resources. The technological infrastructure and online learning environments are also an important component to consider (Bucăţa & Tileagă, 2024; Khan, 2003). Academic educators recognise the importance of using technology and are open to it; however, their understanding and use of technology is as an add-on rather than the technology acting as an integral part of their lesson. She also discovered that in most lessons, the traditional pen and paper method was replaced by a computer, but everything else in the lesson went on as usual (Stewart, 2020). When educational institutes aim to implement online and distance learning, the curriculum needs to be considered, and assessment types re-examined too (Ali, 2020).

There is a possibility that governments or education authorities might have to revisit their curriculum so that ICT knowledge is included to better prepare students (Ali, 2020). In other words, technologies are seen as an additional element rather than an enabler. It's currently being used to replace traditional methods, pedagogies, or actions rather than affording its full potential in allowing the learning environment to be more effective and efficient. If technologies are used correctly as part of the curriculum, they can add meaningful digital literacy skills for the students too. Chomunorwa et al. (2023) state that curricula must be designed to cultivate essential 21st century skills in students.

Irrespective of the intended curriculum content and guidelines, academic educators are still in control of the content, pedagogies and technologies used when planning and implementing the lesson. It does imply more responsibility on an academic educator's end; however, this is where the transformation into the digital economy prevails – to make use of digital pedagogies and digital technologies and move the roles of students from passive receptors to active and engaging producers of knowledge.

2.4.4. Macrosystem Level

At the macro level, the research study looks at the larger societal and systemic factors that influence virtual teaching and online learning. This includes socio-economic factors, socio-cultural attitudes towards online learning, national infrastructure affecting access for internet connectivity, government regulations, and broader trends in education, such as equality and equity.

2.4.4.1. Societal Imbalances and Economic Conditions

Society can be described as a system with subsystems or networks of mutually dependent parts with a specific goal or purpose (Challenger & Clegg, 2011). Education can be seen as one of its subsystems. For a societal system to work efficiently, there is an obligation to provide everyone with equitable access to an education that provides them with knowledge and skills to eventually contribute back into society (Dlamini, 2022). South Africa ranks as one of the most unequal countries in the world (McKeever, 2017). The country inherently has an unequal education system because of the apartheid era. Poverty is another factor for inequality of educational opportunities, as students may not have sufficient economic support (Saifi & Mehmood, 2011). This lack of economic support may also lead to high dropout rates in education. Students in rural areas attend poorly equipped schools with limited to no resources and still must compete with students in developed, well-equipped and informative environments (Saifi & Mehmood, 2011). Students from poor socio-economic backgrounds do less well at school than others (Robson, 2019). Dr Tony Bates, as cited in Valverde-Berrocoso et al. (2020), states that the Covid-19 pandemic demonstrated the current inequalities that exist in the education system and the need for universal and low-cost access to the internet for education.

The pandemic exacerbated existing inequities in education while simultaneously highlighting the potential of technology to expand access and create more inclusive learning environments (Kizilcec et al., 2023). Digital education is transforming the teaching and learning paradigm. Some opportunities that digital education provides are: (1) it can be cost effective in the long term, (2) allows flexibility and convenience for schedules as it is accessible from anywhere at any time, (3) it can contribute towards inclusivity as e-Learning can bridge some of the rural-urban gaps and make the same material available to both, (4) it helps to increase ICT skills which can lead to employability for students and also lead to an overall better workforce, (5) it can be more student-centred which can enable students to retain information better, (6) it can allow for a standard of education across South Africa (Alenezi et al., 2023; Hajam et al., 2021).

The transition to student-centred learning is essential for contemporary education, demanding a departure from traditional educator-centric methods. While technology often accompanies this shift, its core focus lies in empowering students to take ownership of their learning journey. Recognising the diverse needs of South African students, particularly those from disadvantaged backgrounds, requires tailored approaches. The pandemic accelerated this transition, necessitating a fundamental rethinking of higher education delivery and accessibility (Van Staden & Naidoo, 2022). The existing educational inequalities impact the economic and social lives of the students and the possibility of poverty that will be endured in their adult lives (Ndimande, 2016). Bhorat (2004) research on *Employment and Unemployment Trends in Post-Apartheid South Africa*, as cited in Ndimande (2016), indicates that schools with a lack of resources produce poor results, which impacts the graduation and dropout rates, resulting in increasing rates of unemployment.

The socio-economic status of students and their families acts as a strong indicator of a student's educational outcome. The socio-economic status is not only limited to the social and economic standings but expands further into the level of education and occupations of parents too. This is indicative that the socio-economic status impacts students' overall educational attainment as well as the likelihood of students' possible opportunities from an education (Bhorat, 2004). Educational opportunities are linked to the notion of equality in a social system. Students' access to education is perceived to eliminate the current social and economic inequalities that currently exist (Shukla & Mishra, 2020; Yelkesen & Bayar, 2024). Students with low socio-economic status and backgrounds will find it difficult to migrate (Adedoyin & Soykan, 2020). The South African society has the responsibility to work together to ensure that students from all races and socio-economic backgrounds gain access to education as a social justice call to redress the inequalities that arose from the apartheid system.

2.4.4.2. Socio-cultural Context

Integrating digital technologies into education requires a holistic approach that extends beyond simply providing access and training. This transformation necessitates a fundamental rethinking of education, challenging deeply held beliefs about traditional education. Successful integration involves significant cultural shifts among academic educators, students, institutions, and society as a whole (Carrim & Bekker, 2022).

A variety of computational cultures have been developed with the students who currently exist in the education system. There is an increase in social network activities, YouTube streaming,

video gaming and other computational activities that current students are involved in. Although digital technology is widely used in society and work life, it still has not been applied much in education (Ilomäki & Lakkala, 2018). This increase in digital technology use by the students indicates that the current design of the traditional educational system and these very same students are not aligned (Prensky, 2004). Digital technologies possess the potential to revolutionise learning, but their successful implementation depends on broader societal and cultural shifts (Fischer et al., 2020). HEIs should cultivate a culture of innovation to encourage the development of new ideas and solutions that harness the potential of digital technologies. This approach benefits both the institution and society at large (Bucăţa & Tileagă, 2024).

Prensky (2004) states that there is a need to think about how students learn in a dynamic and social context and how schools should deal with the new generation of students. He explicitly states that 'natives' are being taught by 'immigrants' and the language that they speak is again, not aligned. There is a big difference between the students and the social contexts that exist today and those that existed a decade or two ago. Their needs and how they operate are different and this should be understood and impact the existing curriculum guidelines. Most students now have access to computers, tablets, smartphones, and other tools of the digital age. The process of retrieving and using information via search, selection, accommodation and assimilation is critically different (Gnach et al., 2007). Contemporary students are impacting pedagogical model changes from the traditional educator-focused approach to a more student-focused approach. In other words, a pedagogical model of instruction to a pedagogical model of collaboration (Tapscott, 2009).

To effectively design and implement digital learning experiences, we must look beyond the technology itself. There should be a focus on understanding and shaping the broader cultural context in which learning occurs. In other words, a shift from simply adding technology to education to fundamentally rethinking how learning happens within society (Fischer et al., 2020). Therefore, the idea of bridging the gap and using students' developed computational cultures and the traditional education system needs to be further unpacked. Looking deeper into the concept of digital technology tools and artefacts that can be developed and strategies that can help increase the use of digital technologies and digital pedagogies used in the education system is imperative. Dlamini (2023a) acknowledges the unprecedented challenges posed by the Covid-19 pandemic on higher education and advocates for a proactive approach that involves developing a comprehensive digital education strategy and culture to mitigate the impact of future disruptions.

2.4.4.3. National Infrastructure

Virtual teaching and online learning is heavily dependent upon the underlying national infrastructure, which significantly influences the implementation and effectiveness of virtual education. Access to digital devices, such as laptops, tablets, and smartphones, is a fundamental prerequisite for online learning. While technological advancements have increased device ownership in recent years, disparities persist, particularly in rural and impoverished communities (Pather & Booi, 2020). These inequalities exacerbate existing educational inequities, hindering students' ability to participate fully in virtual learning environments. Technological access is a fundamental prerequisite for effective online teaching (Izhar et al., 2022). To establish online learning as the standard, substantial investments in national internet infrastructure are necessary. Ndibalema (2022) also suggests a deliberate investment in creating a sense of digital culture and equity. This collaborative effort involving government, telecommunication companies, and HEIs is crucial for widespread access and participation (Adeniyi et al., 2024; Chung et al., 2020). Inadequate access to digital devices and reliable internet connectivity within many communities significantly hinders students' participation in online learning (Van Staden & Naidoo, 2022; Woldegiorgis, 2022).

Additionally, reliable and affordable internet connectivity is an indispensable tool for virtual teaching and online learning. South Africa has made strides in expanding internet access, but challenges remain. Rural areas often experience limited or no internet connectivity, while urban areas may suffer from network congestion and inconsistent speeds (Hendricks & Mutongoza, 2023). These connectivity issues directly impact students' ability to access online resources, engage in virtual synchronous sessions, and submit assignments. Furthermore, the issue of South Africa's ongoing electricity crisis, manifested in frequent power outages known as load shedding, has had a devastating impact on various sectors, including education. These power cuts disrupt online learning, rendering learning management systems inaccessible and hindering students' ability to complete assessments and engage in academic activities (Khoza, 2024). Kgarose et al. (2024) highlight the compounding effect of load shedding on the already strained higher education system, creating an environment of uncertainty and frustration for students and academic educators alike.

The infrastructure challenges collectively impede the successful implementation of virtual teaching and online learning in South Africa. Students without access to devices or reliable internet are at a significant disadvantage, hindering their academic progress (Pillay &

Madzimure, 2023). Load shedding further exacerbates these issues, creating a chaotic learning environment and increasing students' academic stress (Reddy Moonasamy & Naidoo, 2022). Moreover, the inconsistent and often unreliable nature of the infrastructure has implications for the quality of virtual education. Network disruptions can lead to technical difficulties during online classes, affecting students' engagement and learning experiences (Maphalala & Adigun, 2021). The reliance on backup power sources, such as generators, can be costly and unsustainable for many higher education institutions and households, further exacerbating the challenges faced by students and academic educators.

To bridge the digital divide and ensure equitable access to education, addressing infrastructure challenges is paramount. Investing in expanding internet connectivity, particularly in rural areas, is essential (Bekele, 2021). Additionally, providing affordable devices and data packages to students can help level the playing field. Implementing backup power systems in higher education institutions can mitigate the impact of load shedding on virtual teaching and online learning. Furthermore, developing innovative strategies to overcome infrastructure limitations is crucial. This includes exploring alternative methods of delivering educational content, such as radio and television broadcasts, and leveraging offline learning resources.

2.4.4.4. National Education Policy

The integration of virtual teaching and online learning into the South African higher education sector has been accelerated by the Covid-19 pandemic. This shift has necessitated a comprehensive examination of the country's national education policies to understand their alignment and impact on this new modality of education.

The South African government has shown increasing interest in regulating the online education space. However, the regulatory framework remains nascent and fragmented. While policies such as the National Development Plan (NDP) 2030 and the White Paper on e-Education Strategy provide a broad vision for technology-enabled education, specific regulations for virtual teaching and online learning are still under development.

Government regulations play an important role in shaping the trajectory of virtual teaching and online learning. While policies such as the National Development Plan (NDP) emphasise the importance of technology in education, implementation has been uneven. Vandeyar (2015), as cited in Palvia et al. (2018), highlights a gap between policy formulation and implementation due to insufficient understanding among district and provincial officials. To bridge this divide and enhance policy effectiveness, greater involvement of these intermediaries in the policy

development process is essential (Palvia et al., 2018). Furthermore, Maphalala and Adigun (2021) highlight the challenges faced by academic educators in implementing e-learning in South African HEIs, highlighting the need for more supportive regulatory frameworks. Moreover, the Covid-19 pandemic accelerated the adoption of online learning, necessitating rapid policy responses. Stracke et al. (2022) provide a global overview of initial pandemic responses, which can be contextualised within the South African experience. However, the long-term implications of hastily implemented regulations on the quality and accessibility of online education remain a concern.

Public-private partnerships have emerged as a potential avenue and crucial strategy for expanding access to virtual teaching and online learning in South Africa. These collaborations can leverage the strengths of both the public and private sectors to develop innovative solutions and bridge the digital divide. However, challenges related to equity and sustainability persist. While public-private partnerships can contribute to digital inclusion, the digital divide remains a significant barrier. Makumbe (2020) highlights the economic disparities exacerbated by the pandemic, highlighting the need for targeted interventions. Kulal et al. (2024) provide a broader perspective on digital access and learning outcomes, emphasising the importance of equity and inclusivity in distance education. Achieng and Mlitwa (2024) also emphasise the importance of socio-economic inclusion in higher education. Additionally, the success of public-private partnerships hinges on effective governance and risk management. It is essential to ensure that the interests of all stakeholders are protected. Moreover, there is a need for transparent mechanisms for monitoring and evaluating the performance of public-private partnerships.

South Africa has made an effort in developing digital inclusion policies, aiming to bridge the digital divide and ensure equitable access to technology. Woldegiorgis (2022) focuses on mitigating the digital divide in higher education during the Covid-19 pandemic, offering insights into the challenges and opportunities. However, translating policies into effective practice remains a challenge. To bridge the digital divide, policymakers must create comprehensive plans to ensure equal access to technology, particularly in rural areas. Successful integration of Fourth Industrial Revolution (4IR) technologies in education requires collaboration among governments, institutions, and businesses (Mhlanga, 2024).

Van den Berg (2021) explores the role of open distance learning in addressing social justice, providing a valuable lens for analysing the potential of digital education to redress inequalities. Matsiliza et al. (2022) offer broader perspectives on higher education for the public good,

which can inform the development of more inclusive digital education strategies. While progress has been made, there is still significant scope for improvement. South Africa still faces significant challenges in terms of digital inclusion, with disparities in access to technology and internet connectivity being particularly pronounced. The government has introduced various initiatives aimed at bridging the digital divide, such as the National Broadband Policy. Digital inclusion policies are essential for ensuring equitable access to virtual teaching and online learning. Without addressing the digital divide, the potential benefits of virtual and online education cannot be realised.

2.4.4.5. Equity and Equality

One of the main issues with virtual teaching and online learning as a mode of instructional delivery is the resource readiness of the average South African academic educator and student, as it only truly benefits individuals with the appropriate formal and epistemological access (Bekker & Carrim, 2021). For those with limited to no access, it only leads to creating further exclusivity, especially in the rural communities (Moosa & Bekker, 2022). This is due to a lack of some basic amenities and technology in rural communities (Mahaye, 2020). These individuals suffer the most because of the existing digital divide and inequalities that exist. The concept of the digital divide has been used to describe some of the social inequalities that have emerged in the globalised information society. Often this has been characterised as a divide between those who have access to ICTs and those who do not – technology "haves" and "have nots" (Bertot, 2003). However, the situation needs to expand further than simple "haves" and "have nots". The digital divide has been further broadened to include the various digital inequalities that exist. These include: (1) technical means – hardware, software and connectivity, (2) autonomy – location of access, freedom of use (3) use patterns – purposes of the internet use, (3) skills – ability to use the internet, and (4) social support networks – access to advice from more experienced users (Chiemeke, 2010). Furthermore, Resta et al. (2018) state that for digital equity to exist, there must be equal access to technology, appropriate content, digital literacy, skilled educators, and knowledge about using technology for improved learning.

Equality "relates to the notion of sameness; in this, the provision that fairness and justice are achieved by giving everyone the same" (Willems, 2019, p. 152), while equity is meeting people where they are with what they need to be successful (Levinson et al., 2022). Equality and equity relate to access, participation, and basic minimum standards for all in education (Willems, 2019). South Africa is a country struggling to overcome its vast inequalities, and there are still

high levels of unemployment and poverty. Equitable access to higher education can assist in the eradication of inequalities as it is a fundamental building block for transformational change in individual learning and community development that drives innovation for sustainable progress and overall economic growth (Zhu et al., 2018). This may sound idealistic, but the opportunity costs of improving access to the current higher education system far outweigh the initial cost of investment. By leveraging digital education, in particular virtual teaching and online learning, and integrating its affordances well into the education system, instructional delivery can become more accessible to students, consequently increasing the spread of knowledge, and therefore strengthening the potential of the South African future workforce.

Virtual teaching and online learning are "critically important tools in the struggle against poverty, underdevelopment, and marginalisation" (Letseka et al., 2018, p. 129). It holds significant potential to enhance equitable access to higher education by overcoming traditional barriers such as geographical constraints and affordability concerns (Al-Samarraie, 2019; Letseka et al., 2018; Mhlongo et al., 2023). Furthermore, there is an increase in the frequency of student unrest, pandemics, warfare, climate change, and natural disasters with consequences that vary in their duration, scale, and repercussions (Bartusevičienė et al., 2021). The modes of instructional delivery afforded by virtual teaching and online learning can transcend these challenges, enabling students who are geographically dispersed, in remote or underserved areas, to access quality higher education without relocation or extensive travel (Ally, 2011; Bartusevičienė et al., 2021). Moreover, virtual teaching offers cost-effectiveness by reducing tuition fees, transportation costs, and other associated expenses, thereby increasing access for individuals from low-income backgrounds (Makda, 2024). Additionally, the flexibility of online learning accommodates diverse needs, enabling students from different backgrounds and cultures to pursue higher education while balancing other life commitments. However, a one-size-fits-all approach can hinder this flexibility and create an uneven learning experience for students (Stone et al., 2019).

To facilitate the effective implementation of virtual teaching and online learning, challenges related to the digital divide, infrastructure, technology access, quality assurance, and equity must be addressed comprehensively (Mhlongo et al., 2023). Ensuring reliable electricity, internet connectivity, and technology devices is crucial, along with maintaining high educational standards, accreditation, and student support services. Exploring the design and development of virtual teaching and online learning that allows for a good educational experience for all students is imperative. Additionally, addressing disparities in digital literacy,

language barriers, cultural considerations, gender equality, and accessibility is essential to promote equitable access and participation effectively (Mhlongo et al., 2023). Attending to these challenges requires collaborative strategies, investments, partnerships, and innovative solutions to maximise the benefits of virtual teaching models and contribute to sustainable development goals, especially in developing countries like South Africa (Adeniyi et al., 2024).

2.4.5. Chronosystem Level

At the chrono level, the study looks at experiences over time. This includes the changes in technology advancements, the impact of historical events and increase in disruptions and the change in educational practices over time.

2.4.5.1. Changes in Technology

Digital technology has irrevocably transformed higher education, particularly in virtual teaching and online learning. Technological advancements have been a primary catalyst in the growth of virtual teaching and online learning. The origin of the internet, coupled with the development of learning management systems (LMS) and digital content creation tools, has transformed the instructional delivery modes of education.

The evolution of e-learning mirrors the development of the internet. From static content (Web 1.0), education moved to interactive platforms (Web 2.0) and increasingly connected networks (Web 3.0). Now, the era of Web 4.0 is emerging, with technology enabling direct human-machine interaction. This technological progression fundamentally reshaped the digitalisation of education (Choudhury & Pattnaik, 2019). One of the most impactful technological changes has been the proliferation of LMSs. These platforms have evolved from basic course delivery tools to sophisticated environments that facilitate interaction, collaboration, and assessment. LMSs have become an important element of online education, offering a structured platform for course content, communication, engagement, assessment and learning analytics (Turnbull et al., 2020). Concurrently, the integration of mobile devices has revolutionised how students access and engage with educational content. The ubiquity of smartphones and tablets has enabled anytime, anywhere learning. Mobile learning has the potential to personalise education, tailoring content and delivery to individual student needs and preferences (Chopvitayakun et al., 2023; Gómez et al., 2012). Furthermore, advancements in communication technologies have facilitated a more interactive and collaborative online learning experience. Video conferencing tools, such as Zoom and Microsoft Teams, have become indispensable for synchronous interaction between academic educators and students

(Mpungose, 2021). Additionally, social media platforms have emerged as valuable spaces for knowledge sharing, peer support, and building learning communities (Siemens, 2004).

The impact of these technological shifts is multifaceted. They have expanded access to education, breaking down geographical and socio-economic barriers. Online learning has empowered individuals to pursue higher education and professional development opportunities regardless of their location or circumstances. On the other hand, the rapid pace of technological change has posed challenges for academic educators and students, requiring continuous adaptation and upskilling.

2.4.5.2. Historical Events

The evolution of virtual teaching and online learning is deeply rooted in a series of historical events that have shaped the development of technology and educational practices. The widespread adoption of the internet in the 1990s marked a critical moment. It facilitated global connectivity, enabling the creation of online communities and the dissemination of information on a massive scale. The emergence of email and online forums transformed communication between educators and students, laying the foundation for virtual interactions (Harasim, 1993).

Distance education, a precursor to online learning, has a rich history dating back to the 19th century. The use of correspondence courses and radio broadcasts to deliver instruction to geographically dispersed students gained momentum in the mid-20th century (Moore, 1973). These early forms of distance education paved the way for the development of more sophisticated online learning platforms and delivery methods.

The 21st century has witnessed an exponential growth in online learning. The development of user-friendly LMS coupled with increased internet access, has made it possible for students to access higher education and professional development opportunities remotely. The Covid-19 pandemic accelerated the adoption of online learning as institutions worldwide transitioned to virtual instruction, demonstrating the resilience and adaptability of this educational modality (Bozkurt et al., 2020).

Historical events have also significantly impacted the trajectory of virtual education. The Covid-19 pandemic serves as a prime example of a crisis accelerating the adoption of online learning on a global scale. HEIs were compelled to rapidly transition to virtual platforms, highlighting the affordances and challenges of virtual education. Moreover, other disruptions such as student unrest, warfare, and natural disasters have necessitated the exploration of virtual teaching as a means of ensuring educational continuity (Bartusevičienė et al., 2021).

On the other hand, South Africa has been affected by severe electricity shortages in recent years. Load shedding (scheduled power cuts) and electricity load reduction with frequent and prolonged outages. This energy crisis has disrupted virtual education through exacerbating existing network connectivity problems, particularly affecting students in rural areas with limited digital infrastructure (Majola & Mudau, 2022). High data costs further impede internet access for many students (Mataka et al., 2020).

2.4.5.3. Changes in Educational Practices

The confluence of technological advancements and societal pressures has prompted a shift in educational practices (Antunes & Barreto, 2022). Traditionally, education has been characterised by educator-centred, lecture-based instruction. However, the rise of virtual learning has necessitated a transition towards student-centred and student-focused approaches. Online environments promote active learning, critical thinking, and problem-solving skills through interactive activities, collaborative projects, and inquiry-based learning (Martin et al., 2020). Additionally, the integration of technology has enabled academic educators to employ a variety of instructional strategies, such as flipped classrooms, gamification, simulations and adaptive learning, to cater to diverse learning styles and needs (Flores-Alarcia et al., 2022; Shaykina & Minin, 2018).

There is a growing emphasis on flexible learning, accessibility, and student-centred approaches. Virtual teaching and online learning have emerged as key strategies to accommodate these growing demands. Furthermore, the need to develop digital literacy skills has become increasingly important, influencing the curriculum and pedagogical approaches employed in virtual environments (Alenezi et al., 2023; Ally, 2004; Zhu et al., 2016). The shift towards virtual learning has also prompted a rethinking of assessment practices. Traditional methods, such as paper-based exams, have been supplemented or replaced by online assessments, including quizzes, assignments, and projects. Moreover, the emphasis has shifted from summative assessment to formative assessment, with a focus on providing timely feedback to support student learning. The use of rubrics, peer assessment, and self-assessment has become increasingly prevalent to promote student autonomy and reflection (Wanner & Palmer, 2018).

To ensure student success in the virtual learning environment, HEIs have adapted their support services accordingly. Online tutoring, academic advising, and counselling services have been expanded to provide students with the necessary assistance (Burns et al., 2019; Enwereji et al.,

2023; Inglis & Cathcart, 2018). Furthermore, the development of online communities and social learning platforms has facilitated peer support and collaboration among students (Garrison et al., 2000). However, challenges related to student engagement, motivation, and social isolation have emerged, prompting the need for innovative strategies to facilitate a sense of belonging and community (Bozkurt et al., 2020; Garrison et al., 2000).

3. Chapter 3: Research Design and Methodology

3.1. Chapter Overview

This chapter discusses the methodological aspects employed in the research study in answering the following research questions:

1. How can digital education be harnessed to enhance virtual teaching and online learning across diverse student populations?
2. What factors should be considered in the design and development of virtual teaching and online learning across multiple ecological environments?
    a. What intrinsic factors should be considered in designing and developing virtual teaching and online learning environments to optimise educational experiences?
    b. What extrinsic factors and systemic barriers must be addressed to implement effective and equitable virtual teaching and online learning?

This chapter outlines the chosen research methods and design for data collection and their alignment with the foundational philosophy approach and discusses their alignment with the research questions and objectives. The section on population and sample describes the selected population and sampling strategy, along with justification for the sample size and characteristics. Details about data collection methods, including questionnaires and interviews, are provided, along with considerations for ensuring data quality. The pilot study, conducted before the main data collection phase, is discussed, outlining its objectives, procedures, and outcomes. The methods of analysis, namely simple descriptive statistics, correlation analysis and thematic analysis, are elaborated upon, along with the rationale for their selection. Validity and reliability, and trustworthiness measures, such as dependability, transferability, confirmability, and credibility, are addressed, as well as the use of triangulation to enhance validity and reliability. Key assumptions, limitations, and delimitations of the research study are outlined, along with ethical considerations regarding data handling, respondents, and participant treatment. This chapter serves as a foundational framework for the subsequent analysis, data presentation, and interpretation of the study findings.

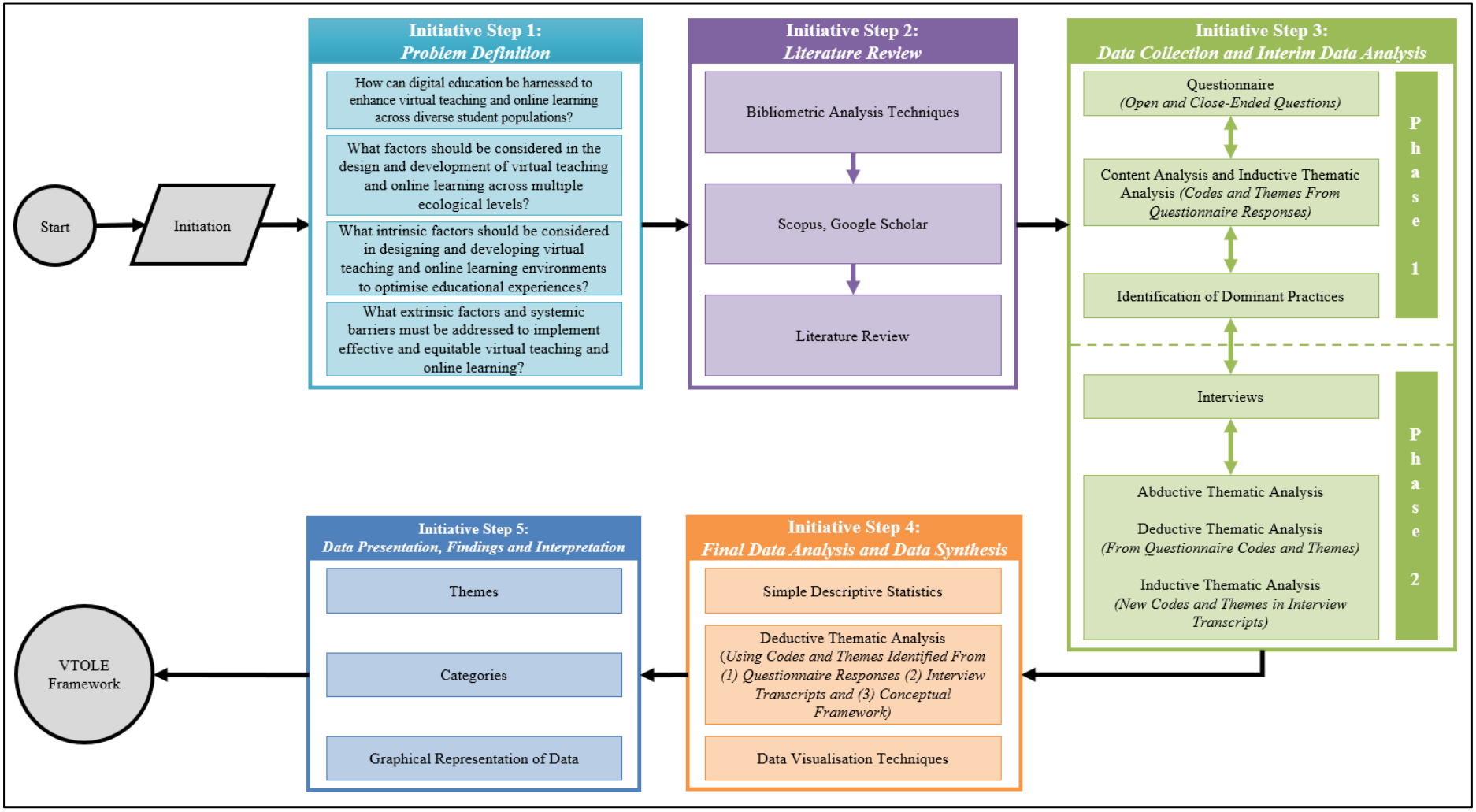
3.2. Research Design

The research study aims to explore how the power of digital education can be strategically harnessed to enable virtual teaching and online learning and to develop a sustainable and adaptable Virtual Teaching and Online Learning Ecosystem Framework (VTOLE-Framework)

specifically tailored to the South African higher education context, with the goal of improving equitable access, transformative educational experiences, and overall quality of education through the strategic use of digital education. To achieve this, the researcher explored how we can harness digital education to enhance virtual teaching and online learning that improves instructional delivery to create transformative educational experiences. To accomplish this, it was imperative to explore the affordances and optimal use of existing digital opportunities, digital technologies, and digital pedagogies to comprehend the actualities of academic educator competencies and practices in virtual teaching and online learning. This involved examining academic educators' thoughts, perspectives and experiences, the digital technologies, and digital pedagogical styles they employ, the challenges they encounter, and their strategies for addressing these issues. This exploration also encompassed an understanding of the intricate interplay among contextual, social, economic, technical, cultural and institutional factors that impact the use of virtual teaching and online learning. Therefore, the research study used a mixed methods approach grounded in pragmatism, with predominant inherent methods of qualitative research and subordinate methods of quantitative research.

Pragmatism is a philosophical approach that emphasises the practical application of knowledge and the importance of addressing research questions effectively (Bryman, 2016; Denscombe, 2017). The choice of this approach was guided by its ability to provide useful answers, rather than an adherence to a particular philosophical stance. Pragmatism views knowledge as both socially constructed and grounded in experience, suggesting that the value of any theory or finding lies in its practical consequences and problem-solving capabilities (Bryman, 2016). Consequently, a combination of qualitative and quantitative research methods was used to study the reality of virtual teaching and online learning. Quantitative methods, specifically the use of Likert scale questions in the questionnaire, provided structured data to measure the extent of agreement or disagreement with specific statements related to the experiences and perspectives of the participants on virtual teaching and online learning. Qualitative methods were used to collect data through open-ended questions in a questionnaire, and interviews were employed to gain a deep understanding of the participants' experiences and perspectives. This combination of methods allowed for a deeper understanding and a more comprehensive analysis, capturing both the depth of individual experiences and the broader patterns across the participants of the study. Figure 7 summarises the research design of the research study.

Figure 7: Graphical Representation of the Research Design of the Study



In the first step of the research journey, the researcher identified a gap and the need for the research study. She then developed two main research questions and two sub-research questions to guide the study. In the second step, the researcher initiated bibliometric analysis techniques to identify the relevant literature, primary authors, relevant sources and highly cited articles (Donthu et al., 2021; Linnenluecke, 2020; Ozturk et al., 2024). The adoption of bibliometric analysis techniques assisted in grasping the conceptual and social framework of literature concerning virtual teaching and online learning in higher education. Through this technique, the research study employed a rigorous literature search process to identify relevant academic research. Scopus and Google Scholar were the primary search engines used, complemented by exploring the university's dissertation databases and the university library. To ensure a comprehensive review, additional relevant studies were discovered by examining the reference lists of the initially identified papers. Some key search words used included individually and in combination, inter alia, "virtual teaching and online learning", "equitable education", "digital education", "digital ecosystems", "online learning ecosystems", "virtual teaching ecosystems", "online learning frameworks". This systematic approach allowed for the identification of a diverse range of scholarly articles, book chapters, conference proceedings, books, and dissertations that contributed to the development of the theoretical framework and empirical analysis. Following the identification of relevant and core literature, an in-depth review of the existing published literature was conducted. This process aimed to comprehend prevalent ideas and concepts theoretically and holistically present in the research area (Linnenluecke, 2020). The insights gained from the bibliometric analysis and literature review were instrumental in informing the design and formulation of questions for the online questionnaire and initial interview questions.

The third step was split into two data collection and interim data analysis phases. The first phase involved the researcher distributing an online questionnaire to gather data from academic educators on the present use of digital education and other factors influencing virtual teaching and online learning. The questionnaire was administered across three South African HEIs, encompassing one urban institution, one focusing on open distance and e-learning (ODeL), and one situated in a rural area, characterised as historically disadvantaged. This approach assisted in identifying the application of digital technologies, digital pedagogies, and other factors in the use of virtual teaching and online learning across diverse South African HEIs, considering variations in populations and systemic barriers.

The responses to the open-ended questions from the questionnaire were analysed using content analysis and an inductive thematic analysis, which involved identifying, analysing, and reporting patterns (themes) and meanings that emerged from the qualitative data (Gioia et al., 2013). This analysis was deemed most appropriate for achieving the objectives of the research study as it emphasised a bottom-up, data-driven approach where themes are derived directly from participants' experiences and perspectives (Gioia et al., 2013). The outcomes derived from the first phase of the interim analysis of the questionnaire enabled the researcher to identify the various dominant practices of academic educators and the influences on virtual teaching and online learning as intermediate themes.

Subsequently, in the second phase of the data collection and interim data analysis, the researcher proceeded to conduct web-based semi-structured interviews with selected participants based on the inductive thematic analysis and dominant practices identified from the questionnaire responses. This approach arose due to geographical dispersion, cost implications, and budgetary constraints, rendering web-based interviews more practical compared to in-person interviews. Interviews were chosen as the preferred research method for delving into opinions, perspectives, emotions, and experiences that necessitate a detailed understanding of individual experiences (Denscombe, 2014). Semi-structured interviews were employed to collect data and meet the research objectives. Recognised for their flexibility, these semi-structured interviews involved discussion-based conversations that adapt dynamically during the interaction between the researcher and participant (Mack et al., 2005). The questions were formulated to guide the conversation and address key discussion points (Collis & Hussey, 2014). The use of semi-structured interviews allowed the researcher to pose follow-up questions or query specific statements or comments, enabling a deeper understanding and extraction of information. The semi-structured interviews aimed to gain deep insights into academic educators' lived experiences concerning the integration of virtual teaching and online learning. Through participants' detailed discussions and reflections, the researcher acquired a more nuanced understanding of the current situation in South Africa, as she was presented with an in-depth description of the thematically identified dominant practices identified from the questionnaire, often conveyed tacitly or expressed pragmatically rather than theoretically. Following the interviews, the researcher conducted an abductive thematic analysis on the interview transcripts through: (1) a deductive thematic analysis of the responses from the participants based on the dominant codes and themes identified during the first thematic analysis of the data from the questionnaire's open-ended questions, and (2) an

inductive thematic analysis was done for any new codes and themes identified from the data collected from the interviews.

After all the codes and themes were identified in step three, step four concluded with a deductive thematic analysis, which was done on both the responses from the open-ended questions in the questionnaire and the transcripts from the interviews. The final thematic analysis further involved identifying, analysing, and reporting patterns (themes) from all the qualitative data (Braun & Clarke, 2006). This involved analysing and interpreting data to draw meaningful conclusions, make inferences, and identify patterns or relationships (Braun & Clarke, 2006). The demographic data from the questionnaires and interviewed participants was analysed and presented using data visualisation methods and the closed-ended questions from the questionnaire were analysed using simple descriptive statistics and basic data visualisation methods. A further conceptual analysis of the literature was done to enhance the understanding of the themes associated with the dominant practices revealed in the questionnaires and semi-structured interviews. This involved an extensive search of academic resources, including journal articles, book chapters, conference proceedings, seminars, and other publications, directly and indirectly, related to the identified themes in the research area of digital education and other factors influencing virtual environments.

Step five involved the presentation of the data across the seven identified themes with data visualisation graphs. This process contributed to the design and development of the Virtual Teaching and Online Learning Ecosystem Framework (VTOLE-Framework). To further validate the virtual teaching and online learning framework, a suggestion for future research is to test the framework through its implementation across courses in HEIs. Furthermore, data should be collected from students within these courses to find any gaps, close these gaps, and strengthen the validity and reliability of the VTOLE-Framework.

3.3. Population and Sample

A purposive sampling procedure was used. Purposeful sampling is a research technique where participants are chosen based on specific characteristics relevant to the study (Bryman, 2016; Creswell & Creswell, 2017; Suri, 2011). The HEIs were selected based on institution type, geographical location, student population size, and urban, rural, or historically disadvantaged status. Furthermore, the criteria of one being an urban institution within a built-up area, one focusing on open distance and e-learning (ODeL), and one situated in a rural developing area, characterised as historically disadvantaged, were used during the selection process. A summary

of the three HEIs selected from the 26 higher education institutions in South Africa can be seen in Table 3.

Table 3: Sample of Higher Education Institutions in South Africa

University Code	Institution Name	Institution Type	Rural/Historically Disadvantaged	No. of students
UL	University of Limpopo	Rural	Yes	20 000
UNISA	University of South Africa (UNISA)	ODeL		400 000
WITS	University of the Witwatersrand	Urban		32 703

Academic educators were selected as participants for this study based on their experiential backgrounds (Bryman, 2016; Creswell & Creswell, 2017). The participants were identified given their diverse experiences, involvement in teaching different courses and rank within their institution, representing various socio-economic backgrounds. The respondents and participants were identified using each HEI's staff webpage. The researcher then contacted the participants telephonically and via email across the selected institutions and distributed the online questionnaire link via email. Furthermore, respondents from the selected HEIs who completed the questionnaire were encouraged to ask colleagues within their institution to respond to the questionnaire, thus employing a 'controlled' snowball sampling technique. Snowball sampling, also known as chain referral sampling, can be described as a method whereby respondents are made contact and then those respondents use their social networks to refer the researcher to other individuals who can participate in the research (Mack et al., 2005). The responses received were around ± 50 responses per institution, resulting in 165 responses overall.

Once the questionnaires were completed, the researcher reviewed the responses from the questionnaires to determine a purposive sample for in-depth semi-structured interviews. Purposive sampling was used to group participants based on their responses and a preselected criterion relevant to the research question (s) of the study (Mack et al., 2005). The criteria were based on participants' potential influence of various factors, such as access to technology, their use of digital technologies, the duration of digital technology use, the types of digital pedagogies employed, pre-existing knowledge levels, their experience in higher education and knowledge of virtual teaching and online learning. A total of six participants were interviewed.

The range of the HEIs and the diversity of participants, varying on socio-economic status, educational background and geographic location, were a crucial factor in this study as the nature of this study demands exploration. "The logic of maximum variation sampling is to

capture a wide range of perspectives relating to the phenomenon that one is studying" (Bryman, 2016, p. 409). The participants were deemed appropriate due to their real-life context, practices, perspectives, attitudes and beliefs. The selection of a variety of HEI types and the analysis of diverse academic educator experiences yielded more insightful and generalisable research results.

3.4. Data Collection

Data was collected in two phases, commencing with an online questionnaire containing both open-ended and closed-ended questions. The questionnaire was distributed to a purposive sample of academic educators to identify the dominant practices and reality of the use of digital education, virtual teaching and online learning. The questionnaire responses were also used to determine which participants would be interviewed to gain further insight. Subsequently, based on the insights of the responses received from the online questionnaire, the second phase of data collection involved a further sample of academic educators who were chosen for in-depth interviews. The incorporation of interviews facilitated a more profound comprehension of academic educators' social meanings and perspectives related to the use of digital education, the application of digital technologies and digital pedagogies, the needed competencies, and other pertinent factors essential in harnessing digital education for ensuring equitable access to virtual education. This collaborative effort contributed to the construction of a meaningful reality concerning the application of virtual teaching and online learning.

3.4.1. Questionnaires

The research study made use of Google Forms to administer the online questionnaire containing both open-ended and closed-ended questions. The questionnaire was distributed to academic educators across three different HEIs in South Africa. The questionnaire served as a valuable tool for gaining insights into the perspectives, attitudes, beliefs, and behaviours of the academic educators (Bryman, 2016). They offered valuable responses that shed light on issues and topics relevant to the study (Bryman, 2016). The questionnaire was used to assist the researcher in identifying the dominant practices, initial codes and themes for virtual teaching and online learning. Additionally, it was used to identify a sample of academic educators, based on the preselected criterion, to interview, as the questionnaire assisted in identifying the extent of use of digital education by these participating academic educators. The *Information Sheet* and *Questionnaire* can be viewed in Appendix A2 and A3, respectively.

3.4.2. Interviews

The interview protocol and schedule were developed using insights gathered from the literature review, responses to the questionnaires, and the researchers' existing expertise in virtual teaching and online learning. The researcher conducted web-based in-depth semi-structured interviews using MS Teams with participants who completed the questionnaires based on their responses. This allowed the researcher to gain a further understanding of the use of virtual teaching, digital technologies, digital pedagogies and other contextual, social, economic, technical, cultural and institutional factors that need to be considered for virtual teaching and online learning. In-depth interviews provided information on academic educators' perspectives, personal history, experience and expertise that led to intangible data in answering the research questions.

The researcher had the opportunity to ask more open-ended and probing questions, whilst the participant had an opportunity to provide meaningful and detailed answers in their own words rather than selecting from a fixed pool of options (Mack et al., 2005). This assisted the researcher in gaining further insight by being able to ask follow-up questions, probing for more elaboration and detailed answers. During the interviews, the researcher used audio recordings, where permission was provided, and interview notes to collect data (Mack et al., 2005). The transcripts and interview notes were expanded within 24 hours of the interview, as the information was fresh in the memory of the interviewer. Written consent was requested from the participants of the interviews. The *Information Sheet*, *Consent form* and *Interview Questions* can be viewed in Appendix A4, A5 and A6, respectively.

3.5. Pilot Study

A pilot study is a small-scale, preliminary investigation conducted before the main research project to test and refine the data collection tools, research methods and procedures (Leavy, 2022). It was essential to conduct a pilot test to assess the trustworthiness, validity and reliability of the data collection tools to identify potential issues, assess the practicality of the research approach, and ensure the effectiveness of the data collection instruments themselves.

The questionnaire was piloted with five respondents who are academic educators, two of whom were in the education discipline, one in the computer science discipline, one in the science discipline and one in the commerce discipline. The questionnaire was distributed to these individuals, who completed the questionnaire and were requested to provide feedback based on the understanding, clarity, relevance, and cultural appropriateness of the questions and items

contained within the questionnaire, with special attention to the question wording, the questionnaire length and the overall flow and structure. There were necessary modifications made to the study's design and the questionnaire was updated. These adjustments are described as follows:

- The word pedagogy was changed to 'method of teaching' as academic educators outside of the education discipline might not necessarily understand the term pedagogy,
- An added definition or a brief explanation for words contained within the questions was provided to add context to the questions for the participants to better understand and question,
- Some closed-ended questions with Likert scales were added to complement the open-ended questions, and
- Questions from the questionnaire that required much more depth in their response were moved from the questionnaire to the interview questions and schedule.

The interview questions were piloted, and an interview dry run with two academic educator participants from the education discipline was conducted. This helped to ensure that the questions were effective, clear, and capable of eliciting the necessary information to meet the research objectives. There were necessary adjustments made to the interview protocol and schedule described as follows:

- Questions that were ambiguous, unclear or confusing to participants were rephrased so they could be easily understood,
- Some questions were refined and made concise to make them more precise and relevant,
- To reduce the time of the interviews, adjustments were made to the questions so that they have some grouping and logical progression, and
- Redundant questions were removed.

The pilot study aimed to provide valuable insights that were used to improve the design and execution of the data collection and data analysis method for the main study, increasing the chances of its success and validity.

3.6. Methods of Analysis

The pragmatism paradigm was used, shaping the data analysis approach and guiding the researcher in planning the data collection methods, primarily using two approaches: (1)

administering questionnaires, and (2) conducting semi-structured interviews. The questionnaires comprised both open-ended and closed-ended questions, strategically designed to capture respondents' perspectives and experiences regarding virtual teaching and online learning. The questionnaire responses served as the initial dataset for analysis. Semi-structured interviews were conducted with a combination of a subset of the respondents to the questionnaire and some new participants to further explore the themes and codes identified in the questionnaire responses. These interviews facilitated comprehensive discussions, offering deeper insights into the research inquiries.

Simple descriptive statistics, correlation analysis and data visualisation techniques were used to analyse the demographics and responses to the closed-ended questions within the questionnaire. Thematic analysis was applied to analyse the open-ended questions within the questionnaire and data from the interview transcripts. Throughout the analysis phase, the overarching objective was threefold: (1) to explore the potential of harnessing digital education to facilitate virtual teaching and online learning, (2) to determine the factors critical in facilitating educational experiences in virtual teaching and online learning, and (3) to identify systemic barriers and socio-economic disparities impeding digital inclusion and equitable access to virtual teaching and online learning. The analysis process was conducted using the theoretical framework developed in Chapter 2, which is geared towards striking a harmonious balance between the pedagogical vision outlined by the community of inquiry, the practical strategies advocated by transactional distance theory and the consciousness of the contextual realities highlighted through the social technical and ecological systems theory. Ultimately, the aim was to develop a virtual teaching and online learning framework for transformative educational experiences.

3.6.1. Simple Descriptive Statistics

Descriptive statistics involves summarising, organising, and presenting data concisely. It reveals a dataset's main features without generalising to a larger population. It aims to provide a clear and concise overview, enabling insights into patterns, trends, and distributions (Ravid, 2024). Measures include central tendency (mean, median, mode), dispersion (range, variance, standard deviation), and distribution shape (skewness, kurtosis). Descriptive statistics also involves graphical representation via charts, graphs, and tables aids visualisation. Common techniques include histograms, bar charts, and scatter plots (Ravid, 2024).

Simple descriptive statistics were used to summarise the demographic data and analyse the closed-ended questions data from the questionnaire by providing basic numerical measures to summarise and describe the characteristics of the data. This analysis provides a concise overview of the participants and the distribution, central tendency, and variability of the data (Ravid, 2024). This assisted in providing valuable insights into the characteristics of the dataset, which was used with the first thematic analysis conducted during phase 1 of the analysis. This preliminary step in the data analysis process helped to understand the data distribution, identify dominant practices, codes and themes and inform further qualitative data collection and analysis.

3.6.2. Correlation Analysis

Correlation matrix analysis serves as a fundamental statistical technique used to explore and investigate the interrelations among variables within a dataset. Understanding the degree and direction of these relationships is paramount for informed decision-making, pattern identification, and outcome prediction. This analytical technique provides a comprehensive overview of the pairwise correlations between variables, revealing both the magnitude and direction of these connections (Ravid, 2024). By examining the correlation coefficients, the researcher discovered whether the factors exhibit positive or negative associations and the extent to which they covary. The researcher conducted a correlation analysis on the data from the closed-ended questions in the questionnaire to explore the interconnections among the key factors and uncover underlying patterns within the dataset. This preliminary analysis played an essential role in data exploration, providing valuable insights into the intricate dynamics of the factors under investigation, reaffirming findings from existing literature, and guiding the thematic analysis.

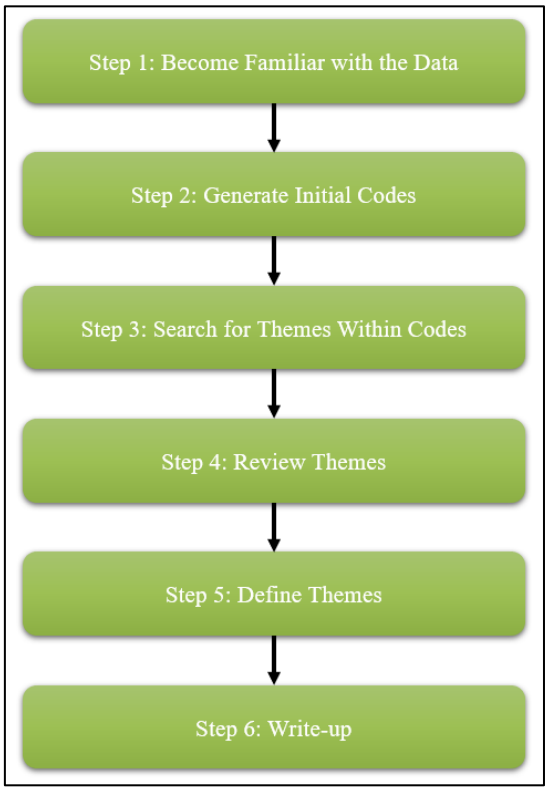
3.6.3. Thematic Analysis

Thematic analysis is a method used to identify, analyse, and report patterns (themes) within qualitative data (Braun & Clarke, 2006). It offers an iterative and reflexive approach to investigating and comprehending the significance and patterns inherent in the data. The emphasis on the iterative and reflexive nature of thematic analysis highlights the importance of engaging deeply with the data and continually revisiting and refining the analysis throughout the process (Braun & Clarke, 2006).

Braun and Clarke (2006) suggest a six-step process when conducting a thematic analysis. Their approach offers a flexible and systematic framework for uncovering and interpreting patterns

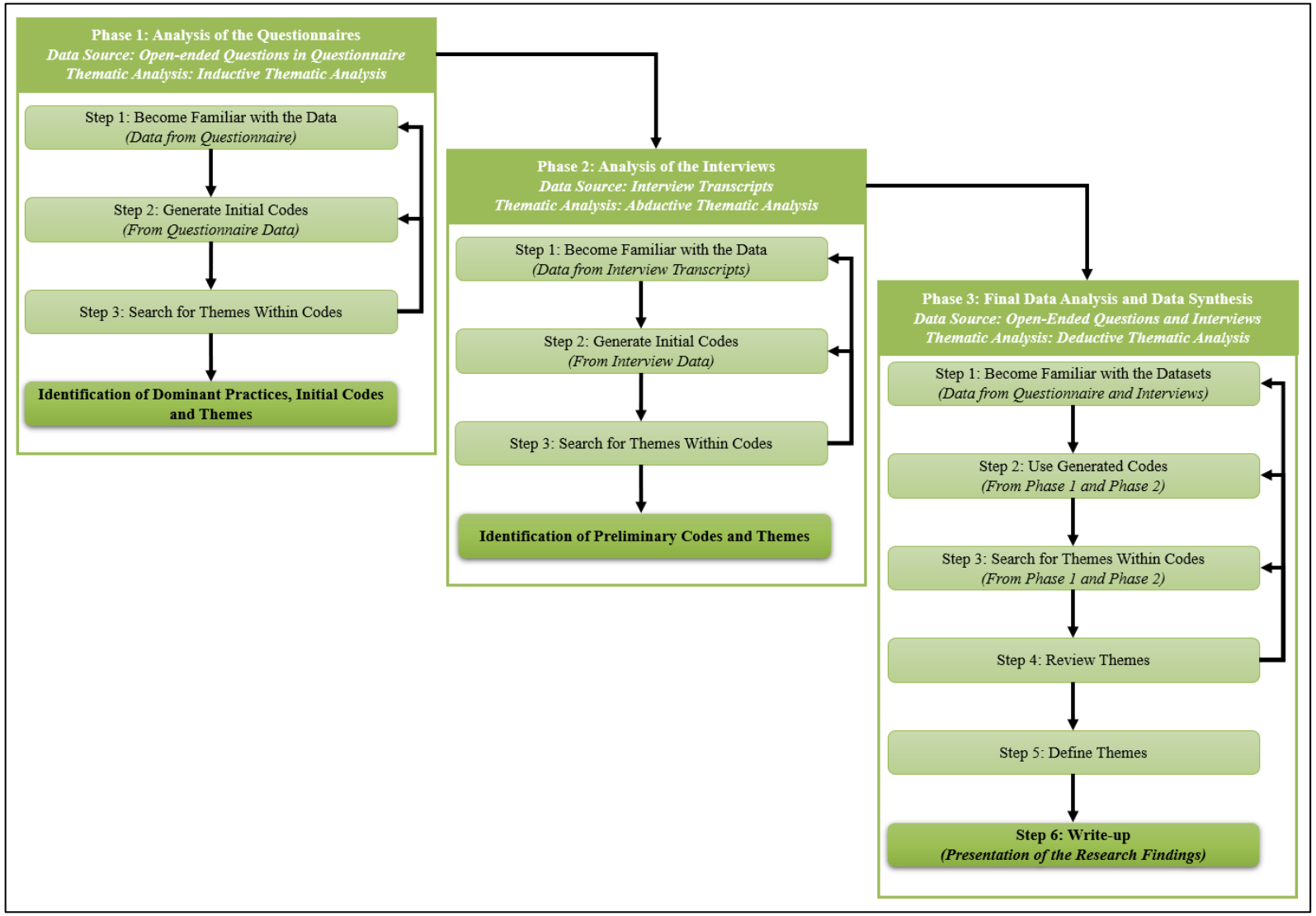
of meaning within qualitative data. These six steps can be used both for an inductive and deductive thematic analysis. Figure 8 illustrates the six steps.

Figure 8: Braun and Clarke's (2006) Six-Phase Framework for a Thematic Analysis



The thematic analysis for the study was conducted in multiple stages, in line with the data collection phases, creating an iterative approach to data analysis. Figure 9 illustrates the phases and steps completed to conduct the thematic analysis.

Figure 9: Phases and Steps for Executing the Thematic Analysis Adapted from (Braun and Clarke, 2006)



Initially, during phase 1 of the data analysis, an inductive thematic analysis was performed on the open-ended questionnaire responses. This involved using open coding followed by axial coding to systematically code the data to identify recurring patterns, themes, and categories that emerged organically from the participants' responses. While it does come with challenges, this data-driven approach ultimately enriched the research process by helping the researcher to uncover hidden patterns that might have otherwise been overlooked (Braun & Clarke, 2006). The preliminary analysis yielded a set of dominant practices, codes and themes relevant to the research questions.

Using the findings of the dominant practices, codes and themes from the preliminary analysis as a foundation, during phase 2, interview questions were formulated to explore the identified themes further. Semi-structured interviews were then conducted, and the transcripts were subjected to an abductive thematic analysis. This involved deductively applying the codes and themes from the preliminary analysis while also inductively identifying new codes and themes that emerged from the interview data. This helped the researcher to identify key themes, interpret meanings and build an understanding of how individuals make sense of the world (Braun & Clarke, 2006).

In phase 3, the final stage of analysis, a deductive thematic analysis was performed on both the questionnaire data and the interview transcripts. This comprehensive analysis involved synthesising the findings from both data sources to refine and validate the identified codes and themes. Through iterative coding and constant comparison of data, a final list of codes and themes was generated, capturing the diverse perspectives and experiences of the academic educators regarding virtual teaching and online learning.

The researcher applied Braun and Clarke's Six-Step Framework as follows:

1. **Familiarisation with Data**

   This initial step is essential for identifying relevant information pertinent to answering the research questions. It helps in gaining an understanding of the content and context of the data (Braun & Clarke, 2006). During the first phase, the thematic analysis was done alongside a content analysis. Across all three phases, the researcher immersed herself in familiarising herself with the data. To deeply engage with the open-ended questions, the researcher engaged in reading and re-reading the responses to get a deep familiarity with the data. This was done before and during the content analysis. To actively immerse herself with the interview data, the researcher herself transcribed the

audio recordings word-for-word and cross-referenced the content by listening to the recordings again for validation (Bailey, 2008). The data collected via the open-ended questions in the questionnaire and the transcripts of the interview were repeatedly read to become familiar with them. The researcher also made use of Microsoft Word (MS Word) and Microsoft Excel (MS Excel) to capture all responses from the questionnaire and the manual transcriptions of the data that she transcribed and captured herself to facilitate her comprehensive immersion into the multiple datasets.

2. Generating Initial Codes

The researcher started by coding interesting points, repetitive trends of the data in a systematic fashion. Codes are the fundamental blocks for the themes (Braun & Clarke, 2006). The process for coding across all three phases involved manually reading through the responses and transcripts in MS Word and MS Excel for labelling or tagging parts of the data that are relevant to the research questions. Although the approach was extensive and time-consuming, it was worth the challenge as it enhanced the validity and trustworthiness of the research and elevated the integrity and the strength of the results (Johnson, 2015). The codes found across the three phases were both descriptive and interpretive. Descriptive coding involves labelling segments of the data with codes that describe the content or characteristics of the data at face value (Braun & Clarke, 2006). These codes capture explicit features of the data without delving into deeper interpretations or meanings. Descriptive code allocation was more dominant during phase 1, the initial inductive thematic analysis, as it helped to systematically organise and categorise the data. A brief excerpt of the preliminary coding process of two participants' responses for one of the open-ended questions from the questionnaire is presented in Table 4.

Table 4: A Brief Excerpt of the Preliminary Coding Process

C_ID	Response	Possible Code
43	…Another barrier is a lack of recognition by many academics as to their level of digital literacy - many have much poorer digital literacy than they realize. There is also a lack of training of digital literacy and a lack of making such a requirement in hiring practices. Importantly, for these approaches to be adopted, staff need to have the time to get fully involved and invested in the (re)design of the courses with support from experienced colleagues. Staff need to be shown the value of these methods not only for learning but for their experience as teachers.	Digital Literacy Training Academic Educator Practices
84	Proficiency in a few of the technologies for online learning, subject matter expertise, competency in at one pedagogical strategies for online learning.	Technological Proficiency Subject Matter Expertise Pedagogical Competency

The researcher also made use of interpretive coding to go beyond describing the surface-level content of the data. This allowed the researcher to assign codes that capture underlying meanings, interpretations, or nuances (Saldana, 2013). The interpretive process allowed the researcher to identify codes that were implicit or hidden in the data, including participants' perspectives, attitudes, emotions, or underlying themes (Saldana, 2013). The interpretive coding was more dominant during the second phase of the thematic analysis and in the final phase of analysing both the questionnaire data and the interview data holistically. The coding process required the researcher to engage in deeper analysis and interpretation of the data, drawing on her own insights, theoretical frameworks, and contextual understanding to assign meaningful codes (Saldana, 2013). Engaging in both descriptive and interpretive coding techniques afforded the researcher to systematically analyse all the qualitative data and uncover patterns and themes both explicit and implicit within the data.

3. Searching for Themes

The researcher identified potential themes by sorting and organising all the coded data. This was done by interpreting individual data responses to interpret the aggregated meaning and significance across the data. The coded data was examined and analysed to identify how various codes can be grouped based on shared meanings, leading to categories and then the formation of themes or sub-themes. Themes are patterns of meaning that emerge from the data and represent something significant about the

phenomenon under study (Braun & Clarke, 2006). Across all three phases of the analysis, the researcher consolidated and grouped multiple related codes to form themes. There were also instances where a single code emerged as a representative of an overarching narrative and thus became a theme. Throughout this step, the researcher consistently referenced her research questions, research objectives and research aim to ensure coherence with the identified codes and themes. At the end of this step, she had organised all pertinent coded data excerpts into their respective themes and sub-themes, appropriately categorised under relevant headings.

4. **Reviewing Themes**

The researcher had to review and refine the identified themes to ensure that they are coherent, internally consistent, and distinct from one another (Gioia et al., 2013). This meant revisiting all the data to validate and confirm the relevance of the themes. This was done during phase three. The researcher developed mind-maps outlining the primary themes, which were subsequently refined through a process of consolidating and subdividing themes. While the themes were reviewed, some themes did not effectively serve a purpose or had relevance to the research questions. These were removed. There were also some instances where codes within themes were repetitive or incongruent and had to be revised. This iterative approach persisted until she was content that the themes effectively conveyed the narrative inherent in the data and aligned with the research aim and the answering of the research questions.

5. **Defining and Naming Themes**

Once the themes were finalised, the researcher defined and named each theme, providing clear descriptions and explanations to illustrate what each theme represents. This step involved articulating the core concepts or ideas encapsulated within each theme. Subsequently, she assessed how each of these themes integrated into the overarching narrative of the complete datasets. As summary of the themes can be seen in Table 5.

Table 5: Summary of the Themes and Codes of the Study

Theme	Codes
Pedagogical and Student-Centred Course Design, Structure and Technology Integration	➢ Student Autonomy Through Student-Centric Approach ➢ Course Design ➢ Synchronous and Asynchronous Teaching and Learning ➢ Digital Technologies ➢ Digital Pedagogies ➢ Digital Resources ➢ Assessment and Evaluation Practices ➢ Accessibility and Inclusivity
Dialogue, Social Presence and Collaborative-Cognitive Learning Environment	➢ Communication Streams ➢ Student Participation, Interaction and Engagement ➢ Collaborative Activities ➢ Cognitive Presence ➢ Academic Educator Teaching Presence ➢ Conducive Learning Environment and Workspace
Academic Educator Professional Development and Teaching Competencies	➢ Academic Educator Competencies ➢ Digital Education Literacy and Technology Aptitude and Prowess ➢ Academic Educator Training and Continuous Professional Development ➢ Self-reflective and Introspection Practice
Student Efficacy, Agency and Support Cultivation	➢ Student Efficacy and Agency ➢ Student Support ➢ Student Well-being
Institutional Structure, Resource Availability and Education Equity	➢ Institutional Policy, Procedure and Practice ➢ Strategic Blueprint and Planning ➢ Institutional Infrastructure Distribution for Equitable Access ➢ Equality and Equity – Know Your Students (KYS)
Contextual Realities of National Infrastructure Readiness	➢ National Infrastructure Readiness
Socio-economic and Socio-cultural Context	➢ Social and Cultural Climate ➢ Societal Imbalances and Economic Conditions

6. **Writing the Report**

   Finally, the researcher presented the findings and completed a write-up on the findings of the thematic analysis. She included excerpts from the data to support the identified codes and themes. The write-up provides an in-depth exploration of the themes, their significance, and their implications for theory and practice. This phase involved synthesising the analysis into a coherent narrative that communicates the key insights derived from the thematic analysis.

The integration of data from both questionnaires and interviews allowed for a holistic understanding of the research topic, enabling triangulation of findings and enhancing the trustworthiness and credibility of the research study. By iteratively moving between inductive, deductive, and abductive approaches of thematic analysis, this study adopted a rigorous methodological framework to explore the complexities of digital education and virtual teaching and online learning within the South African context.

3.7. Validity, Reliability and Trustworthiness

Validity is used to measure whether the method measures what it is intended to measure (Golafshani, 2003). Reliability is used as a measure of quality and is used as a measure to determine if, on two separate occasions, a measure will yield the same results under the assumption that the measure is unchanged (Golafshani, 2003; Scott & Morrison, 2005).

There have been opposing views as to whether qualitative research can encompass validity and reliability as quantitative research does (Golafshani, 2003; Noble & Smith, 2015). Qualitative research accepts the basic principles of validity and reliability but rarely uses the terms because of their association with quantitative research. To ensure reliability and validity in qualitative research, the examination of trustworthiness is imperative (Golafshani, 2003; Noble & Smith, 2015). The quality criteria that are used to enhance trustworthiness include dependability, transferability, confirmability, and credibility (Guba, 1981; Moon et al., 2016; Shenton, 2004). Additionally, the researcher used member checking and peer review as two strategies to ensure rigour.

3.7.1. Dependability

Dependability can be described as the consistency and reliability of the findings of research. This can occur if the research methods are well described and documented, as this will allow another independent researcher to follow the research process (Creswell & Creswell, 2017;

Guba, 1981). The researcher described the research methodology and data collection procedures in detail to allow others to understand the extent of the research process and practices. The researcher spent ample time during the data collection and data analysis stage of this study to develop a deep understanding of the participants' perspectives and contexts to ensure that the interpretations of the data were comprehensively understood. Data triangulation was used to corroborate findings from the questionnaires and interviews. Following the completion of the code list during the content and thematic analysis, the text underwent re-coding to determine consistency.

3.7.2. Transferability

Transferability can be described as the degree to which findings from a study can apply to theory or practice or other contexts (Lincoln & Guba, 1985). The researcher described the research methodology and research design in detail by providing detailed descriptions of the research context, transparency of the selection criteria for participants, a description of the participants, data collection and data analysis used in the study. This included diverse characteristics and demographic information of participants, details about the questionnaire and interview process and the broader socio-cultural context in which the research took place. Additionally, the researcher has provided access for other researchers to engage with her data collection instruments. Furthermore, during the analysis phase and data presentation, the researcher provided direct quotations from interviews and examples of data excerpts of thematic quotes to illustrate key findings and themes. These quotations can be representative of the diversity of perspectives within the data set and can provide other researchers with concrete examples to understand how themes emerged. All the detailed information provided can allow other researchers to assess the similarities and differences between their own context and that of the study to determine how the findings in the study can be relevant to their contexts.

3.7.3. Confirmability

Confirmability can be understood as the data and interpretations of the data are based on the participants' inputs and not on the bias of the researcher herself (Moon et al., 2016). The researcher maintained an audit trail by noting the procedures used for checking and rechecking the data throughout the research process. This assisted in making sure that the findings through the data analysis are not influenced by her bias but rather presented by the participants' responses. Responses received from the open-ended questions of the questionnaire were stored on a consolidated MS Excel spreadsheet on her computer and all interviews were recorded and

stored on her computer in both audio and transcript formats. Furthermore, the researcher maintained an audit trail of the research process, including the coding process, interpretations and any revisions that were made. Reflective notes were made to remind the researcher of her own biases, assumptions, and preconceptions throughout the research process to reduce her influence on the interpretation of data and the emergence of themes. The notes and document version control were maintained to document the decisions made through each step of the research process. This allowed for all iterations of the coding process, demonstrating the progress of the findings, to be preserved. The researcher also asked a peer in the field to confirm the findings of the research study.

3.7.4. Credibility

Credibility can be described as the research represents the actual meanings of the research participants (Moon et al., 2016). Noble and Smith (2015) offer some strategies that can be used to ensure the credibility of the qualitative research. The researcher incorporated these strategies during the qualitative research interviews: (1) disclosed any bias that may influence findings based on the researchers personal bias that may have developed from personal experiences and viewpoints (Noble & Smith, 2015), (2) ensured that the interpretation of the data is consistent and transparent (Noble & Smith, 2015), (3) recorded the interviews so they can be revisited at a later stage (Noble & Smith, 2015), (4) included appropriate and close verbatim descriptions of the participants (Noble & Smith, 2015), (5) regurgitated what the participants say during an interview to ensure a correct thought process and interpretation of what they have said, (6) maintained a research diary (Vaismoradi et al., 2013), and (7) got participants validations by requesting them to comment on the interview transcripts and determine whether the final themes sufficiently reflect the concepts being tested (Noble & Smith, 2015). The researcher also incorporated these strategies during the qualitative research coding and thematic analysis: (1) requested a peer to code and classify independently of the researcher as a measure of improving reliability. This was time-consuming and resource-intensive; however, it was a good benchmark during the data collection and analysis (Sofaer, 2002), and (2) maintained a code book and research diary (Vaismoradi et al., 2013). The researcher was also mindful of the quality and credibility of the articles used in the research study to ensure the quality criteria were met (Lincoln & Guba 1985). To further increase the credibility of the findings, discussions were conducted with other researchers with expertise and experience in the field to achieve agreement on codes, categories, and themes. Furthermore, debriefing sessions were

held between the researcher and her supervisor and between the researcher and other colleagues to bring other experiences and perceptions to the research study.

3.7.4.1. Member Checking

Member checking was used as a qualitative research technique to enhance the credibility and validity of the findings (Bryman, 2016). The researcher presented the preliminary findings from the questionnaire, interviews and the interpretations of the data with some of the participants who contributed to the study and invited them to review, verify, or comment on the accuracy and relevance of the findings. This process allowed the participants to confirm whether the researcher's interpretations align with the participants' own experiences and perspectives. By involving participants in the validation process, the researcher ensured that the findings accurately reflect the realities of the respondents and participants and increase the validity and reliability of the study results (Bryman, 2016; Denscombe, 2017).

3.7.4.2. Peer Review

Peer review involved some peers and colleagues who are competent in qualitative research procedures to re-analyse the raw data, listen to the researcher's concerns and discuss them. The researcher enlisted the help of several colleagues who are academic lecturers and experts in the field to double-check the data analysis. The peers also reviewed the study as the researcher progressed to evaluate the quality, validity, and originality of scholarly work before it was submitted. Peer review helped to ensure the integrity and rigour of the research study as peers provided constructive feedback (Bryman, 2016).

3.8. Triangulation

Triangulation refers to the practice and use of employing multiple research methods or data sources within the same research design to gain a comprehensive understanding of the findings (Bryman, 2016). This helps increase the credibility and provides greater confidence that what is being targeted is being accurately captured. Triangulation serves as a valuable methodological tool for researchers as it enables thorough exploration of all possible facets of the topic under investigation (Bryman, 2016). Additionally, triangulation enriches the nature of research data by incorporating multiple perspectives and sources. It facilitates the study where one methodological approach complements and builds upon another, creating a more comprehensive understanding of the research phenomenon (Bryman, 2016). Furthermore, triangulation enables comparisons while also enhancing the validity, credibility, and utility of

research findings (Bryman, 2016). Multiple perspectives of the phenomenon of virtual teaching and online learning were investigated.

There are four main types of triangulations: (1) data triangulation, where researchers use multiple sources of data to address their research inquiries. This approach involves diversifying data collection methods across different timeframes, geographical locations, or various individuals, (2) methodological triangulation, where researchers employ varied methods to investigate the same research query. It is a common form of triangulation, frequently involving the integration of both qualitative and quantitative research techniques within a single study, (3) investigator triangulation, where multiple observers or researchers are engaged to independently collect, process, or analyse data, and (4) triangulating theory, where researchers employ multiple theoretical frameworks in their research, rather than relying on a single theoretical perspective to address a research question (Bryman, 2016).

In this study, data triangulation was employed to enhance the credibility of the findings. Multiple sources of data were collected using a review of literature, questionnaires and interviews, sourced from various HEIs across different geographic locations, and gathered from academic educators representing diverse disciplines. This approach aimed to strengthen the credibility of the data by ensuring its consistency across different contexts and perspectives (Bryman, 2016). By selecting academic educators from diverse HEIs and disciplines, the researcher sought to obtain a broader perspective and assess whether data from multiple sources converged to similar conclusions (Bryman, 2016). Moreover, using multiple data sources helped mitigate the influence of inherent biases that may be present in any single method or source (Bryman, 2016). By comparing data from different perspectives and contexts, the researcher was able to better identify an account for potential biases (Denscombe, 2017). Additionally, the use of multiple data sources facilitated the acquisition of comprehensive insights, as each source offered unique and complementary perspectives on virtual teaching and online learning.

By triangulating data from various sources, the researcher obtained a more comprehensive understanding and enhanced the credibility and validity of the findings on how digital education can be harnessed to for virtual teaching and online learning, as well as the factors and systemic barriers that should be considered in developing a virtual teaching and online learning framework to enable effective educational experiences.

3.9. Assumptions

The first assumption was that respondents and participants responded to the researchers' inquiries and questions with openness and honesty and without persuasion. The second assumption was that following the disclosure of the study's confidential nature through an informed consent procedure, participants opted to participate in the research of their own choice and freely.

3.10. Limitations of the Study

The research study has several limitations. The first limitation is that the level of experience with virtual teaching and online learning of the respondents and participants may have affected the study. Most of the respondents and participants have experience in virtual teaching and online learning stemming from the pandemic period. As a result, they may not have much experience as virtual educators but are more likely familiar with Emergency Remote Teaching (ERT) practices. To mitigate the limitation concerning participants' varying levels of experience with virtual teaching and online learning, a multifaceted approach was used. Firstly, participant selection was broadened to include individuals with diverse backgrounds and experiences in virtual education, beyond those primarily influenced by the pandemic. This included the use of an ODeL institution, which expanded representation aims to offer a more comprehensive understanding of the phenomenon under investigation. Additionally, efforts were made to specifically use responses of experienced virtual academic teaching staff to ensure their insights contribute meaningfully to the study. Follow-up interviews were conducted to further explore the participants' experiences, providing an opportunity to clarify and mitigate potential biases stemming from limited experience. Furthermore, data triangulation was employed with multiple data sources; in other words, by supplementing the questionnaire responses with data collected from interviews to corroborate findings and enrich the analysis.

The second limitation is time, budget and resources; the research study only looked at three HEIs in South Africa from the 26 listed HEIs. Across the selection, 165 questionnaires were completed and only six academic educators were interviewed. This is a relatively small sample size compared to the population of the country. To mitigate time, budget and resource constraints limitation the researcher leveraged technology for data collection by using an online questionnaire and virtual interviews. This helped to streamline the process and reduce logistical constraints associated with in-person data collection. The researcher also collaborated with

some respondents and other researchers to facilitate access to a larger participant pool and alleviate the burden of data collection. Moreover, the researcher employed the purposive sampling technique to ensure an adequate representation across different demographics and academic disciplines within the selected higher education institutions. With regards to the literature reviewed, most literature was during the pandemic and post-pandemic. Although the literature reviewed was during the pandemic, the findings are valuable for the post-pandemic era, especially for virtual teaching and online learning.

A third limitation is that the academic educators responding to the questionnaire or participating in the interviews might not have understood some of the terminology. To mitigate this limitation, the researcher conducted a pilot study. She ensured that the questionnaire was written in clear and accessible language, avoiding jargon or technical terms whenever possible. She also provided definitions or explanations for any specialised terminology that is essential for the study but may be unfamiliar to participants. She triangulated the questionnaire data with interviews to validate and contextualise the findings. Additionally, before distributing the questionnaires, she piloted it with five respondents and prior to conducting interviews, she piloted interviews with two participants representative of the target population to identify any language comprehension issues and refine the interview protocol accordingly. During the interview data collection phase, she offered participants the opportunity to seek clarification on any terms or concepts or even questions that they found confusing, through additional explanations provided. Finally, she analysed the responses of the questionnaires and interviews with sensitivity to potential bias, misunderstandings or misinterpretations.

The fourth limitation is associated with the qualitative data collection and analysis. Data that is gathered from qualitative research cannot always be generalised as it is derived from personal values, experiences, and views. This can also lead to the reliability of the data being undermined (Collis & Hussey, 2014). To attempt to offset this limitation, the researcher acknowledged her own biases and subjectivity, thus highlighting the importance of reflexivity and transparency throughout the research process. She attempted to continuously remain conscious of her role in the research and maintain objectivity throughout the research process to eliminate possible bias in the research findings. This was achieved by treating all views in the data equally, being honest in the data analysis and avoiding the temptation to change any data (Denscombe, 2014). After her analysis, the researcher asked other peers in the field to complete a thematic analysis to improve the trustworthiness of the analysis.

3.11. Delimitations of the Study

In a research study, delimitations refer to the boundaries established by the researcher within the defined purpose and scope of the study (Creswell & Creswell, 2017; Lunenburg & Irby, 2007). The first delimitation was restricting data collection to three South African HEIs. The second delimitation involved collecting data through the questionnaires and conducting interviews with academic educators who experienced working virtually during the pandemic, which may have potentially influenced their responses. Hence, considering the exploratory nature of the study, a pragmatic approach incorporating a predominant qualitative questionnaire with open-ended questions and interviews was chosen as the research methodology.

A final delimitation is that once the current framework is developed from the literature and the current use of digital education is identified from the questionnaires and interviews. A final step would be to test the framework within an institute in South Africa. This will increase the validity and reliability of the framework itself. For the scope of the research study, the framework is designed and developed through a review of the literature and collection of empirical quantitative and qualitative data, however, the testing of the framework is proposed for future research.

3.12. Ethical Considerations

Ethics are about undertaking research responsibly and without causing any harm to those we obtain data from (Bryman, 2016). In educational ethics, adherence to certain foundational principles is paramount to ensure ethical conduct throughout the research process. Firstly, voluntarism highlights the importance of participants freely choosing to participate in the study without coercion or undue influence (Bryman, 2016). Confidentiality, the second principle, mandates that all information provided by participants remains private and is not disclosed to unauthorised individuals (Bryman, 2016). Anonymity, the third principle, ensures that participants' identities remain undisclosed, further safeguarding their privacy and confidentiality. The right to be accorded informed consent, the fourth principle, emphasises the necessity of providing participants with comprehensive information about the research purpose, procedures, and potential risks, enabling them to make an informed decision about participation (Bryman, 2016). Lastly, the right to withdraw emphasises participants' autonomy to discontinue their involvement in the study at any time without facing adverse consequences.

These five principles collectively uphold the ethical integrity of educational research and prioritise the well-being and rights of research participants.

To ensure ethical conduct, the researcher submitted an ethics clearance application to the institutional Ethics Committee and obtained approval. Subsequently, receiving conditional ethics clearance, permission was sought from the three selected HEIs. Data collection commenced only upon securing unconditional ethics approval from both the institutional Ethics Committee and the participating institutions. The *Ethics Clearance Certificate* can be seen in Appendix A1.

Whenever qualitative research is conducted with the involvement of participants, the well-being of the participants must be a priority (Mack et al., 2005). Information relating to the study needs to be provided to the respondents and participants of the study. The *Information Sheet and Consent form* contain the purpose of the research study, the risks and benefits of the research study, cost compensation, confidentiality, and anonymity sections. This gives an overview and information about the research study and the responsibilities of all the stakeholders. The information sheets and consent forms for the questionnaire and interview can be viewed in Appendix A2, A4 and A5.

Informed consent was requested from the participants of the study to ensure that they understood the research project specifics and their role in participating. This allowed the participants to make a conscious decision as to whether they wished to participate. Before the participant provided consent, the researcher explained the (1) nature and purpose of the research, (2) expectations of the research, (3) the possible risks involved, (4) the benefits of the research, (5) the fact that participation is voluntary and that the participant may withdraw from the research study at any point, (6) how confidentiality and anonymity will be protected, (7) logistics around recordings and, (8) provided the contact details of the researcher should the participants have any questions or wish to discuss anything relating to the research study (Mack et al., 2005).

For the online questionnaire, informed consent was obtained from all participants before their involvement in the study. Participants were provided with detailed information about the study. The information was presented in clear and accessible language. By selecting “yes” to proceed after reviewing the information, participants provided consent to participate in the study. For the interview process, the researcher, before the scheduled interview, invited the participants via email and attached the consent form and information sheet to provide participants with

information relating to the study for the participant to read before agreeing and signing the consent form for an interview. The consent form can be seen in Appendix A5. Additionally, before the commencement of the interview, the researcher verbally provided the necessary information about the study to the participants to ensure that the participants fully understood their role and that they could withdraw from the study at any point.

3.13. Chapter Summary

In this chapter, the methodological aspects of the ongoing research study were thoroughly examined. It elucidated the chosen research design for data collection and its alignment with the foundational philosophy and approach of the study. Beyond explicating the research design, the chapter also provided insights into the research instruments used for data collection, discussed the significance of the pilot study and its impact on the research process, described the methods and techniques employed for data analysis, and offered detailed information on the population and sample under study. Additionally, the chapter provided insight into considerations of trustworthiness and triangulation to ensure the validity and reliability of the findings. Acknowledged limitations and delimitations were also addressed to provide a comprehensive understanding of the study's scope and constraints. Concluding this section was a thorough description of the ethical considerations considered throughout the research process. A summary of the research design and processes is illustrated in Table 6.

Table 6: A Summary of the Research Design and Processes

Research Design and Process	Researchers Choice	
Research Paradigm	Pragmatism	
Methodological Aspect	Predominantly Qualitative with subordinate Quantitative Techniques	
Research Methods and Instruments	Pilot Study	Questionnaire
	Open-ended and Close-ended Questions	Questionnaire
	Semi-structured Interviews	Interview Protocol
Study Population	Academic Educators Across Three HEIs (Urban, Rural, and ODeL) (Questionnaire n=165, Interviews n=6)	
Sampling Methods	Purposive, Non-Probability Sampling	
Data	Responses from Open-ended and Close-ended Questionnaire Questions Audio Recordings of Interviews Interview Transcripts Interview Notes	
Data Analysis	Simple Descriptive Statistics (Mean, Mode, Correlation Analysis and Data Visualisations) Thematic Analysis (Manual Coding, Categorising and Identifying Themes)	

4. Chapter 4: Data Analysis and Presentation of Findings

4.1. Chapter Overview

Chapter Three provided a comprehensive and detailed explanation of the research paradigm, research approach, participant selection criteria, as well as the data collection and analysis methods used in this study. The aim of this study is to explore how the power of digital education can be strategically harnessed to develop a sustainable and adaptable Virtual Teaching and Online Learning Ecosystem Framework (VTOLE-Framework) specifically designed for South Africa's higher education context. This framework seeks to understand how we can leverage the power of digital education to create transformative, equitable educational experiences for students, considering the unique contextual, social, economic, technical, cultural and institutional factors. This chapter analyses the questionnaires and semi-structured interviews data using the theoretical framework developed in Chapter 2, grounded in Socio Technical Theory (Davis et al., 2014), the Ecological Framework (Bronfenbrenner, 1979), the Theory of Transactional Distance (Moore, 1997) and the Community of Inquiry Framework (Garrison et al., 2000), to provide a comprehensive understanding of how the combination of these theoretical perspectives can inform the enhancement of digital education and its influence on virtual teaching and online learning. This chapter presents a triangulated analysis of qualitative and quantitative data, focusing on key themes emerging from interviews and open-ended questionnaire responses of the qualitative data, and simple descriptive statistics and correlation analysis of the quantitative data from the questionnaire. Employing a pragmatic lens, this study provides a thematic analysis of qualitative data, supported by quantitative insights, to address the research questions:

1. How can digital education be harnessed to enhance virtual teaching and online learning across diverse student populations?
2. What factors should be considered in the design and development of virtual teaching and online learning across multiple ecological environments?
    1. What intrinsic factors should be considered in designing and developing virtual teaching and online learning environments to optimise educational experiences?
    2. What extrinsic factors and systemic barriers must be addressed to implement effective and equitable virtual teaching and online learning? The complete qualitative analysis process yielded seven definitive themes.

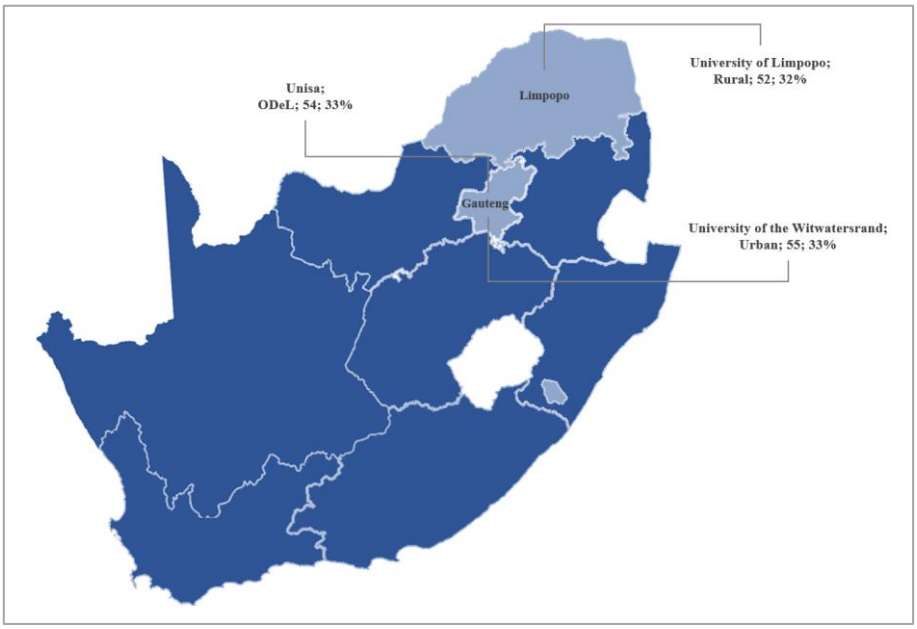
4.2. Demographics of Respondents

This section presents an overview of the demographic data of the respondents who participated in the questionnaires during the first phase of the data collection. There were 165 responses consisting of academic educators across three higher education institutions; one being an urban institution within a built-up area, one focusing on Open and Distance Learning (ODeL), and one situated in a rural developing area, characterised as historically disadvantaged. The demographic data provides valuable insights into the composition of the sample population and aids in understanding the representativeness of the study.

4.2.1. Respondents Institution Type

Respondents were located across three different types of higher education institutions. The percentage distribution of respondents across the different types of institutions was quite balanced, possibly contributing to a range of views and experiences. The distribution of respondents by institution is as follows: 55 (33%) from the University of the Witwatersrand, an urban type of institution, 52 (32%) from the University of Limpopo, a rural type of institution, 54 (33%) from Unisa, an ODeL institution, and 4 (2%) are unknown. Although Unisa, the ODeL institution, is based in the Gauteng province, the students who attend are majority South African, but as a prominent distance learning institution, Unisa also enrols a significant number of international students, most of whom come from countries within southern Africa. This reflects Unisa's mission to provide accessible education across the African continent (Letseka et al., 2018). The distribution is illustrated in Figure 10.

Figure 10: Summary of Respondents by Institution Type

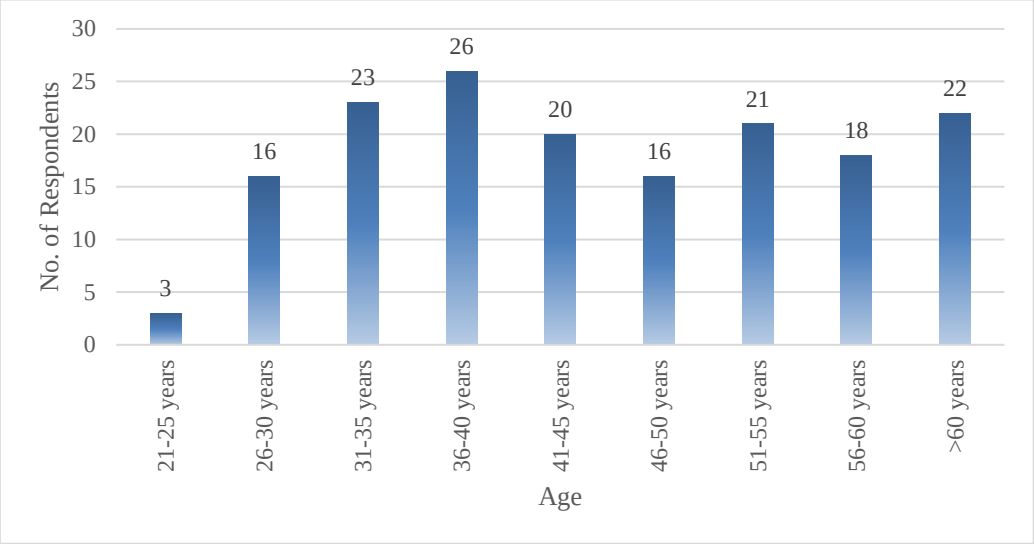


The researcher deemed it imperative to include academic educator respondents ranging from urban, rural, and Open and Distance Learning (ODeL) institutes when determining the factors to consider in developing the Virtual Teaching and Online Learning Ecosystem Framework (VTOLE-Framework). This diversity allowed for a nuanced understanding of the contextual differences, resource availability, infrastructure challenges, student diversity, pedagogical practices, and policy implications across various institutional settings. By incorporating perspectives from academic educators in urban settings, the researcher explored the implications of ample resources and infrastructure, while insights from rural and ODeL institutes shed light on challenges such as limited internet connectivity and diverse student demographics. Understanding how virtual teaching and online learning align with different pedagogical approaches and support the needs of diverse student populations enabled the researcher to develop an adaptable VTOLE-Framework that promotes inclusivity and student success. Furthermore, considering the policy implications across the different institutional settings aided in recommending strategies for promoting institutional support and sustainability of virtual teaching initiatives. This comprehensive approach ensured the development of a contextually relevant and inclusive framework that addresses the diverse needs and challenges of higher education institutions in various South Africa.

4.2.2. Respondents Age Distribution

The age distribution of respondents ranged from the 21–25 years category to the >60 years category. Three (1.82%) of respondents are between 21 and 25 years old, 16 (9.70%) of respondents are between 26 and 30 years old, 23 (13.94%) of respondents are between 31 and 35 years old, 26 (15.76%) of respondents are between 36 and 40 years old, 20 (12.12%) of respondents are between 41 and 45 years old, 16 (9.7%) of respondents are between 46 and 50 years old, 21 (12.73%) of respondents are between 51 and 55 years old, 18 (10.91%) of respondents are between 56 and 60 years old, and 22 (13.33%) of respondents are older than 60 years. Most respondents fell within the 36-40 category, followed closely by the 31-35 years category and the > 60 years category. Figure 11 shows a summary of the respondents by age.

Figure 11: Summary of Respondents by Age

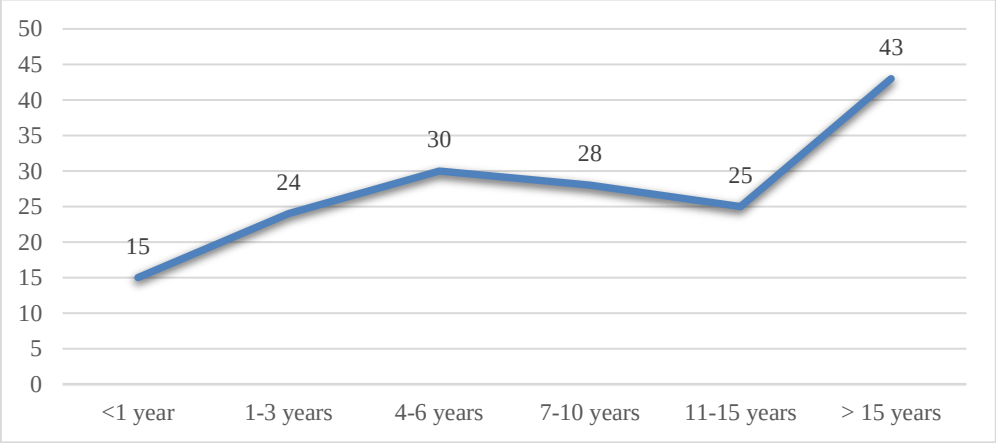


It was essential to consider an age range of academic educators for a comprehensive understanding of the micro, meso and macro factors, as well as understanding the systemic barriers that need to be considered in the development of a VTOLE-Framework. Such diversity ensured capturing varied perspectives, experiences, and comfort levels with technology and online platforms. By encompassing academic educators of different ages, the researcher discerned how academic educators across generations perceive and adapt to technological changes, thereby informing effective transitions to virtual teaching environments. Additionally, the researcher explored age-related influences on pedagogical approaches in identifying effective strategies for integrating virtual teaching for instructional delivery. It was important to consider and acknowledge age-related differences in interactions with technology, ensuring the inclusivity and sustainability of the VTOLE-Framework.

4.2.3. Respondents Years of Experience

This distribution reflected the diversity of experience levels among academic educators within the institutions, ranging from novice to seasoned professionals. The distribution of respondents by years of teaching experience in higher education is illustrated in Figure 12. The data indicate that respondents' years of experience at their current institution varied significantly. 15 (9.09%) of participants reported having < 1 years of experience, 24 (14.55%) reported 1-3 years of experience, 30 (18.18%) reported 4-6 years of experience, 28 (16.97%) reported 7-10 years of experience, 25 (15.15%) reported 11-15 years of experience, and 43 (26.06%) reported >15 years of experience.

Figure 12: Summary of Respondents by Teaching Experience

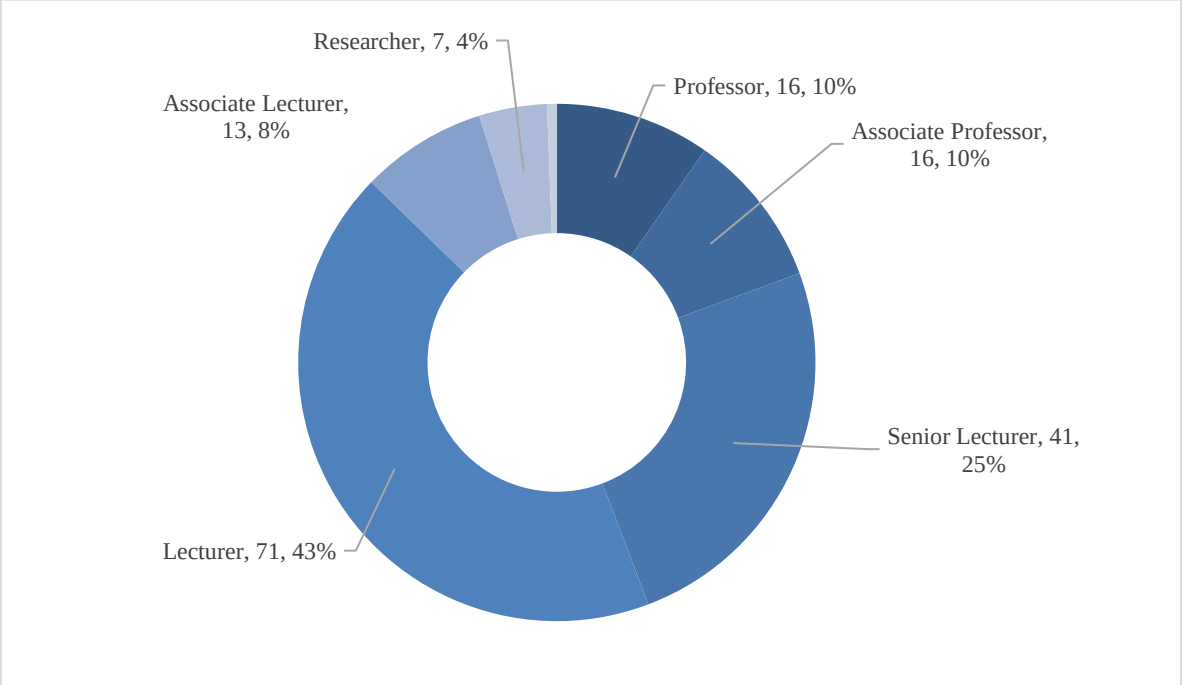


The researcher thought, as with the age distribution, that it was essential to incorporate a range of years of experience among academic educator respondents when determining the factors to consider in the development of the VTOLE-Framework. This approach ensured the inclusion of diverse perspectives, technological adaptability, pedagogical expertise, professional development needs, and leadership potential across different experience levels. More experienced academic educators brought insights based on their extensive teaching history and familiarity with traditional practices, while newer academic educators offered fresh perspectives informed by recent training and educational trends. Understanding how academic educators of varying experience levels navigate technology and pedagogical strategies while considering systemic barriers informed the design of the VTOLE-Framework, tailored to accommodate diverse teaching styles and learning preferences.

4.2.4. Respondents Rank

The distribution of respondents by rank offered an overview of the roles and responsibilities held by the respondents within the educational institution. The data revealed a range of job titles and ranks among respondents, reflecting the diverse functions within the institution. Eight (8%) of respondents identified their rank as associate lecturer, 71 (43%) as lecturer, 41 (25%) as senior lecturer, 16 (10%) as associate professor, 16 (10%) as professor, and 7 (4%) as researcher. This is illustrated in Figure 13. This distribution highlighted the multifaceted nature of roles and the ranks across the higher education institutions.

Figure 13: Summary of Respondents by Job Title



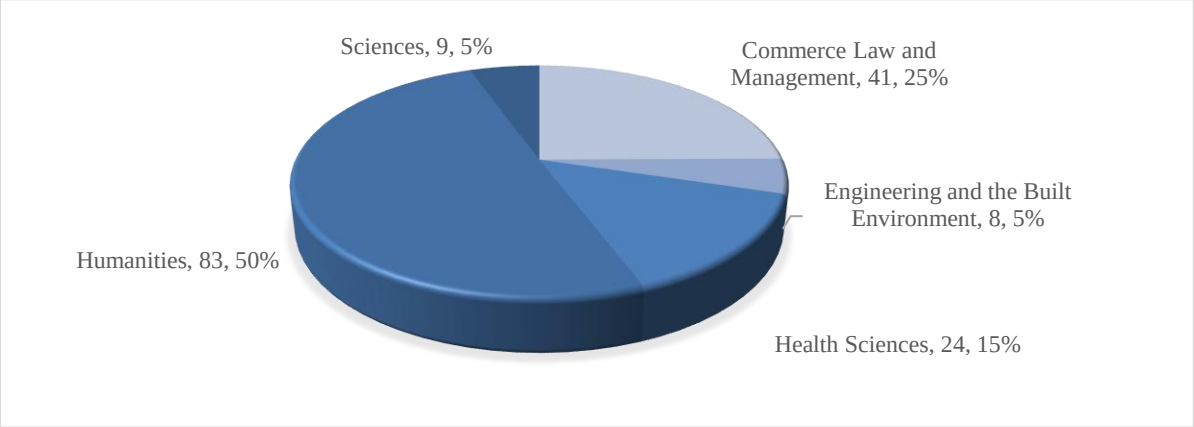
The researcher invited a range of academic educator respondents across various ranks, including associate lecturers, lecturers, associate professors, and professors. She thought this to be crucial in the development of a comprehensive understanding of the factors influencing virtual teaching and online learning. This diversity ensured the inclusion of varied perspectives, teaching experiences, research expertise, leadership insights, and mentorship within the academic community. Associate lecturers and lecturers offered insights grounded in their direct teaching experiences and instructional practices, while associate professors and professors contributed perspectives shaped by their leadership roles, research contributions, and institutional responsibilities.

4.2.5. Respondents Discipline

The distribution of respondents across different faculties provided insights into the representation of different academic disciplines and departments within the three educational institutions. The data revealed a diverse distribution of respondents across various faculties, with half of the respondents coming from the Humanities and Education area. It should be noted that in the education discipline, there are multiple subject disciplines as academic educators are preparing pre-service educators for the teaching of multiple subjects in schools. The distribution of respondents' disciplines is illustrated in Figure 14. This distribution highlighted the interdisciplinary nature across the institutions, with academic educators representing a wide range of academic disciplines and departments. It also reflected cross-

disciplinary interactions within the institutions, contributing to a rich and diverse educational environment.

Figure 14: Summary of Respondents by Faculty



The researcher thought to include academic educator respondents from a range of faculties across humanities, sciences, health sciences, engineering, commerce law and management to be essential when determining the factors to consider in developing the VTOLE-Framework. This diversity ensured a comprehensive understanding of disciplinary perspectives, promoting interdisciplinary experiences, customising content delivery methods, addressing technological integration challenges, accommodating student diversity, and advocating for institutional support. By engaging respondents from various faculties, the researcher was able to design and develop an inclusive and effective VTOLE-Framework that meets the diverse needs of faculty members and students across different disciplines, encompassing innovative and holistic approaches to teaching and learning in virtual environments.

4.2.6. Concluding Remarks

Overall, the demographic data of respondents to the questionnaire highlights the diverse representation within the sample population. The findings provided valuable insights into the characteristics of the participants, aiding in the interpretation and generalisation of the findings within the study.

4.3. Demographics of Participants

During the second phase of the data collection, the researcher conducted interviews with six participants: four selected from the pool of 165 respondents and two participants independent of the questionnaire. These participants were chosen based on specific criteria: (1) they are academic educators at one of the three higher education institutions under investigation, (2)

they have teaching experience exceeding ten years, (3) they possess at least three years of involvement in virtual teaching and online learning, and (4) they demonstrate a comprehensive understanding of the virtual teaching and online learning environment. Table 7 illustrates a summary of the demographics of participants who were interviewed.

Table 7: Demographics of the Participants

Participant	Years of Teaching Experience	Years of Virtual Teaching Experience	Rank
Dr Alexander	> 15 Years (34 Years)	> 15 Years (18 Years)	Lecturer
Prof Baloyi	> 15 Years (26 Years)	> 15 Years (20 Years)	Associate Professor
Dr Mbatha	> 15 Years (20 Years)	11-15 Years (13 Years)	Senior Lecturer
Prof Radebe	> 15 Years (21 Years)	11-15 Years (14 Years)	Professor
Dr Mrwebi	> 15 Years (29 Years)	4-6 Years (4 Years)	Senior Lecturer
Dr Sithole	> 15 Years (16 Years)	4-6 Years (4 Years)	Senior Lecturer

The demographics of the participants who were interviewed in the study highlight a highly experienced group of academic educators. All participants have over 15 years of teaching experience, with most having significant experience in the virtual teaching space as well. Their ranks range from lecturer to professor, indicating a mix of seniority and expertise. The diverse mix of ranks, teaching experience and virtual teaching experience among the participants offers a broad perspective on the challenges and opportunities in virtual teaching and online learning.

Academic educators Dr Alexander, Prof Baloyi, Dr Mbatha, and Prof Radebe bring plenty of experience and wisdom to the study, having engaged with virtual teaching and online learning methodologies well before the onset of the Covid-19 pandemic. With their roles ranging from lecturer to professor, they had already integrated digital tools and online platforms into their teaching practices, showcasing a proactive approach to educational innovation. Prof Baloyi, affiliated with a contact university, contributed insights from a context where face-to-face interaction traditionally plays a significant role in educational delivery. During the pandemic, these academic educators further adapted their strategies, expanding their use of virtual teaching to ensure continuity in education amidst unprecedented challenges. Post-pandemic, they continue to leverage their accumulated expertise, refining their online teaching methodologies and integrating new technologies. Their experiences pre-pandemic, during the pandemic and post-pandemic provided valuable insights into the evolution of virtual teaching practices in higher education, emphasising both continuity and adaptation in response to

technological advancements and educational needs while keeping in mind the systemic barriers that plague its use.

There are two academic educators (Dr Mrwebi and Dr Sithole) who started using virtual teaching and online learning during the Covid-19 pandemic, demonstrating adaptability in incorporating digital education into their teaching practices. Despite their relatively recent four-year experience in virtual teaching and online learning, they continue to use these methods. This might suggest their recognition of the benefits and effectiveness of virtual teaching and online learning, reinforcing the importance of its affordances in modern higher education. Their experiences provide valuable insights into the transition to and sustained use of digital education post-pandemic.

Dr Mrwebi is affiliated with a contact higher education institution. Post-pandemic, she has integrated blended teaching methods into her instructional delivery. This may be indicative that she recognised the benefits of virtual teaching and online learning in its effectiveness and versatility and attempted to incorporate its affordances into her teaching practices. During the interviews, Dr Sithole expressed a strong stance against post-humanism, although he used virtual teaching and online learning. This adds a unique perspective on the integration of digital education and virtual teaching and online learning. Despite his opposition to post-humanism, he continues to effectively use digital tools and blended teaching strategies, demonstrating a balanced approach that leverages technology while maintaining a human-centred educational philosophy.

4.4. Data Exploration Through Simple Descriptive Statistics and Data Visualisations

Quantitative data underwent standard statistical analysis to produce descriptive statistics, such as percentages and frequencies (Cohen et al., 2011). The questionnaire contained two primary closed-ended questions employing Likert scale options ranging from “Strongly Agree” to “Strongly Disagree” for respondents to indicate their level of agreement. The first question pertained to intrinsic factors (factors that higher education institutions and academic educators can control and directly impact) that exert influence on the shaping of educational experiences within virtual teaching and online learning environments. Conversely, the second question explored extrinsic factors (factors that higher education institutions and academic educators cannot directly impact but are inherent in the field) that impact the development and execution of virtual teaching and online learning initiatives.

This section of the study presents and interprets the responses obtained from the Likert scale questions “Select your level of agreement on the importance of the intrinsic factors when using virtual teaching and online learning” and “Select your level of agreement on the influence of extrinsic factors when using virtual teaching and online learning”. The data collected through the questionnaire provides valuable insights into the respondents’ perceptions towards the intrinsic and extrinsic factors in the context of virtual education.

4.4.1. Analysis of Intrinsic Factors

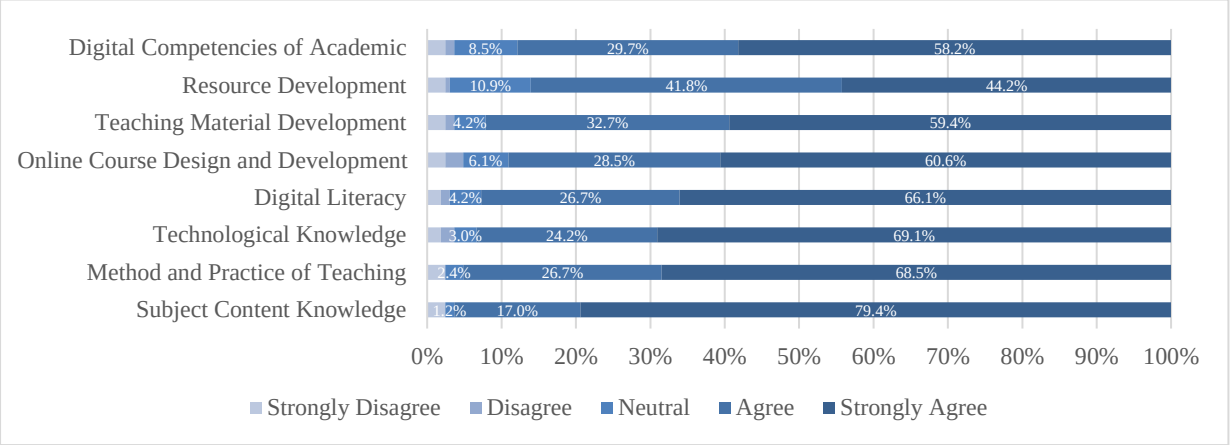
In the context of the study, intrinsic factors are variables that academic educators have control over and can directly impact. This includes their subject content knowledge, their method and practice of teaching, their technological knowledge, their digital literacy skills, their considerations for online course design and development, their ability to develop teaching material and resources and their overall digital competencies. Figure 15 displays a tabulation of the percentage distribution and the graphical representation of the responses.

Figure 15: Percentage Distribution of Intrinsic Factor Analysis

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Subject Content Knowledge	2.4%	0.0%	1.2%	17.0%	79.4%
Method and Practice of Teaching	2.4%	0.0%	2.4%	26.7%	68.5%
Technological Knowledge	1.8%	1.8%	3.0%	24.2%	69.1%
Digital Literacy	1.8%	1.2%	4.2%	26.7%	66.1%
Online Course Design and Development	2.4%	2.4%	6.1%	28.5%	60.6%
Teaching Material Development	2.4%	1.2%	4.2%	32.7%	59.4%
Resource Development	2.4%	0.6%	10.9%	41.8%	44.2%
Digital Competencies of Academic	2.4%	1.2%	8.5%	29.7%	58.2%

Most of the respondents strongly agree and agree that the factors subject content knowledge (96.4%), method and practice of teaching (95.2%), technological knowledge (93.3%), digital literacy (92.7%), online course design and development (89.1%), teaching material development (92.1%), resource development (86.1%) and the digital competencies (87.9%) of academic educators are important when using virtual teaching and online learning. These high levels of agreement are indicative that the majority of the respondents believe that these intrinsic factors are important in the context of virtual teaching and online learning. Figure 16 illustrates a graphical representation of the responses for the intrinsic factors.

Figure 16: Summary of Intrinsic Factor Analysis



The intrinsic factors subject content knowledge, method and practice of teaching, technological knowledge, digital literacy, online course design and development, teaching material development, resource development and digital competencies of academic educators are integrated into the themes and further elaborated on in the thematic analysis.

4.4.2. Analysis of Extrinsic Factors

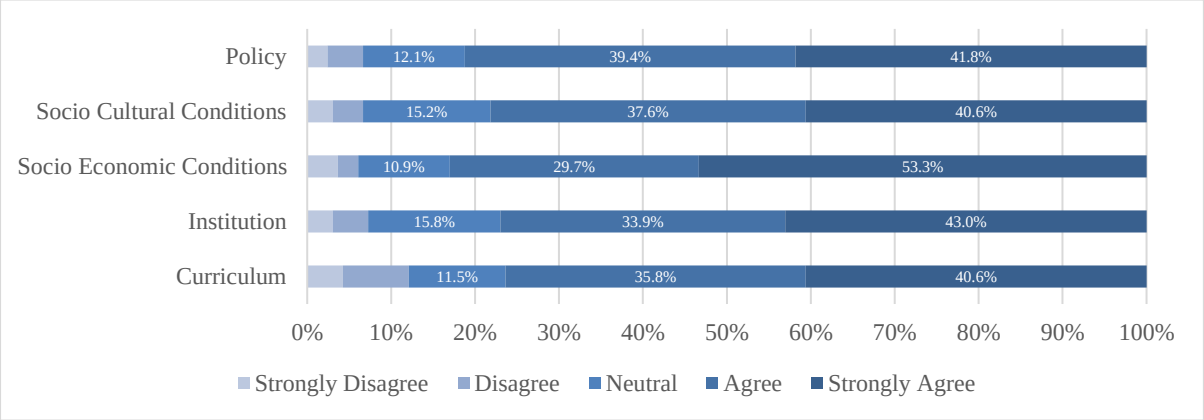
In the context of the study, extrinsic factors are variables that academic educators do not have control over and cannot directly impact. This includes the curriculum, institution, socio-economic conditions, socio-cultural conditions and policy. Figure 17 displays a tabulation of the percentage distribution and the graphical representation of the responses.

Figure 17: Percentage Distribution of Extrinsic Factor Analysis

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Curriculum	4.2%	7.9%	11.5%	35.8%	40.6%
Institution	3.0%	4.2%	15.8%	33.9%	43.0%
Socio Economic Conditions	3.6%	2.4%	10.9%	29.7%	53.3%
Socio Cultural Conditions	3.0%	3.6%	15.2%	37.6%	40.6%
Policy	2.4%	4.2%	12.1%	39.4%	41.8%

Most of the respondents strongly agree and agree that the factors curriculum (76.4%), institution (77.0%), socio-economic conditions (83.0%), socio-cultural conditions (78.2%) and policy (81.2%) are important when using virtual teaching and online learning. These levels of agreement are indicative that most of the respondents believe that these extrinsic factors are important in the context of virtual teaching and online learning. Although it should be noted that there were influential percentages in the Neutral zone. During the interviews in the second phase of data collection, it was realised that due to the diversity of the sample, some did not quite understand the context of the extrinsic factors and their implications. More emphasis was placed on the extrinsic factors during the interviews in phase two of data collection. Figure 18 illustrates a graphical representation of the responses for the extrinsic factors.

Figure 18: Summary of Extrinsic Factor Analysis



The extrinsic factors policy, socio-cultural conditions, socio-economic conditions, institution and curriculum are integrated into the themes and further elaborated on in the thematic analysis.

4.4.3. Correlation Matrix Analysis

The correlation matrix provides a comprehensive overview of the pairwise correlations between variables, revealing the strength and direction of these associations. By examining correlation coefficients, researchers can discern whether variables are positively or negatively related and the extent to which they co-vary. In this section, the researcher presents the results of a correlation matrix analysis conducted on the closed-ended questions data, aiming to elucidate the interrelationships between key variables and uncover underlying patterns within the data. Through this analysis, the researcher intends to gain insights into the complex dynamics of the variables under study and their implications. This assists with the thematic analysis too.

4.4.3.1. Intrinsic Factor Correlation Analysis

Table 8: Intrinsic Factors Correlation Matrix Analysis

Factors	Subject Content Knowledge	Method and Practice of Teaching	Technological Knowledge	Digital Literacy	Online Course Design and Development	Teaching Material Development	Resource Development	Digital Competencies of Academic
Subject Content Knowledge	1							
Method and Practice of Teaching	0.439166239	1						
Technological Knowledge	0.288490716	0.397225886	1					
Digital Literacy	0.191205636	0.424579712	0.777296615	1				
Online Course Design and Development	0.225948058	0.294566291	0.505024351	0.593512	1			
Teaching Material Development	0.326574718	0.327282651	0.359545957	0.374681857	0.543868642	1		
Resource Development	0.201494856	0.223386709	0.335168559	0.282514255	0.46777044	0.581456088	1	
Digital Competencies of Academic	0.143132245	0.30985649	0.570325094	0.603974941	0.474699373	0.309338479	0.457721755	1

Each of the factors exhibits a positive correlation, as revealed by the correlation analysis in Table 8. The strongest positive correlation is observed between technological knowledge and digital literacy, followed by the correlation between digital literacy and digital competency, and lastly, the correlation between digital literacy and online course design and development. A noteworthy finding to emphasise is that digital literacy emerges as a top factor in the three strongest positive correlations.

A correlation value of 0.777296615 between variables of technological knowledge and digital literacy indicates a strong positive correlation between the two variables, as shown in Table 8. This means that as the level of technological knowledge increases, there is a tendency for the level of digital literacy to also increase, and vice versa. In other words, academic educators who possess higher levels of technological knowledge are likely to have higher levels of digital literacy, and academic educators with lower levels of technological knowledge are likely to have lower levels of digital literacy. The strength of the correlation coefficient (0.777296615) suggests a strong relationship between these variables, indicating that they are closely related and tend to vary together consistently. This finding is valuable for understanding the interplay between technological knowledge and digital literacy in the context of virtual teaching and

online learning, as it highlights the importance of considering both factors when designing virtual teaching and online learning environments. It can also be beneficial in designing educational interventions and support programmes aimed at enhancing digital competencies among academic educators and students.

A correlation value of 0.603974941 between variables of digital literacy and digital competency suggests a moderate positive correlation between the two variables, as shown in Table 8. This indicates that there is a tendency for academic educators who exhibit higher levels of digital literacy to also demonstrate higher levels of digital competency, and vice versa. While the correlation is not as strong as a perfect correlation of 1.0, it still signifies a meaningful relationship between digital literacy and digital competency. In practical terms, this finding suggests that academic educators who are proficient in digital literacy skills, such as navigating digital tools and accessing online resources, are likely to possess a certain level of digital competency, which includes the ability to effectively use digital technologies and digital pedagogies for various purposes, such as communication, collaboration, and problem-solving. Understanding this correlation can be beneficial for academic educators in designing their virtual teaching and online learning environments. It can also help in developing targeted interventions and educational initiatives aimed at enhancing digital literacy and competency among academic educators and students, thereby preparing them for success in an increasingly digital world.

A correlation value of 0.593512 between variables of digital literacy and online course design and development indicates a moderate positive correlation between the two variables, as shown in Table 8. This suggests that there is a tendency for academic educators who possess higher levels of digital literacy to also be more involved in online course design and development, and vice versa. While the correlation is not as strong as a perfect correlation of 1.0, it still signifies a meaningful relationship between digital literacy and engagement in online course design and development activities. In practical terms, this finding suggests that academic educators who are proficient in digital literacy skills are more likely to actively participate in the design and development of online courses, incorporating digital tools and technologies into their teaching practices. Understanding this correlation can be valuable for educational institutions and instructional designers in leveraging the expertise of digitally literate academic educators to create effective and engaging online learning experiences for students. Additionally, it highlights the importance of enhancing digital literacy skills among academic educators to promote innovation and excellence in online course design and development initiatives.

4.4.3.2. Extrinsic Factors Correlation Matrix Analysis

Table 9: Extrinsic Factors Correlation Matrix Analysis

Factors	**Curriculum**	**Institution**	**Socio-Economic Conditions**	**Socio-Cultural Conditions**	**Policy**
Curriculum	1				
Institution	0.455987157	1			
Socio-Economic Conditions	0.185649188	0.371117515	1		
Socio-Cultural Conditions	0.334453184	0.39970825	0.790440773	1	
Policy	0.356513162	0.439224099	0.413523065	0.510286414	1

Each of the extrinsic factors exhibits a positive correlation, as revealed by the correlation analysis in Table 9. The strongest positive correlation is observed between Socio-Economic Conditions and Socio-Cultural Conditions, followed by the correlation between Socio-Cultural Conditions and Policy.

A correlation value of 0.790440773 between variables of Socio-Economic Conditions and Socio-Cultural Conditions indicates a strong positive correlation between the two variables. This suggests that there is a significant tendency for academic educators and students who experience certain socio-economic conditions to also experience similar socio-cultural conditions, and vice versa. In other words, as socio-economic conditions improve or decline, there is a corresponding trend in socio-cultural conditions. This strong positive correlation implies that these two sets of conditions are closely related and tend to vary together consistently. This correlation may provide insights into the interplay between socio-economic factors (such as income, education, and employment) and socio-cultural factors (such as cultural norms, values, and beliefs), and how they collectively influence academic educators' and students' experiences and well-being.

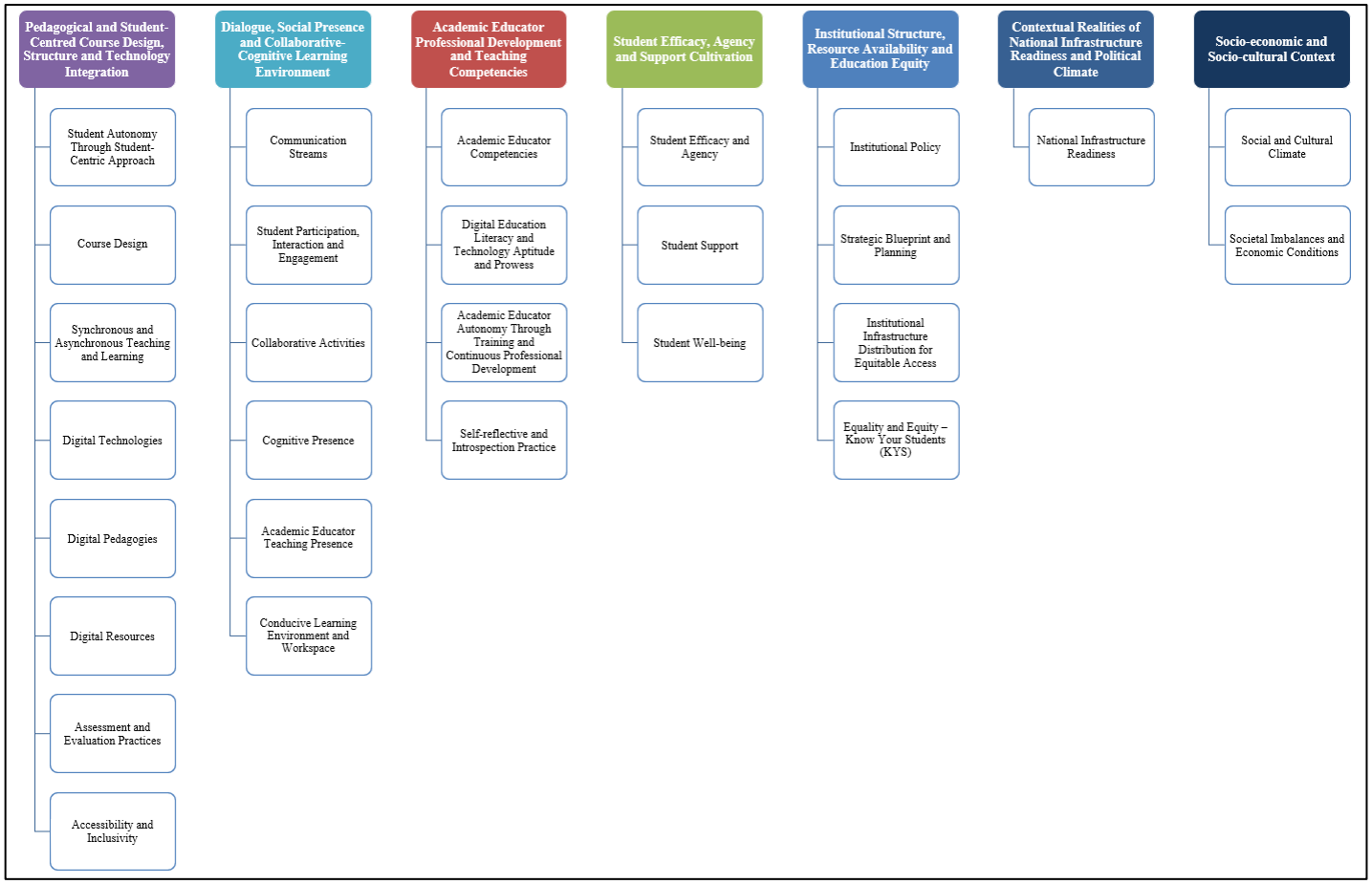
A correlation value of 0.510286414 between variables of Socio-Cultural Conditions and Policy indicates a moderate positive correlation between the two variables. This suggests that there is a tendency for certain socio-cultural conditions to be associated with specific policy contexts, and vice versa, although the relationship is not as strong as a perfect correlation. In practical terms, this finding implies that socio-cultural factors, such as cultural norms, values, and

beliefs, may influence the development, implementation, or effectiveness of policies, and conversely, policies may shape or respond to prevailing socio-cultural conditions. Understanding this moderate positive correlation can provide insights into the interplay between socio-cultural dynamics and policy outcomes, helping higher education institutions, policymakers and other relevant stakeholders develop more contextually relevant and effective policies that are responsive to socio-cultural contexts.

4.5. Thematic Analysis

The thematic analysis was conducted on the open-ended questions in the questionnaire and the transcripts of the interviews. The themes and codes identified are summarised in Figure 19.

Figure 19: A Summary of the Research Themes



The themes outlined in Figure 19 are thoroughly examined and substantiated with pertinent examples drawn from the open-ended questions and semi-structured interviews.

4.5.1. Pedagogical and Student-Centred Course Design, Structure and Technology Integration

The integration of pedagogical strategies with student-centred course design and advanced technology is vital. The shift towards more interactive, engaging, and inclusive learning environments requires methods that address the diverse needs of students while leveraging digital tools to enhance the virtual educational experience. This theme explores the critical components required to design and develop courses for effective educational practices in the virtual teaching and online learning environment. Eight sub-themes were identified under this theme namely (1) Student Autonomy Through Student-Centric Approach, (2) Course Design, (3) Synchronous and Asynchronous Teaching and Learning, (4) Digital Technologies, (5) Digital Pedagogies, (6) Digital Resources, (7) Assessment and Evaluation Practices, and (8) Accessibility and Inclusivity.

4.5.1.1. Student Autonomy Through Student-Centric Approach

The analysis and findings on *Student Autonomy Through Student-Centric Approach* emphasise the significance of cultivating student autonomy in digital education, highlighting the importance of tailored approaches, student-centricity, and empowerment in preparing students for the demands of the digital age.

Participants advocated for a student-centric approach, where the focus shifts from academic educators to students. Dr Malan said that virtual teaching and online learning *should be student centric, i.e., focus should be on students not educators, enabling autonomy by putting the responsibility of learning on students.* Dr Mbatha stated *I think it kind of comes with what control are you willing to relinquish? And I don't think it's a technology thing. So I don't think it's a discussion, you know, ok, this is unique to online learning and we need to learn to both plan but also I think if you think of the traditional face to face classroom and how many lecturers still do you know the sage on the stage type lecture where they talking and telling and you know I'm informing you and you must just take it in and repeat back to me. And even though lots of research is showing that that's not very successful because they're not willing to let go and let classes take shape with the students that they have there in front of them. Because I think letting go is a little bit scary.* The student-centred approach empowers students by placing the responsibility of learning on their shoulders, creating a sense of autonomy and self-

directedness. The differentiation between undergraduate and postgraduate student needs indicates the importance of tailoring educational approaches. While undergraduates may require more structured guidance and support due to their learning readiness and maturity levels, postgraduates can benefit from greater autonomy and self-directed learning opportunities.

While a student-centred approach is recommended to be adopted, participants recognised the varying needs between undergraduate and postgraduate students. While undergraduates may require more guidance and structured learning experiences, postgraduates can benefit from greater autonomy and self-directed learning. Dr Burger said *perhaps the question becomes, is it for undergraduate or postgraduates? for undergraduate, the content will have to heavily involve and rotate around the lecturer despite the push for student-centred learning. I am stating this having lectured a first-year course this year and realizing that they basically need to be taught everything and are not eager to learn on their own. For postgraduate students, much of the learning should be left to students with the lecturer taking a supportive role. Central to student autonomy is the adoption of a student-centric approach which can empower students to take ownership of their learning journey. This can allow academic educators can nurture autonomy, critical thinking, and problem-solving skills essential for success in the digital age*.

4.5.1.2. Course Design

The analysis and findings on *Course Design* explore the participants' perspectives on course design and structure, offering valuable insights into the principles, challenges, and strategies involved. It stresses the multifaceted nature of course design, emphasising the significance of content knowledge, innovation, practical components, and other relevant considerations in designing and developing engaging and effective virtual and online learning experiences.

Participants highlighted the importance of aligning course design with fundamental educational principles to enhance the learning experience. Dr Maponya emphasised *through the triangle of effective education: student-centred teaching, interactive learning, and transformative assessment*. This approach ensures that teaching methods, learning activities, and assessment strategies are tailored to meet the needs of individual students, thereby promoting deeper engagement and understanding. Participants emphasised the importance of considering the content of the subject or module in course design. Dr Ndaba responded that *the content of the subject is important*, and Dr Van Niekerk suggested that *the content of the module should be*

taken into consideration. This highlights the necessity for academic educators to have a deep understanding of the subject matter to ensure that course materials are relevant, engaging, and aligned with the learning objectives.

It was noted that course content should not only be theoretical but practical as well to facilitate deep learning by providing a comprehensive understanding of the subject matter. Dr Alexander states that *you know the content now you know need to figure out what tools, what tools are you going to use to do this, to do the teaching to do this assignment and then you set up your entire module site, the gate to use the correct tools to do the teaching and the statement.* This indicates the importance of having subject content knowledge to develop the content and also being able to choose the appropriate digital tool to deliver it. Dr Mangena stated that *content should be practical and practical for the students to relate and learn,* and Dr Zwane supported this by raising the ideology around *the depth of knowledge*. This stresses the importance of designing courses that promote critical thinking and mastery of the subject content.

It was suggested that study materials, module learning outcomes, and assessment criteria should be clearly defined to provide a framework for academic educators to work within. Prof Muri stated that s*tudy material, module learning outcomes and assessment criteria should be clearly defined to enable lecturers to work within a given scope.* Clarity in these aspects, especially the learning outcomes, enables academic educators to design courses that are coherent, focused, and conducive to effective teaching and learning experiences. The participants also highlighted the potential use of incentives and awards to motivate students and promote successful completion of the learning outcomes. Dr Mathebula said the *use of incentives and awards for completing outcomes* should be considered.

While acknowledging the importance of designing courses around specific learning outcomes and assessment criteria, participants also recognised the challenges posed by the limitations of available Learning Management Systems (LMS). However, they stressed the need for academic educators to have a deep understanding of how to leverage these systems to engage students effectively in their learning process. Dr Mbhele said, *ideally, the design should be centred around the specific outcomes and assessment criteria and NOT the available learning management system (LMS). However, with the limitations of LMSs, lecturers should have a deep understanding of how the LMS can be used to engage students in their learning.*

Participants also emphasised the importance of designing courses that cater to the diverse needs and abilities of students. Dr Chauke raised the point of *the structure of the course itself in terms*

of how material is presented as this supports students to navigate tasks and content in particular ways. Tasks and content itself need to be considered. This highlights the point that the structure of the course itself is crucial in supporting students to navigate tasks and content effectively, highlighting the importance of considering how material is presented to facilitate specific ways of learning and to promote student participation and engagement.

It was suggested that online learning should be designed to accommodate the individual needs and abilities of students, promoting interaction, engagement, and active learning. Dr du Toit said *tailor online instruction to student needs and abilities,* whilst Dr Brand said that *digital learning can be designed to promote interaction,* and Prof Govender stated that *it should be made more interactive so that students should be able to learn and engage with content based on its design.* Recognising the diverse requirements of students and designing online instruction to accommodate individual abilities and preferences is essential for promoting engagement and understanding. Making courses more interactive and engaging promotes active learning and facilitates deeper understanding of the material.

Participants emphasised the importance of properly designing the online course, making the course content interactive and user-friendly to enhance student learning experiences. Prof Mafuna said that *it has to be properly designed,* while Prof Genge said that *it should be user friendly,* and Prof Louw supported this by stating that *it should be designed in simple, understanding and clear to follow*. The concept of scaffolding was also highlighted. Dr Alexander said *I set the course up so that the one thing builds to the so it's I know these are word scaffolding but whatever and people will say to me ohh I can see the scaffolding.*

Participants highlighted the need for innovation and creativity in course design to enhance participation, engagement, and effectiveness in online learning environments. Dr Adams raised the point that *courses designed specifically for online learning,* and Dr Biko supported this by stating the point of *creating a guided curriculum interface,* and Dr Kubyane stated that *creativity, innovation and appropriateness should be involved in this process.* Creating guided curriculum interfaces and incorporating elements of creativity and innovation can enhance the learning experience and promote student engagement.

Participants also emphasised the importance of incorporating relevant learning theories and educational technology into the course design. Proper module design should incorporate learning theories and online design concepts to ensure that courses are pedagogically sound and aligned with best practices in education. Dr Meyer said *proper module design*

incorporating the latest learning theories and online design concepts. Dr Cronje raised the point *knowledge of educational technology theories.* This is indicative that knowledge of educational learning theories and educational technology theories is essential for designing courses that effectively leverage digital technologies and platforms to support learning.

Participants suggested incorporating Universal Design for Learning (UDL) principles and providing instructional design support to ensure that courses are accessible, engaging, and effective for all students. Dr Biko raised the point of …*UDL Principles…* and Dr Mbeki the point of *instructional design and support.* Adhering to UDL principles ensures inclusivity and accessibility, catering to diverse student needs and preferences through flexible and adaptable course design.

While important points were raised in promoting effective course design, some participants identified several challenges and considerations related to course design and structure too. Dr Mashinini said that *online learning comes with a lot of challenges. For instance, participation is minimal due to students won't rely on recording and if you are not short and brief or interesting students won't engage with the recording. It needs a very high amount of preparation from the Lecturer and keeping the lecture as short as possible to avoid losing students. The University needs to create a platform that will be easy for lectures to navigate on while teaching. Training for Lecturers is required in online learning because of the transition from face-to-face lectures.* Challenges such as minimal student participation in online learning, the need for extensive academic educator preparation, and the transition from face-to-face to online teaching highlight the importance of adequate training and support for academic educators. Additionally, considerations such as time constraints in course development and the practicality of course content were highlighted as important factors to address in designing effective courses. Prof Petersen raised the point of *time in terms of course development.* Participants stressed the need for adequate time and support for academic educators to fully engage in the (re)design of courses, highlighting the value of ongoing professional development and collaboration with experienced colleagues. Prof Frans raised a valid point regarding virtual teaching and online learning by saying that, *importantly, for these approaches to be adopted, staff need to have the time to get fully involved and invested in the (re)design of the courses with support from experienced colleagues. Staff need to be shown the value of these methods not only for learning but for their experience as teachers.* Dr Marais suggested *by getting technological expect to assist academics* with course design, given the constraints of time and the possibility of limited competencies in instructional design and UDL principles.

Flexibility and adaptability were identified as key principles in course design to accommodate the diverse needs and preferences of students as well as across different disciplines. Prof Luthuli highlighted *flexibility and the recognition of students' individuality during the design of instruction*. Considerations for students from different courses showed the importance of fitting the online approach to meet diverse educational requirements. Designing courses with flexibility and recognition of students' individuality allows for personalised learning experiences, accommodating diverse learning styles and preferences.

Dr Brand said that *the learners from different courses have different requirements which should be considered during the online approach*. For more practical subjects and topics or courses with practical components, blended learning approaches, which integrate practical components alongside online learning, were suggested to enhance the depth and richness of the learning experience. Dr Mandela suggested that *the knowledge acquired by online learning should be further enhanced and deepened by attending suitable practical's in well-equipped laboratories under quality supervision!* Practical components, such as science lab work, were identified as essential aspects of certain courses or modules that require physical interaction. Dr Maluleke stated that *practicality (some courses or modules require physical interaction e.g., science lab work)*. Participants stressed the importance of designing blended learning curricula that accommodate practical components, ensuring that students have opportunities for hands-on learning experiences. Dr Potgieter stated that a *blended learning curriculum should be designed to accommodate Modules with practical component*. This highlights the importance of considering practical components. In the area of virtual teaching, a way to accommodate this may be the use of virtual reality, augmented reality, and mixed reality.

4.5.1.3. Synchronous and Asynchronous Teaching and Learning

The analysis and findings for *Synchronous and Asynchronous Teaching and Learning* highlight the importance of implementing both synchronous and asynchronous teaching and learning experiences in online education. The concepts of accessibility, careful planning, flexibility, and varied delivery methods in synchronous and asynchronous teaching and learning environments are stressed.

Participants highlighted the importance of ensuring that access to course materials encompasses both synchronous and asynchronous components. Course materials should be accessible asynchronously, particularly in areas with unstable internet connections or poor network due to loadshedding. Dr Bester said *that it must be available offline due to unstable*

connections with sufficient time allowed to make arrangements to access it. Providing access to lessons post-learning, along with all related materials and resources, ensures that students can review content at their own pace and mitigate the impact of connectivity issues. Prof Oosthuizen suggested that the *availability of the lesson post learning, with all the material and resources used and or referred to during the lesson.* It is essential to use platforms and methodologies like asynchronous teaching and learning that are not sensitive to issues arising from loss of internet connection and can potentially work offline, ensuring continuous access to course materials. Dr Alexander shared that *everything was asynchronous and everything was written and writing is very important to students, but writing should actually go on to oral as well.*

Thorough planning is required for interactive synchronous sessions to ensure active student participation. Dr Chauke stated *how interactive lessons are run, ie synchronous sessions need meticulous planning to ensure participation.* Participants also highlighted the need to keep all students involved by changing the mode of delivery and adopting varied approaches of interactive elements and engagement strategies to engage students effectively. Dr Moloi said *the ability to keep all students involved. Changing the mode of delivery as much as possible.* Prof Radebe said *I am trying I have moved away from this way of a teacher centred, approaching, lecturing. I've move away from that type of teaching because I did a lot of research with virtual reality.* Dr Mashinini further suggested to *alternate between creating recorded lecture videos and live lectures. This will accommodate students who are interested in engaging with the lecture and those who just want to see the videos.* The suggestion of alternating between creating recorded lecture videos and delivering live lectures to accommodate different learning preferences is necessary. This approach allows students to engage with course material in a way that suits their individual learning styles, whether they prefer interactive live sessions or self-paced video content. However, this approach requires careful consideration of teaching strategies and techniques to maintain student engagement throughout the course. Additionally, given the context of South Africa and the loadshedding schedules, recorded lectures offer accessible and equitable education to students in courses. Dr Mrwebi said *I just found that if they've got the recorded lecture, that's the key, main concepts, explanations that are really need you to nail so that you can engage in the debates and tensions around whatever those concepts are. So, when they preparing for an exam or whatever, they can always go back to those core and those core sort of recorded lectures to just refresh their*

memory on it. The cause also thinking in terms of your recorded lectures. I mean, that's also helping, especially given the context of where we live and that around load shedding.

Dr Alexander said that she adopts a synchronous flipped classroom approach. She said *I do use videos as well and I do have a flipped synchronous now as flip synchronous class that they can attend if they want to, but it's a flip classroom so I tell them you go do your readings, go do your assessments come to the classroom and ask questions* (Dr Alexander). Dr Mrwebi too adopted a flipped approach. She shared *so students [sic] had stuff to do where you watch this, read this answer this write a paragraph on respond to somebody else's. The very often I would group them so that they responding to each other and creating a bit of a community chat around a topic and then bringing back in my next truck. Sort of recorded lecture with them picking up on some of the responses that had come from the group previously, but they were working through those kinds of things in ways that had been set up for them to continue asynchronously, but at the same time, every week we were doing a synchronous session where that became. I'm assuming that you've read and watched what it was that was put up for you. Now we actually talk and deepen engagement around certain issues, and I can elaborate on things and it's a space you can use your chat function to put any questions you had on this week's material. We pick up all those questions, make sure we answer them, even if you don't feel comfortable putting your hand up to speak out loud. We've still got stuff and activities that then and readings and stuff they need to watch. I'm using more of a kind of flipped classroom approach in my courses, so I make them watch the core lecture. I record that and they watch the core recorded lecture prior to meeting me for an in-person session. So, it's the assumption you've done the prep, you've watched the recorded lecture, and now I pick up on key issues, key concepts and we create space for discussion. When I meet you synchronously [sic] around what I think you've now already laid the groundwork for*. Dr Mbatha also shared her experience with synchronous virtual classes. She said *one of the things that that my students have quite liked and is online classes. So synchronous classes and we, we'd meet on teams for an hour or two and I mean this was mostly with the first years.* So, the combination of virtual synchronous sessions which are recorded for students with connectivity issues during the time and the online learning asynchronous aspect of it makes a balanced online learning environment. Dr Mbatha said *it was amazing and uploading it onto the learning management system and the amount of students that they went to watch that, but also the amount of students that attended and then went to watch the video again. It's not just that they enjoy the interactivity, but then they also go back and they're clearly get something out of it.*

It became apparent to acknowledge extrinsic factors such as load-shedding and power outages to offer flexibility in course deadlines, which enables students to manage their learning effectively amidst unforeseen circumstances, enhancing accessibility and reducing stress. Participants highlight the point of flexibility for what's best for their students in terms of synchronous and asynchronous learning. Dr Sithole stated that he asks himself *does it work for them?* He further engages his students by asking *What method they prefer, and I would go with that certainly*. Flexibility in course design is essential to accommodate unforeseen circumstances. Providing extensions for assignments and course deadlines allows students to manage their workload effectively in challenging environments. Dr Molefe suggested the *possibility of making course flexible to allow for extensions etc due to load-shedding and power outages.* Additionally, setting deadlines for asynchronous lecture videos encourages student engagement and ensures thorough review of course content. Dr Brits suggested that *students must be given a deadline to finish their asynchronous lecture videos to encourage them. Usually, they don't go through the videos thoroughly because they speed-up to videos. This is a passive way of learning, like watching TV.*

Further to asynchronous teaching was also asynchronous activities. This affords a variety of assessments. Some examples that Dr Alexander gave of asynchronous activities were that she *would do a little case study using OER and we would have a little debate in the classroom, the virtual classroom, have a little debate, but it was all asynchronous.* Further to the asynchronous debate she also highlighted the use of discussion forums and blogs. *So, the discussion forum I will post questions and then they would answer the questions and then they did the blog. So, the blog was they had to do a reflection. The reflection is difficult if you don't internalise the new information. You can't reflect on it, so if you didn't read it and had any emotion while reading, so do you read something, and it really infuriated you. You know these rhino horn things, you know, then you internalised it and you can reflect on it. But if you didn't, you just read it without even putting any effort into it. You can't internalise it. You can't reflect, so it became a very good exercise to see if and change behaviour* (Dr Alexander). She also used peer review *and then I had a section where I did peer review, so they started to review the each other's case studies. I still have discussions and to help them work through their study material, I would do short quizzes so a lot of them multiple choice question or another question of filling the word or something like that. Just to help them gauge their understanding of the study material. So, I would have quizzes and then the blogs and then the case studies.*

4.5.1.4. Digital Technologies

The analysis and findings on *Digital Technologies* demonstrate the importance of leveraging digital technologies effectively to enhance teaching and learning experiences. The integration of a user-friendly LMS platform, a combination of appropriate digital technologies, tools and functionalities, allows academic educators to create engaging and effective digital learning environments that meet the needs of diverse students.

Participants highlighted the importance of using a stable and user-friendly Learning Management System (LMS) to facilitate online learning. Dr Mangena stated the *selection of a user friendly LMS* while Dr Meyer suggested to *Start by using a good Learning management system (LMS) and build additional online applications to support subject specific needs.* Dr Mogale supports this by stating that *through stable and user friendly LMS, role players can effectively design course material using online lessons, assessments, classes, teaching videos to facilitate learning online. However, provision must be made for those students without the necessary tools that can allow for effective online learning.* Dr Mrwebi also shared some of the ways in which she uses LMS. She said *setting up your different pages that you can actually lead them through. Watch this. Read this answer this in a discussion thread. You can actually organize your you can structure what it is you wanting them to do quite systematically, and you can move them through a variety of different activities that you build into what it is that they need to do for a particular week or whatever it is. And when we first started using it, I think our tended to do what most people did, which was really quite limited in the sense of it was uploading sort of recorded lectures for them to watch and uploading their readings for them to read. And I think in using it more I found it quite effective to start building in some activity or a discussion thread or a respond to this question or a complete this little quiz and those kinds of activities in between just so that you actually are sure that they able to engage with the material a little bit more than just relying on them watching a recorded video and we then obviously also started doing the kind of taking a group for a lecture online. And so putting them into that kind of space. So I like the sort of functionality of having that those add in features like you can set up a team's meeting for your group via the LMS [sic] and so those kinds of lectures I was conducting on teams rather and it was more effective for me because it I was able to do things like move them into breakaway rooms so that you could pose a question to the whole group, but split them up to go into breakaway rooms to talk about it and come back.* A good LMS enables academic educators to design and deliver course materials effectively, including online lessons, assessments, and teaching videos. Additionally, the

selection of a user-friendly LMS is crucial to ensure ease of use for both academic educators and students. Dr Kapp said that *the appropriate LMS is key. It assists the lecturer to create lessons and activities which allows students to learn and develop.*

Dr Alexander used the LMS to provide access to the content and assignments for her students. She said that she *and then I started on the learning management and system, and I started using the tools that was available to me to upload the study material and the assignments*. Further to the uploading of assignments, she also used it as a platform to provide feedback for her students. She said *But the information was also on the website, the module site and then all their statements was on the module side were on the module side and they also submitted on the module side I would download it, mark it digitally and upload the digitally marked assessments assignments with the comments on that.*

The use of a variety of digital technologies, tools, and platforms is recommended. Prof Letsoalo said *Use open software such as Moodle, it has several functionalities that will assist the academic to develop relevant online teaching content.* Dr Van Rooyen supports this by stating that *Institutions need platforms such as Blackboard which are not sensitive to issues which may arise because of loss of internet connection and if possible, could also work without needing the internet all the time.* LMSs such as Moodle and platforms like Blackboard were recommended for their functionalities that support the development and delivery of relevant online teaching content.

This also raises the point that academic educators need to be aware of the affordances and constraints of the digital platforms and tools that they use. Dr Chauke said that *the platform being used so that one is aware of its affordances and constraints.* Sometimes it is also about comfort and proficiency. Many academic educators have relied on tools like PowerPoint because they are familiar and comfortable with them. This comfort level can lead to effective presentations when used well, as academic educators can focus more on content delivery rather than grappling with new technologies. Dr Sithole said that *in terms of teaching strategy, my use it in the often-using PowerPoint for you know, since day one since I can remember that it, you know working in university context and that's what I've been used, that's what I knew even just before, you know, Covid.* It is crucial to consider the current changing technologies and students' digital literacy levels to ensure that the technology used remains engaging and relevant.

The course *can be designed in line with the current changing technologies and also consider what the students are mainly exposed to. This is because students are digital natives and if the technology is regarded as old-fashioned by them, they easily get bored. Applications like the chatgpt 4 are a necessity for them* (Dr Ngcobo). The integration of tools like note annotation features, interactive whiteboards, and chatbots can enhance learning experiences and support specific instructional objectives. Other digital technologies should also be considered and *thinking about when and how to use add in tools eg note annotation features, mentimeter, padlet, interactive whiteboards etc is important as these can support for particular objectives for particular lessons where appropriate* (Dr Chauke). This also highlights the importance of academic educator competencies in having knowledge of third-party applications that can be integrated into the LMS platform.

Participants highlight the importance of leveraging technologies, but with consideration of their purpose. Dr Sithole said *you know, as I said, my view is that, look, I think we need to embrace, you know, technology, but we need to, you know, not how whole heartedly we need to use what, where it's advanced, whether benefits, advantages but also we need to be critical, especially when it comes to you know, people just using technology*. This may also be indicative of the cart before the horse phrase. Digital education and technologies should not compromise the quality of education in terms of delivery and comprehension. Participants stressed the importance of technology rationality by stressing the importance of ensuring that the digital technology is fit for purpose. Prof Radebe said that *if you want to go on virtually so, you must design and you need to evaluate the type of tools that you will use and whether these tools and resources are credible to your course.* It's essential to ensure that all necessary tools are available for teaching any subject and that content is presented effectively. Moreover, ethical considerations such as plagiarism must be addressed to maintain academic integrity in online learning environments. Dr Ndou states that *digital education should be designed in such a way that it does not compromise the quality of education both in delivery and comprehension. This can be done by ensuring that all the necessary tools are available for teaching any subject and that the content is presented the way it should and is received with full representation of its meaning. It must also be designed in such a way that ethics of the teaching and learning are adhered too such as Plagiarism etc.*

4.5.1.5. Digital Pedagogies

The analysis and findings on *Digital Pedagogies* highlight the importance of integrating digital pedagogical considerations into the design and implementation of digital education. Ensuring

that academic educators are equipped with the necessary training, support, and understanding of pedagogical principles assists in developing effective and engaging online learning experiences for students.

Participants acknowledge that harnessing digital education for virtual teaching and online learning goes beyond simply uploading materials to an LMS; it involves designing learning experiences that leverage the affordances of digital tools and environments. Prof Grobler stated that *digital education involves more than just uploading lecture slides or lecture recordings to the LMS system. It also involves making sure that students can move easily between supportive, stimulating, engaging, challenging, and inspiring physical and online environments. Thus, the design of digital education should be informed by pedagogy which determines what and where things are taught, and the tools used to support this.* Prof Radebe shares a pedagogical strategy that works for him in the virtual teaching and online space – *I have moved into different innovative and creative pedagogies I brought in flip learning. I even started with flip learning in 2017 that helps me and most of the academics was already busy with other innovative type of learning approaches, so I brought in flip learning. You will be in a live classroom, but you can also give students work to work on at home in groups they are clustered.* Dr Alexander shared her experience with having *discussion forums with your student. You can have students reflect on their learning* (Dr Alexander). Dr Mbatha supports this view by sharing *online discussion forums and just because it allows students to reflect and do nice and innovative thing or nice discussions around it, drawing on their own life. And so, so just kind of that idea of a discussion forum as a place where people can connect and reflect on their own experiences. What other people are experiencing, and I've been.* Another pedagogical strategy that Dr Mbatha shared was the use of collaboratively creating wikis. She said *I got my students to create wikis. I would, you know, sort of like Wikipedia type things on religions and that was quite fun, and I always had this idea.*

Prof Frans highlighted the necessity for *an understanding that you need to consider the technologies affordances and work within them rather than assuming technology can do everything.* Therefore, academic educators should consider how technology can support various aspects of teaching and learning, ensuring that students have access to supportive, stimulating, and engaging learning experiences online. Dr Mbatha said *I mean, I've done other things I've got in my students to do digital posters and so that they kind of and imagine themselves in a real-world scenario and where they have to and to communicate what whatever lesson it was that there to learn to the general public*.

Participants emphasised the importance of evaluating the pedagogy of courses to determine if they are suitable for online approaches. It's essential for academic educators to adapt and develop pedagogical strategies that are specifically fitted to the online learning environment, rather than trying to force traditional approaches into digital spaces. Dr Mbeki raised the point of the *pedagogy of the course - does it suit online approaches* and Prof Gama said that *I think that teachers need to learn how to use online pedagogies, not just look for ways to shoehorn traditional pedagogies into online spaces.*

Leveraging the affordances of digital technologies to incorporate digital pedagogies is important. Dr Alexander *offered the practical with its videos and I have an external specialist* (Dr Alexander). This demonstrates an example of digital pedagogy by using video and video conferencing tools to engage with experts in the field or area and invite them to incorporate within an academic educator's online lesson. Dr Mbatha provides some insight on some of the digital pedagogies that she uses. She said *and so the thing that I'm currently really like. OK, let me call it in love with teaching online is and the possibilities of using peer assessments and peer review and assessing. And because I think it teaches, and of course you can do it and not online and the learning management system that we use, Moodle has a really nice tool in it. But uh, these are tool in Moodle called the workshop tool where you can get students to peer evaluate to one another and to also allow them a chance to and to self-reflect and through self-assessment. So that's one of, I think and all of my teaching I use that now and because I think it's such a powerful tool. And of course, it looks different for a first year than it looks for an honest student, but I think it's incredibly powerful tool just to use in general, and so. So that's kind of the one thing then I use and I I'm I've become a quite a big fan of podcasts and creating podcasts for my students. And rather than videos, although I do that as well and but podcasts that kind of they can put a voice to, to, to, to my facelessness almost and in a way that's really personal but data light.*

Participants highlighted the importance of training and professional development to get academic educators at a point to incorporate digital pedagogies to integrate digital technologies effectively. Dr du Toit said that *The fact is that the teachers will be using the interfaces and tools that are strange to them, they will certainly need quite some time to get familiar with these interfaces and tools to make the learning resources available in the virtual classroom.* Training on the use of digital technologies should not only focus on the technical aspects but also on incorporating pedagogical affordances. Academic educators need to understand how to effectively integrate digital tools into their teaching practices to support learning outcomes.

Academic educators may require significant time to become familiar with digital interfaces and tools used in online teaching. Training and support should be provided to help academic educators navigate these interfaces and effectively utilise digital tools to create virtual learning environments that are conducive to student engagement and learning. Training should be provided by qualified pedagogues who understand how to maintain the integrity of assessments and ensure quality assurance in remote learning environments. Dr Walters suggested that *workshop by People who are not only qualified to carry out workshop, but are also qualified pedagogies, because the way assessment is carried out remotely is not the same as when it is carried out physically. We are trained to use the gadget, but we are struggling to adapt to the way assessment that maintain the integrity of the programme and provides good quality assurance should be carried out remotely.*

4.5.1.6. Digital Resources

The analysis and findings for *Digital Resources* highlight the importance of developing, searching, selecting, and maintaining digital resources to support effective teaching and learning in online environments. The correct use of digital resources and the provision of accessible and diverse resources can assist students in their understanding of the content and in meeting the learning outcomes.

Participants emphasised the need to develop resources tailored for digital education, including audio and visual presentations, as well as guides for reference. Dr Lange said that *teaching aids need to be developed to facilitate digital education such as audio and visual presentation and guides for references.* These resources play a crucial role in enhancing student engagement with the content and their understanding in online learning environments. Participants also raised the issue of outdated resources. Prof Radebe said that *learning material like digitalisation africanisation I brought in decolonised curriculum, so that is very important. It's a strategy I brought in because when I came at this ODL institution, most of the data or the information or the resources was outdated. This movement like talked about decolonization and I have to change some of my content so that is very important as an academic*. This indicates a need for continuous review and updating of educational materials and resources to ensure they remain current and relevant.

While developing resources is valuable, participants also stressed the importance of critically selecting appropriate and relevant resources. Dr Chauke said that *Appropriate and relevant selection (rather than development) of resources. If not developing own resources, critical*

selection from available resources is important. This includes both developing original resources and carefully curating existing materials to ensure they align with learning objectives and enhance the learning experience. Participants also stressed the importance of easy access to a variety of source materials is essential for facilitating different methods of studying for students. Dr Brand said to *have easy access to different source material and to help facilitate different methods of studying for students.* Ensuring the *accessibility of the learning material and resources online* (Dr Malan) is crucial for promoting equitable access to educational content and supporting diverse learning needs. Dr Alexander highlighted the use of OER's as accessible to academic educators and students due to the no-cost factor. Dr Alexander said *so I first added ten week with a textbook, but I changed it to an OER then so open educational resource that doesn't cost them.*

Integrating links to external online resources directly within the learning management system (LMS) can provide students with easy access to additional materials and enhance their learning experience. Dr Zimba said that *maybe have links to go straight to the internet from collaborate/blackboard.* Dr Zimba further stressed the importance of *slides, audios, pictures and videos most of which you can use in contact teaching and learning.* Using multimedia resources such as slides, audios, pictures, and videos can enrich teaching and learning activities, whether in online or face-to-face settings. There is also emphasis on the proper *maintenance of the available resources* (Prof Fredericks) as it is important to ensure their relevance, accuracy, and usability over time. Regular updates and monitoring are necessary to address any issues and maintain the quality and effectiveness of digital resources.

4.5.1.7. Assessment and Evaluation Practices

The analysis and findings for *Assessment and Evaluation Practices* highlight the multifaceted nature of assessment and evaluation practices in the virtual teaching and online learning space. The design of authentic assessments, ensuring validity and reliability, and implementing tools for monitoring student participation and attendance is necessary for academic educators to effectively evaluate student learning and provide meaningful feedback in online learning environments.

Participants emphasised the importance of designing online assessments that align with learning objectives and provide meaningful feedback to students. Dr Masuku said that it is important to consider the *design of online assessment, including design of feedback*. Dr Chauke said *types of assessment tasks including receiving formative feedback requires consideration*

are important s*uch that it facilitates quick/immediate feedback* (Dr Mofokeng). This means that academic educators should have *knowledge of design of online assessment* (Prof Greyling) relating to assessment design, *aligning assessments* (Dr Biko) with course content, types of assessment tasks, and ensuring quick and immediate feedback to facilitate learning and improvement.

There needs to be integration of authentic assessment so that the assessment tests students' skills and not just content knowledge was identified as crucial. Prof Frans stated that *authentic assessment that truly tests the skills and not just the content knowledge of students is key*. Prof Radebe states that *Covid had accelerated our paradigm or pedagogy, our paradigm of assessment we have moved now to e-assessment and alternative assessment.* Digital education should be used in virtual teaching and online learning in a way that it can be designed to include dynamic and interactive assessments that form an integral part of the learning journey. Prof Frans said that *digital education needs to be designed around interaction with content, peers and teacher in dynamic and interesting ways with formative assessment that helps students check their understanding and that is part of a learning journey rather than separate from it.* Systems should develop the achievement of learning outcomes and enable application of assessment criteria, while also reducing or eliminating cheating incidents. Dr Twala said that *digital systems should be designed in such a way that they foster the achievement of exit level outcomes in a programme. Further, both facilitators and students should be able to interact with ease towards applying the pre-determined assessment criteria to achieve the stated learning outcomes in every module. Such systems should enable the use and application of level descriptors relevant to all NQF levels.*

Participants highlighted the importance of ensuring validity and reliability when it comes to assessments. Valid and reliable assessment methods are essential for accurately measuring student learning. Dr Mbhele highlighted the importance of knowing the *factors related to valid and reliable assessment methods.* Academic educators need information on valid and reliable assessment methods, as well as guidance on how to assess students effectively in online teaching contexts beyond scenarios, quizzes, and case studies. Dr Nel said that *more information on how to assess students when teaching online than just scenarios, quizzes and case studies.*

Participants also shared the use and impact of peer review in online settings. They explained how they use it as well as the impact it has on the skill development of students. Dr Alexander

said that she *had a section where I did peer review, so they started to review the each other's case studies. So, it took a lot of work to get them to do it, and then once they've done the peer review, I take it back. And then I will say to them, they still rubric that I will use or that you will use to actually peer review each other's case study. So, you developing your students critical thinking skills and that and you know they have to provide feedback to his peer reviews so they come in out and they bring in these communication skills and it as well* (Dr Alexander). Dr Mbatha also shared how she incorporates peer review into her course, *I think for me the big thing currently is sort of this peer review going and helping students with learning how to do peer review and thinking about and feedback that they give and get in assessments. And I'm, I mean it's difficult for me to think about the technology behind it because behind sort of what I do is more about the learning goals that I want to achieve you know. So, when I'm thinking, you know the peer review, you know that's a really cool tool that I'm using. But actually, my goal behind it is to get them to think about assessments, to think about, and because all of the places where I use peer review, it's sort of a step in a final product. So, you know, getting my students to do the peer review with one another, but then taking that that assessment where they've given each other feedback and resubmitting it as a final product. So, so sort of in a step of having them think about what is, what do you do with feedback rather than this thing where they, you know they get it, they get feedback on it essay and then that's it. It's always really been about how do I link assessments to one another so that they scaffold and across an across an across my assessment plan* (Dr Mbatha). The use of peer review promotes critical thinking as it requires students to evaluate their peers' work against a set rubric. This process helps students develop analytical skills and a deeper understanding of the subject matter. Furthermore, by providing and receiving feedback, students develop a set of essential communication skills, as peer reviews offer students the opportunity to practice this skill in a structured environment. Another point to remember is that the iterative process of peer review and resubmission encourages students to reflect on their work and understand the importance of feedback in the learning process. This reflective practice is crucial for continuous improvement and lifelong learning.

Tracking student participation and compliance is also important to ensure the integrity of assessments. Dr Nel suggested *to also track if students are really attending and participating.* Tools and facilities for monitoring student participation, compliance, and attendance are crucial in online learning environments. Academic educators need ways to track student engagement during tests and exams, as well as ensure that students are actively participating and attending

online sessions. Dr Yende alluded to *the monitoring facilities, especial during tests and exams* and Dr Marais supported this with the suggestion of *students' compliance monitoring tools.* Some participants suggest moving away from formal traditional assessments and implementing other types of assessments. Prof Radebe said that *we brought in new, Umm teaching assessment types alternatives and called eportfolio and there is now a move that we want to move away from pen and paper exams. We want to move in continuous assessment and 90% of our modules is already on continuous assessment and alternative assessments eportfolio and we also have an eportfolio for teaching practice.*

Consideration of artificial intelligence should be given attention, particularly considering how it can easily be misused by the students (Dr Walters). Consideration of ethical implications, particularly regarding the use of artificial intelligence in assessments, is necessary. Academic educators should be aware of how technological tools can be misused by students and take steps to mitigate cheating while ensuring the integrity and fairness of assessments.

4.5.1.8. Accessibility and Inclusivity

The analysis and findings for course design relating to *Accessibility and Inclusivity* highlight the importance of designing courses that are accessible and inclusive for all students, regardless of their abilities or backgrounds. Considerations for individualised accommodations, designing for accessibility, and considering the needs of students from diverse geographic locations, educators can create learning environments that promote equitable access and opportunities for all students.

Access moves beyond access to the technology, but also in terms of access to knowledge of knowing how to use the digital technology or digital platform. Additionally, access in terms of usability of the tool is important. Dr Alexander said *all they had was a cell phone. They were smartphones, so it was sufficient, but it was a cell phone, and that small screen is really restrictive. So ok, in in a way, when you have when you struggle to read. And I think older students, because I mean, I'm starting to wear glasses now, not permanently, but for reading. Then you have to realise that small screen is difficult. I want them to use all kinds of tools and to do this only on a phone, it's so difficult. It's so difficult, so I've tried one day to just take my tablet and do the stuff that I want on my learning management system on my module side. On the tablet I got so frustrated it's so slow, you know, it's just too slow and it takes too long to do. And that's unfortunately what some of the students have. You take note of accessibility, your language and screen size. You know things like that and then, so I really decided that I need to*

make sure that I don't overload students. There's so much information you actually don't even have to give them any content. The balance in course material and information provided to students is also highlighted as academic educators should not overload their students. Dr Mrwebi also highlighted the limitation of mobile phones as *majority of them are sitting with a cell phone, but a cell phones, also a small screen* (Dr Mrwebi). This demonstrates another level of access as mobile devices do assist with access to education however, the level of access in terms of engaging with the content on a small screen can prove to be difficult.

Participants highlighted that *there are students with special needs* (Prof Muri) and *physical challenges for both facilitators and/or students (Disabilities)* (Dr Ndou). Dr Chauke stated that *Individual learning needs should not be forgotten, and accommodations made for students who for example may be hard of hearing and require sub-title text to read while viewing recordings*. This emphasises the importance of accommodating individual learning needs, particularly for students with disabilities or special needs. This includes providing accommodations such as captions for students who are hard of hearing, as well as knowing how to assist visually and hearing-impaired students in the virtual classroom. This works in hand with the UDL point raised earlier. Dr Mogale said that *knowing how to assist visually and hearing-impaired students in the virtual classroom*. Academic educators must consider the diverse needs of their students and make appropriate adjustments to ensure equitable access to educational materials and resources.

Designing to accommodate a range of accessibility profiles (Dr Biko) is essential for ensuring inclusivity in the virtual classroom. This involves providing *access to teaching and learning aids to all* (Dr de Villiers) students, regardless of their abilities or backgrounds. Courses should be designed in a way that effectively delivers content to all students without disadvantaging those with disabilities. Prof Magagula said that *it should be designed in way that it will effectively achieve the main goal of delivering the content to all students without disadvantages other due to their disabilities (Visuals + audio etc).* Incorporating features such as visual aids, audio descriptions, and accessible formats can enhance the learning experience for students with diverse needs.

In addition to accommodating students with disabilities, it's important to design courses *in a manner that accommodates even students from rural areas* (Prof Olivier). This may involve considerations such as access to reliable internet connectivity, provision of offline resources,

and flexibility in course delivery to accommodate varying circumstances. Thus, stressing the importance of synchronous and asynchronous learning.

4.5.2. Dialogue, Social Presence and Collaborative-Cognitive Learning Environment

There is a need for dialogue and social presence in the virtual teaching and online learning space, with emphasis on active and collaborative learning environments. This focus is particularly relevant in the context of virtual learning, where creating a sense of community and engagement can be challenging. This theme explores the interplay between dialogue, social presence, and collaborative-cognitive learning environments in promoting effective virtual learning experiences. Six sub-themes were identified under the theme, namely (1) Communication Streams, (2) Student Participation, Interaction and Engagement, (3) Collaborative Activities, (4) Cognitive Presence, (5) Academic Educator Teaching Presence, and (6) Conducive Learning Environment and Workspace.

4.5.2.1. Communication Streams

The analysis and findings for *Communication Streams* highlight the importance of establishing clear communication to facilitate effective teaching and learning experiences. Academic educators can leverage the affordances of digital technologies and communication tools to maintain constant communication with students to create a supportive learning environment.

Effective communication and interaction with students are essential components of successful teaching and learning experiences in the virtual space. Dr Nel highlighted the point of *communication and interaction with students*. Academic educators need to establish clear channels of communication to engage with students, provide support, and facilitate learning activities. Participants emphasised the importance of ensuring clear and constant communication throughout the learning process. Dr Biko said *ensuring clear and constant communication*, whilst Prof Petersen brings out the notion of *clear continuous communication and guided practice* when it comes to communication. Continuous communication and guided practice are key aspects of effective teaching and learning. Regular communication helps to keep students engaged and motivated, while guided practice provides opportunities for students to apply their learning and receive feedback from educators. A careful, structured approach to teaching was highlighted as important for ensuring that students understand course expectations and have clear guidance on accessing course materials and participating in online activities. Dr Engelbrecht suggested that *a careful, structured, weekly system of teaching so*

students understand when they are expected to be online and when they will access specific things as the course develops. This is important as clear communication helps to keep students informed about course expectations, assignments, and deadlines, amongst other considerations, while also providing guidance and support as needed.

To present effective communication, the use of a technological tool is necessary. Academic educators can leverage access to communication tools within the LMS, as well as use communication tools independent of the LMS, such as WhatsApp and email. This enables academic educators to send messages or files efficiently. Dr Zimba stated the use of *WhatsApp and emails to send documents as well as transmit messages*. These tools facilitate seamless communication between academic educators and students, as well as between students, enabling the exchange of information and resources in a timely manner.

4.5.2.2. Student Participation, Interaction and Engagement

The analysis and findings for *Student Participant, Interaction and Engagement* highlight the multifaceted nature of student participation, interaction, and engagement in digital learning environments. Addressing challenges, incorporating interactive activities, and leveraging innovative technologies, academic educators need to create engaging and effective online learning experiences that promote meaningful dialogue, social presence, and collaborative-cognitive learning.

Social presence is important in an online environment because it makes students feel connected to both their peers and instructors. This connection is essential for students' participation, sharing ideas, engaging in discussions, and facilitating meaningful interactions with peers. Prof Radebe stated that *it is important to have social presence on your platforms is crucial because it's there when you meet the students where other students meet each other and there you share ideas, you interact, you let your students engage and so on. So, I have that experience for many, many years and why these students like me, because I like my students must do things that they love.*

The way content is presented in an online setting needs to be engaging and interactive. Incorporating visual elements and interactive tools into presentations can significantly enhance student engagement. Prof Baloyi said *the effective strategy for any academic and I will speak to my own experience, is to understand that it is the way you present the content that has to change, because remember now that you are not seeing them in person, you cannot assess if they are maybe an avatar on the online or anything. But you have to make the class fun,*

especially online. So, the effective strategy has to be you have to make the class very interactive. You can't just be talking at people, and I mean, personally, you will never see me do any presentation. That one is very colourful. I bring a lot of colours to my presentation. I bring interactive sessions into my present. I use Slido. There for me I use Mentimeter. I've also had to use, you know, all kinds of tools, but I use it Slido a lot because I realize that slightly is really very manageable for students to really work on and it's been able to create that kind of interactions that actually will help in nursing that kind of digital education in the virtual space. Dr Mrwebi also shared her use of digital tools to create an engaging virtual teaching and online learning environment within an MS Teams environment. She said *And so that's when I started experimenting with bringing things in that would get them doing and talking during an online lecture. So, I made I use mentimeter and things like padlet quite a lot. So, here's a question, go into your breakaway rooms. Here's the link to a padlet in your group. Fill in your group's response on the padlet. I bring you back to the main room and I'm able to share screen with what are all the responses from the group that have come in on the padlet and that kind of thing helped me to start getting better engagement in that kind of online space*. The use of tools supports various types of interactive content such as live polls, quizzes, and Q&A sessions, which can make the learning experience more dynamic and participatory, helping to keep students engaged and involved in the learning process. In addition to leveraging the affordances of these tools, it also provides a platform for students to think, reflect and respond to questions. Prof Baloyi further said *apart from the participation and the opportunity for them to actually engage at that level, I realize that it also gives the opportunity for them to think about their answers before they respond. You know, because even though there is no name, you become more reflective and if you observe there are you, you could also imagine students they've sent through a response already, but they will resend another one because they have not thought through it. But if it is in an open contact space, they will feel like they are dominating the class.*

Encourage students to attend and to participate (Dr Van Der Merwe) and *getting students actively involved* (Dr Molefe) is crucial for the *ability to engage students* (Dr Sebe) and facilitate effective learning experiences. Dr Mbatha shares her experience with synchronous classes, which, although they are live virtual classes, as an academic educator, it's better not to dominate the session but to use the platform to provide opportunities for students to interact as well. Dr Mbatha said *they hear me, I structure my classes and such a way that it's not generally me talking all of the time and that there's an opportunity for them to interact either through the chat function through allowing them to talk, opening mics and things like that and or polls, you*

know, so trying to build an interactivity in in sort of these online classes. Prof Nkosi also raises the point that *interactive, in short formats, should promote team/group work among students, and it should be flexible to allow both synchronous and asynchronous learning*. Dr Rasool further states that *digital education should mimic students current life. As institutions are competing for students time, we can only remain relevant if we become exciting to students, if we create platforms that allow students to grow without feeling compelled or treated in an aggressive manner. Learning should become fun, doable, rewarding, both in the short term and long term. We should aim to build skills to work, instead of abilities to answer complex questions.* Activities such as using games to reinforce concepts can force students to engage with their peers and think critically for themselves. This will assist in making learning fun, rewarding, and relevant. Dr de Beer states that *digital education must include activities that force students to engage with their peers and also to think critically for themselves e.g. using games to reinforce a concept*

Designing virtual teaching and online learning environments needs to leverage digital education around *interaction with content* (Prof Frans) to provide opportunities for substantive engagement, meaningful participation, and interaction with others are key factors in promoting student engagement and combating feelings of isolation. Dr Chauke said that *tasks and content itself needs to be considered. Opportunities for substantive engagement and meaningful participation need to be included. Opportunities to ask questions and receive answers to clarify understanding need thought. Opportunities to interact with others and share opinions, views and perspectives are important to combat potential feelings of isolation and support understanding.* Furthermore, *To maximize student engagement and use [sic] available technology to enhance the experience of the learner* (Dr Brand) is needed. Prof Moyo supports this by stating that the *incorporation of newest technologies such as AI and new tools for interaction between students and the lecturer as well as students themselves. Student engagement techniques within the digital platforms* (Dr Rasebotsa) by taking on a more *learner centred approach, to engage learners otherwise they become passive during online classes* (Dr Rasebotsa) can result in *more learner engagement - use whiteboards etc.* (Dr Van Der Merwe). Using student-centred approaches, incorporating digital technologies, and considering the number of student enrolments and their learning methods are important for creating engaging and student-centric online platforms. Dr Van Niekerk says that *the number of student enrolment for the particular module and their learning methods* are important as *this will enable the instructor to effectively teach using methods that keep the students engaged* (Dr Van Niekerk).

Student engagement and take-up of the online platform is key (Dr Hattingh). Overcoming challenges such as maintaining student engagement, addressing time constraints, and keeping the class engaged during online teaching requires creating engaging online platforms where students can interact with the lecturer in real-time. Prof Mabuza says that *creating an engaging online platform, where students can engage with you as lecturer while you are teaching. one of key challenges that is normal experience during online platform, it is very difficult to keep the class engaged while teaching due to time constraints.* Encouraging discussions, the *incorporation of newest technologies such as AI* (Prof Moyo) and focusing on students' motivation and interests are vital for keeping students interested and actively participating in online classes. On the other hand, Dr du Toit said that *the virtual classroom still has so many inadequacies which make it difficult for it to be exactly like the traditional face-to-face classroom. The teacher cannot effectively visualize the class reaction in terms of assimilation of what is being taught, various real-time facial expressions and body language which would have been observed directly in the face-to-face classroom cannot be fully captured in the virtual classroom. Secondly, class participation, concentration, and coordination by each student cannot be ascertained in the virtual classroom since any student could decide not to be involved in an ongoing teaching session.* Therefore, it's important to acknowledge the inadequacies of the virtual classroom, such as the inability to fully capture class reactions, facial expressions, and body language, as well as challenges in assessing student participation and concentration. This makes it imperative to develop strategies that combat this limitation with digital technologies and digital pedagogies, such as using discussion forums or break rooms for collaborative type of activities.

4.5.2.3. Collaborative Activities

The analysis and findings for *Collaborative Activities* highlight the importance of incorporating collaborative activities into virtual teaching and online learning environments to promote dialogue, social presence, and collaborative-cognitive learning. The use of stimulating discussions, facilitating peer-to-peer learning, promoting interactivity, and supporting both individual and collaborative work are important in creating engaging and effective learning experiences that have active participation and meaningful engagement among students.

Dr Davids said *I think that digital education must be interactive.* Digital education in virtual teaching and online learning must prioritise interactivity and collaboration to effectively engage students in the learning process. When academic educators create opportunities for interactive learning experiences, they can facilitate active participation and collaboration

among students. Collaborative activities in the online environment should extend beyond the confines of the traditional classroom, providing opportunities for effective learning and collaboration in both individual and group settings.

Dr Andrews stated that collaborative activities *need to be somewhat interactive and fit with what is being taught.* One way to do this is with *Peer-to-peer learning* (Dr Abrahams), which emerged as a valuable component of collaborative activities in virtual teaching and online learning settings. Encouraging students to learn from their peers promotes a dynamic learning environment where knowledge sharing and collaboration thrive, thus making interactive activities that align with course content, facilitate peer-to-peer learning and enhance comprehension and retention of concepts imperative.

Dr Vilakazi states that within the virtual teaching and online learning environment, *digital education should create opportunities for effective learning and collaboration outside the classroom. It should support individual and collaborative work.* Academic educators can leverage digital tools and platforms to create flexible learning environments that accommodate various learning preferences. Whether students are working independently or together, the goal is to design a collaborative-cognitive learning environment that promotes dialogue, social presence, and effective learning outcomes.

4.5.2.4. Cognitive Presence

The analysis and findings for *Cognitive Presence* highlight the importance of promoting cognitive strategies within virtual teaching and online learning environments. By implementing cognitive strategies to ensure active engagement with content, creating opportunities for understanding and application, and monitoring student progress, academic educators can develop a collaborative-cognitive learning environment.

Participants emphasised the importance of not assuming students have engaged with the content provided. Dr Bester says that *the content cannot be assumed to have been engaged with*, highlighting the necessity for academic educators to implement strategies that encourage active engagement and participation to ensure that students effectively interact with and comprehend the course material. Beyond merely presenting content, academic educators should focus on creating opportunities for students to understand and apply the knowledge. It is imperative to consider that *in general, it should not just be about loading content but thinking around how to create opportunities for understanding and application of content* (Dr Chauke).

This highlights the need to design learning experiences that promote critical thinking, problem-solving, and real-world application of concepts.

Participants highlighted the importance of *stimulating discussions* (Dr Potgieter) and creating opportunities for dialogue among students. Through *sharing experiences and engaging in trial and error* (Dr Jacobs), students can learn from each other and actively participate in the learning process. Collaborative activities serve as catalysts for meaningful exchanges of ideas, experiences, and perspectives, creating deeper understanding and engagement with course material.

The continuous monitoring of student progress is vital for identifying areas of difficulty and providing appropriate support. Academic educators should implement mechanisms to track student performance and adjust instructional strategies accordingly. This aligns with the notion that *It is important that student progress be monitored, and differing levels of scaffolding built in where appropriate to support learning* (Dr Chauke).

4.5.2.5. Academic Educator Teaching Presence

The analysis and findings for *Academic Educator Teaching Presence* involve articulating a teaching philosophy and actively shaping the learning environment by bringing together the different dimensions of the online learning ecosystem through designing student-centred courses encompassing engaging activities, facilitating discussions, and guiding students towards achieving the learning outcomes.

The most important thing is whether it is fit for purpose. Online learning should be well aligned with learning objectives and designed to meaningfully realise them (Dr Alberts). This emphasises the importance of aligning online learning activities with learning objectives. Further aligning with the notion that effective teaching presence involves ensuring that instructional activities are purposeful and well-aligned with the intended learning outcomes. Academic educators must design online learning experiences that meaningfully realise learning objectives, thereby enhancing the quality and relevance of the educational experience.

The mention of a *teaching philosophy* (Dr Booysen) highlights the significance of academic educators' underlying beliefs, values, and principles in shaping their teaching practices. Developing a teaching philosophy involves reflecting on one's pedagogical approach, beliefs about learning, and instructional strategies. This aspect of teaching presence emphasises the importance of academic educators' self-awareness, reflective practice, and commitment to continuous improvement in their teaching practices.

4.5.2.6. Conducive Learning Environment and Workspace

The analysis and findings for the *Conducive Learning Environment and Workspace* refer to the space that a student uses when engaging with the virtual teaching and online environment. This indicates the significant impact of a dedicated area or areas students can use to attend the virtual environment, particularly in South Africa, where socioeconomic disparities are prevalent. The responses highlight various aspects related to creating conducive virtual teaching and online learning environments.

A conducive work environment with minimal to no distractions is necessary. Academic educators and students alike face challenges related to distractions in their working environments. Dr Adams noted that *Minimising distractions eg barking dogs, children walking in and out of the room* is important as these can hinder concentration and disrupt the learning process. *Your working environment as lecturer or/and student should be conducive to teaching and learning, respectively* (Dr Kruger). A supportive and well-equipped workspace enhances focus, productivity, and engagement, thereby facilitating effective online education.

4.5.3. Academic Educator Professional Development and Teaching Competencies

The dynamic nature of education demands that academic educators continuously develop their skillsets to effectively navigate virtual teaching and online learning environments. This is particularly true with the continuous changes in technologies and where technology plays an increasingly prominent role in teaching and learning. Four sub-themes were identified under the theme of Academic Educator Professional Development and Teaching Competencies, namely (1) Academic Educator Competencies, (2) Digital Education Literacy and Technology Aptitude and Prowess, (3) Academic Autonomy Through Training and Continuous Professional Development, and (4) Self-reflective and Introspection Practice.

4.5.3.1. Academic Educator Competencies

The analysis and findings for *Academic Educator Competencies* underline the importance of addressing gaps in experience and understanding, developing diverse academic educator competencies, ensuring competence in instructional design and delivery, and proficiency in assessment and feedback are essential components of academic educator competencies within the context of academic educator presence, professional development, and teaching competencies. Through continuous professional development to enhance their skills and

knowledge, academic educators can effectively design teaching and learning environments that promote a good student experience as well as improve their own academic success.

There is a lack of experience of learning in these ways and the benefits these ways bring when done well and thus there is a lack of understanding of how to create such learning experiences for students (Prof Frans). This response highlighted a perceived lack of experience and understanding among academic educators regarding innovative teaching and learning methods. This gap in experience and understanding may hinder academic educators' ability to create effective learning experiences for students. Academic educators may struggle to create effective learning experiences due to a lack of familiarity with these methods and a limited understanding of their benefits when implemented successfully. To address this gap, academic educators should prioritise professional development opportunities that enhance their familiarity with innovative teaching methods and deepen their understanding of the benefits these methods offer when implemented successfully.

Participants emphasised the importance of academic educators being competent in designing, developing, and delivering quality teaching and learning strategies across multimodal platforms. Dr Phakathi states that *all personnel involve in facilitating teaching and learning should be competence in designing, developing, and delivering quality and purposeful teaching and learning strategies, contents, resources, and support to all students on multimodal platforms*. Academic educators need to be able to design effective online teaching, which requires adapting traditional pedagogical methods to the online environment. They need to structure and organise online courses to ensure coherence and connection. Dr Alberts said that *a familiarity and ease with the technology being used. The ability to systematically structure and organise learning so the learning experience connects and is coherent from part to whole. The ability to provide meaningful feedback to support learning and scaffold learning. The competency to explain concepts in ways that allows students to make links between ideas rather than just learning chunks of information in isolation. Subject as well as pedagogical competency and how to design and present courses*. Academic educators also need know *how to design teaching and learning resources and activities that facilitate active student participation and engagement* (Dr Crous). This is necessary to facilitate active student engagement and participation in virtual teaching and online learning environments. Competence in these areas ensures that academic educators can effectively engage students and provide meaningful support across diverse learning environments.

Academic educators need *to have the ability to use technology as an effective tool for knowledge integration* (Dr Afrika). They must possess fundamental digital skills, including computer literacy and familiarity with standard software. They should know *how to prepare a PowerPoint that is engaging. if it is to have very little in terms of written material - the prescribed reading must be indicated* (Dr Bester). Academic educators should have *competency of application of the Learning Management system used for online teaching* (Dr Bruin). *Knowledge of the learning management system, what tools and software packages are available to us* (Prof Esterhuizen). Additionally, academic educators should possess technical skills for online teaching platforms and video conferencing tools like MS Teams. Prof Muri said that academic educators should have *an ability to use ICT facilities, an understanding of application/s used by institution/s such as google Meet, Blackboard, Microsoft teams and what have you*. Extending further on basic digital skills, academic educators should possess some advance digital skills. They should be able to create and manage digital content, design interactive and engaging online lessons. Dr Crous said academic educators should know *how to design teaching and learning resources and activities that facilitate active student participation and engagemen*t. Prof Gouws said *Digital literacy is the bedrock required for further competency development as with a certain level of digital literacy, learning new online tools becomes about adaptation and experimentation rather than developing a completely new skill. An often-overlooked skill is the ability to experiment with different approaches to creatively come up with interesting interactive lessons rather than reverting to default approaches developed as a learner from their teachers in different contexts. Knowledge that is essential is an understanding of how to create interactive online lessons and how to effectively shift our of passive approaches to learning and teaching. Clear communication is extremely important in these environments but is often overlooked and negatively impacts student motivation - staff need to communicate clearly, clarify instructions and communicate the often taken-for-granted information that someone new to a course needs to be successful in it.*

Proficiency in assessment and providing feedback is critical for academic educators to effectively evaluate student learning and support their academic development. Dr Crous said that *academics' competencies with the use of assessments and giving of feedback to students*. Dr Davids said that *there is a need for the skill of providing constructive feedback while giving assessments online*. Competence in designing assessments and delivering constructive feedback assists with student growth and engagement. Academic educators must possess the

necessary skills and knowledge to design assessments that accurately measure student learning outcomes and provide timely and meaningful feedback to support student progress.

Clear and *effective communication* (Dr Brits) is crucial in virtual and online learning environments. Academic educators need to be able to *communicate course goals* (Dr Mandela), *instructions, learning objectives, expectations* (Dr du Plessis) and *feedback* (Dr Mofokeng). The mention of soft skills such as *presentations, PowerPoint, and video recording* (Prof Magagula) indicates the importance of academic educators possessing diverse competencies beyond subject matter expertise. These skills are essential for effectively engaging students through various instructional modalities and creating dynamic and interactive learning experiences. Academic educators also need to have emotional and social skills, as online teaching requires *emotional intelligence* (Dr Masondo) and the ability to build relationships in a virtual environment. Developing proficiency in soft skills enhances educators' ability to deliver engaging and impactful teaching and learning experiences that meet the necessary learning outcomes.

4.5.3.2. Digital Education Literacy and Technology Aptitude and Prowess

The analysis and findings *for Digital Education Literacy and Technology Aptitude and Prowess* underline the importance of recognising and addressing differences in digital literacy levels, proficiency in technology use, addressing barriers to digital literacy, and cultivating a culture of continuous learning.

Participants acknowledged that digital tools could assist in the virtual teaching and online learning space, however, there is a need to understand and know how to use them to make full use of their potential. Prof Baloyi said *we still think very traditionally, I mean, I mean there is a lot you can leverage on with all these tools and with all these platforms, if you know exactly what you're doing.* Academic educators should possess knowledge of technology use, including familiarity with learning management systems and various apps used for teaching subject specifications. Prof Radebe gave an example of during the pandemic how academic educators struggled because *their learning management system was not up to a particular standard and most of the academics at your contact university or residential universities was actually caught off guard and most of the lecturers were not use to the digital space and now they must teach online*. Dr du Preez says that the *knowledge of technology use, knowledge of learning management systems, various apps used to teach subject specifications* is necessary. Proficiency in these tools enables academic educators to effectively integrate technology into

their teaching practices and create engaging learning experiences for students. When academic educators leverage technology effectively, they can enhance student engagement, facilitate deeper learning to meet the outcomes, and provide overall transformative educational experiences.

Prof Frans notes *another barrier is a lack of recognition by many academics as to their level of digital literacy - many have much poorer digital literacy than they realize. There is also a lack of training of digital literacy and a lack of making such a requirement in hiring practices.* Many academic educators may lack awareness of their own level of digital literacy, highlighting a potential barrier to effective technology integration in education. There is a need for increased recognition of the importance of digital literacy and ongoing training initiatives to enhance academic educators' digital skills. Additionally, making digital literacy a requirement in hiring practices can help ensure that academic educators possess the necessary skills to effectively leverage technology in teaching and learning. This demonstrates the importance that academic educators should possess knowledge of technology use, including familiarity with learning management systems and educational apps. Proficiency in these tools enables academic educators to effectively integrate technology into their teaching practices and create engaging learning experiences for students.

The willingness of *educators to learn about digital literacy* (Dr Davids) is crucial for their professional development and effectiveness in integrating technology into their teaching practices. Dr Sithole said *but again, this points the importance of, you know, people really embracing it complete but also learning you know how to use you know the technology but also how to.* Academic educators should cultivate a culture of continuous learning by demonstrating an openness to acquiring new digital skills and continuously improving their technological proficiency to meet the growing needs of students in digital learning environments. The culture of lifelong learning through continuous learning and professional development allows academic educators to stay abreast of emerging technologies and innovative pedagogical practices. This plays a crucial role in equipping academic educators with the skills and knowledge needed to navigate the complexities of virtual teaching and online learning and enables academic educators to adapt to developing educational trends and effectively meet the needs of students in digital learning environments.

4.5.3.3. Academic Educator Training and Continuous Professional Development

The analysis and findings for *Academic Educator Training and Continuous Professional Development* capture the importance of training and continuous professional development in empowering academic educators to navigate the complexities of virtual teaching and online learning, thereby promoting academic autonomy and ensuring high-quality education in digital environments.

Participants emphasised the importance of leveraging existing technology that academic educators are familiar with and can afford. Dr du Toit said that *the best technology is the one you already have, know how to use, and can afford.* Dr Sithole revealed *and in terms of strategy, we have might use it in the often-using PowerPoint for you know, since day one since I can remember that it, you know working in university context though and that's what I've been used, that's what I knew even just before, you know, covid*. This demonstrates the idea that effective technology integration is not about acquiring the latest tools but rather, more importantly, about upskilling and integrating the tools already available to academic educators into their teaching practices. Dr Alberts reiterated this by stating that the *up skilling of educators to best make use of the available technologies* whilst Prof Govender supported this by the statement of *academics must be developed to be able to make online learning effective instead of it being used as a mode of content delivery such as posting slides etc.* Prof Radebe indicated the importance and difference that professional development makes in empowering academic educators by stating *I went for continuous professional development training so that you helped me to explore because now I'm capacitated with digital literacy skills. So, first strategies, the university have a constant continuous professional development training. The first thing is an academic must be empowered.* Participants acknowledge that both *staff and students require training* (Dr Alberts) to effectively navigate online platforms and engage in virtual teaching and online learning. Academic educators need training to enhance their digital skills and pedagogical approaches for online teaching, while students need to be familiar with the platforms used for learning and assessment. Dr Booysen stated that *both staff and students need to be familiar with the platforms applied, staff need to be appropriately trained, and need to attend training to facilitate their continuous development in using online platforms, as well as have an understanding of the most appropriate ways of assessing students.* This implies that continuous professional development plays a crucial role in equipping academic educators with the digital skills and knowledge needed to navigate the complexities of online teaching and

learning. Prof Radebe said that *now universities have invested more through professional development training to rescale upskilling academics through digital literacy programmes.*

Continuous professional development is essential for academic educators to stay abreast of new developments in virtual teaching and online learning. Dr Conradie stated *training of educators in relevant digital skills, awareness of the remote teaching and online learning approaches to all educational institution's staff, both academics and admin staff*. Regular *training and workshops* (Dr Hadebe) and training sessions can provide academic educators with the necessary skills and knowledge to effectively utilise digital tools and pedagogical approaches in their teaching practice. Dr Khumalo said that *there should be continuous skilling of the teaching personnel as new things keep on propping up in online teaching and learning.* This emphasises the importance of *training of academics and support staff* (Dr Mangena) as well as the timing and *frequent workshops on the use of these technologies* (Dr Zitha). At times, training for academic educators on virtual teaching and online learning platforms should be mandatory rather than optional. This ensures that all academic educators have the necessary skills and competencies to effectively navigate and utilise digital tools in their teaching practice. Dr Mbhele says that *Proper training of lecturers on the platform to be used. This should NOT be optional.*

Dr Tshabalala said that *digital education should be incorporated into the training of lecturers.* This ensures that academic educators are equipped with the skills and knowledge needed to facilitate effective online learning experiences for students. Furthermore, this training should be *through inter-disciplinary and multidisciplinary training* (Dr Xaba). Interdisciplinary and multidisciplinary training approaches can provide academic educators with a holistic understanding of virtual teaching and online learning practices across different disciplines. Dr Masuku emphasised this point by stating that *education of student teachers should contribute to a thorough understanding of how learning takes place in an online environment, and how study material, learning activities and assessment should be designed on a learning management system to enable effective learning.*

As digital education becomes increasingly prevalent, it is essential for academic educators to acquire the necessary skills and competencies for employment. Prof Greyling alluded to the idea that *digital education will soon be a requirement for employment for academics. Attention should be on the basics that will provide academics skills to explore further development on their own as things are rapidly changing everyday.* Looking ahead, as digital education

becomes increasingly integral within higher education institutions, training programmes should focus on providing academic educators with foundational digital skills that enable them to adapt to evolving technologies and educational practices. By investing in the professional development of academic educators, higher education institutions can create a culture of innovation, autonomy, and excellence in virtual teaching and online learning.

4.5.3.4. Self-Reflective and Introspection Practice

The analysis and findings on *Self-Reflective and Introspection Practice* highlight the significance of academic educator reflective practice, emphasising the importance of continuous learning, adaptation, and iterative improvement for enhancing teaching effectiveness and student learning outcomes.

Participants realised the shift in modes of instructional delivery and the importance of adaptation. Dr Sithole stated *But it's true that look with COVID you know, I mean, we were forced all of us, myself included, really to consider that a mode of teaching. So, we were forced to, so I had to adapt.*

Following adaptability, the upskilling of oneself plays a major role. In addition to professional development stemming from the higher education institutions providing training initiatives, it is also important for academic educators to take their own initiatives to better their knowledge and skills. Dr Alexander said *We changed to that learning management system, but then over time I thought, no, no, there must be more to this. You know, they are all these fabulous tools. It absolutely changed my life completely because it just showed me this is exactly what I needed. It showed me, but you can have discussion forums with your student. You can have students reflect on their learning. Do blogs. You can do all kinds of wonderful things with your students.* The initiative that academic educators take on to improve their knowledge and skills has a ripple effect on positive learning for their students as they learn how to leverage different digital technologies and digital pedagogies to improve their virtual teaching and online learning environments.

The motivation to learn continuously is highlighted as essential, particularly due to the rapid changes in technologies and the amount of technology integration needed in virtual teaching and online learning spaces. Dr Jacobs said that *motivation to learn continuously since technologies change rapidly.* Reflective practice involves academic educators acknowledging the need to adapt their teaching methods and skills to keep pace with technological advancements.

Reflective practice involves evaluating the teaching experience and making iterative revisions based on feedback and reflection. Dr Duma said to *evaluate the experience of the participants,* whilst Dr Kgosana acknowledges this by stating *yes with much iteration and revision*. Academic educators must critically assess their teaching methods, approaches, and outcomes to identify areas for improvement and refinement. Participants also acknowledge the importance of academic educator efficacy and agency, like student agency, academic educators need to drive their own self-development, moving beyond professional development and training that their higher education institution can provide, but rather what they can also do for their own personal development. Dr Alexander said *I did a five-week course, and they changed my life because I kept on. I want to know more. I want to do more. They must be more. They must be more, and I kept on saying I can do more. Surely and that's how I got to the student support? I thought of myself. Surely I can do more in terms of student support me not the university. Not, you know somebody else, not the college. I can do something more and so if they're good students.* As academic educators are teaching, they are continuously involved in *lifelong learning* (Dr Alexander).

Participants emphasised the need to assess situations and adapt by unlearning and relearning. Dr Sithole said *and also, if that's what it means, adaptability with that used, but also it's about, you know us like I said and learning and trying to learn a new as well, but also find ourselves really in this world. Umm, because I can say it. Whether we like it or not.*

4.5.4. Student Efficacy, Agency and Support Cultivation

The success of any learning environment hinges on creating a sense of student empowerment. This is particularly crucial in virtual learning contexts, where students may face unique challenges related to motivation, engagement, and autonomy. Three sub-themes were identified under this theme, namely (1) Student Efficacy and Agency, (2) Student Support, and (3) Student Well-being.

4.5.4.1. Student Efficacy and Agency

The analysis and findings on *Student Efficacy and Agency* highlight the importance of how students develop a sense of motivation and self-confidence in their learning abilities and the freedom to take ownership of their learning journey through self-directed learning within the online environment.

Participants highlighted the importance of student agency in addition to the support provided to students and the institutional policy that is put in place. Prof Baloyi stated that *it is not so*

much about the support mechanisms that are in place or should not be in place to assist student is about the one that is in place, are they maximising its use? It's about their agency. What I'm actually emphasising is taking responsibility. The fact is that whatever is made available to you, if you super maximize it, your outcome, your output will be way above average. Simple. So, what I'm saying, So what is what I'm saying is that you've so is a long conversation that we are having, but I mean, but what I'm saying is that either you are talking of support mechanism or institutional policies or all these, you can you can pull any phrase to it until students use their own self agency to the maximum benefit, no institutional policy, no support mechanism will cut it. So, the agency you bring in to as a student is the agency where you sit in the driver seat, you take on the wheels and you drive your own learning experience. Autonomy is around yourself and yourself alone. You are self-driven, but when you use your own agency you are not just thinking about yourself and your serve alone. You are also maximising the kind of support structured institutional policies around everything you are doing for the best outcome in terms of your teaching and learning. From this response no matter how much support resources, support mechanisms or institutional policy is in place to balance the socio-economic imbalances that exist, it ultimately comes down to student agency.

Dr Alexander encourages and guides her students in their learning by facilitating her students to conduct their own research so to *go to Professor Google and ask Professor Google what is a case study and come back to this discussion forum and tell us what your professor Google or Professor Bing or whatever says is a case study. So, I make them teach each other what a case study is* (Dr Alexander).

Dr Alexander also spoke about the importance of self-directed learning. She said *You know, self-directed learning and student agency. I think a lot of effort also comes from the student side, especially in these online environments, because if they don't take ownership of their own learning responsibility of their own learning, then I think from as a lecture from lecture side and it doesn't run as smooth as you know, we envision it too. Yeah, so I give them right in the beginning of the year. I give them a lesson, I say you're mature, students. I will treat you as adults. This is what I expect from you* (Dr Alexander).

4.5.4.2. Student Support

The analysis and findings for *Student Support* highlight the importance of providing support mechanisms to students in online learning environments. Higher education institutions need to ensure that students receive the necessary support to excel in digital learning contexts. The

support can come by prioritising training initiatives, orientation programmes, and timely assistance. Additionally, providing support through tailored learning experiences and a comprehensive support infrastructure is essential for student success in virtual and online learning environments. When students are equipped with the necessary skills and support mechanisms, institutions can facilitate a seamless transition to digital learning and empower students to thrive in virtual environments.

Many students transitioning from basic education struggle to adapt to the demands of higher education. They are often unfamiliar with both online learning environments and traditional contact modes of learning. Prof Radebe said *another issue that I want to say many of our students came directly from the basic education schooling system and some of them are not used to working in an online space or in a contact. So that created a problem with learning umm how to learn in higher education and also how do you learn in an open distance learning environment. And they something with a lot of stress and anxiety emotionals going up to the students drop out why because there's not enough support for the students. So, what we have done then, we identified our first-year students, those coming we have a risk register developed by the system. So, since 2022, sorry 2021-2022. Now we have clear cut. If I look at my module, I can intently see the learning path of my student. I can determine whether that student will make it or not in my module, so the system then flag the students that score below, or grading is below a certain. A mark and they are flag, and they need to go to a special or they must get extra task or evaluating or if need give them extra assessment. They need to read and stuff, so there's a clear report. Maybe there's three in my subject that just been flag, so as a lecturer I need to do that that that is very important.* It became apparent that students should have some literacy coming in from school to higher education. Dr Sithole said that *some students have experience and knowledge of you know online some students it was a shock. So, then what this means? Unfortunately, we cannot expect university to miracles. But what this means is that perhaps you look at primary, look at secondary and you know and what is it that I mean, whether they're playing their part in terms of helping us, really, you know, exposing students really to this kind of learning and teaching.* This highlights the role of earlier educational stages in preparing students for university-level digital learning. Students entering university come from diverse educational backgrounds. Some have extensive experience with digital tools and online learning, while for others, it is a completely new and potentially overwhelming experience. This disparity can significantly impact their ability to adapt to and succeed in a digital learning environment. The varying levels of digital literacy and access to technology

among students emphasise the broader issue of the digital divide. This divide can exacerbate inequalities in educational outcomes, as students with less exposure to digital tools may struggle more in university settings that increasingly rely on such technologies. To mitigate these disparities, primary and secondary education systems need to play a crucial role in providing early exposure to digital tools and online learning environments. This can help build a foundation of digital literacy and familiarity with online learning, better preparing students for the demands of higher education. Incorporating digital education into the curriculum at all levels can ensure that students develop the necessary skills gradually. This includes using digital tools for assignments, incorporating online collaborative projects, and familiarising students with virtual classrooms and learning management systems.

Dr Sithole further stated that in terms of students not having any exposure to online environments, start at a lower level than those who have experience. He said that *what came out very clear is that for those students were who were used to online or what it's little bit of experience, you know, knowledge really on this way, it will really adjust quickly. And they were really to participate in the in the academic project whereas some student, it was difficult. They have to learn real how to use machines, so they started on the back foot and so to speak. So, it's quite difficult.* He further emphasises the importance of the relationship and collaboration between higher education institutions and basic education to promote students' understanding and use of ICTs. Dr Sithole said *I honestly I don't know, but I've decided to say, look, I think it's important that higher and basic education department work closely together and for me, I think this would be one way of making progress as far as embracing and you know, deriving the benefits really come with technology and ICT, but also coming up really with those answers*.

Participants emphasised the importance of academic educators being aware of differing levels of digital literacy among students, which can then assist them to adjust levels of support accordingly. Dr Mrwebi said *You know with understanding that we all having different levels of ability, but we need to think about that in terms of digital literacy at the same time and not just in the form of doing the ICT assessment. We need to understand they need it as a working tool for their studies. And we used to only think about it sort of in the academic reading, literacy, numeracy, kind of aspect, but we need the category of digital literacy as well.* Alongside this, academic educators should recognise variations in data access and technological comfort levels. Dr Chauke stated *additionally an awareness of differing levels of data access, technological comfort levels and technological 'capital' as well as digital literacy is important to be aware of in terms of adjusting levels of support if necessary.* Recognising

differences in data access, technological comfort levels, and digital literacy skills is essential for ensuring equitable access to educational resources and opportunities for all students. When academic educators acknowledge these differences, they can better design their instructional strategies to accommodate the diverse needs of students in digital learning environments.

Dr Chauke said *I do not think the goal should be digital learning for the sake of digital learning. I think the question is how can I ensure that my students learn? If it is to be digital learning then it should be structured for that mode of delivery taking constraints into account and building on affordances in much the same way different opportunities and limitations may present in contact mode. The key question is how are my students supported to learn this content and these concepts in this context via this mode.* This is indicative of the idea that it is essential to structure online learning to align with the mode of delivery, considering both constraints and affordances. Ensuring effective student support in online learning environments requires a multifaceted approach that prioritises the diverse needs of students. This approach ensures that students receive adequate support tailored to the online learning context, as the goal is not merely digital learning for the sake of it but rather a strategic alignment of teaching methodologies with the mode of delivery.

To achieve this, institutions must invest in comprehensive support, including *training of both staff and students on teaching and learning using the online mode* (Dr Crous). *Technological support* (Dr Kapp), *user-friendly technology* (Dr Maree), and *timely assistance [sic]* (Dr Malan) are essential components of this infrastructure, ensuring that students receive the necessary guidance to navigate online platforms effectively. Dr Mrwebi also stated that *Look, I'm I do think that socioeconomic backgrounds [sic] is an area that we need to be thinking a lot more carefully about because we make we used to make all of these assumptions and it's interesting how things have shifted because we used to make our assumptions used to be around things like they have matriculated. So, they will be able to handle an academic reading and we assumed that they all came with a sort of equal kind of reading level been ability to write an essay. And we learned very quickly that people are coming to us from various different contexts with varying levels of ease and academic capital that they were bringing in to start their and to start their degree with. We now have to start realizing that it's not even just about reading and writing. It's also about what it what have there been exposed to? So, somebody who's coming in, we throwing our first years for example into using or LMS [sic] from day one as a learning platform, here's where you'll find your course. Your course readings, whatever it is that you, you've got to do for a student who's coming in, who hasn't actually been exposed to*

using technology, and we are almost. Disadvantaging them right at the beginning. So, I don't know if we don't need to be thinking about things like building in for students who feeling like they would like that kind of support we do that ICT course for what is it, ICT competence course. And so that's almost their whole first year. And I'm wondering if as maybe part of you know the. And they have all of the orientation kind activities for First year's coming in. That takes two or three weeks where we spend a lot of time making them walk around the university campus and sing songs. And I'm wondering if there isn't a space in that kind of program where they are actually taken through things like how do you log onto the LMS [sic]? Where do you go to access this and make build that in as part of an orientation program? Because even for students who've had more exposure to technology, you know, coming before they've come into university, they're not all familiar with the platforms that we use. Providing training for students on teaching and learning in virtual and online modes is crucial. This includes technological support and orientation programmes to ensure that students are equipped with the necessary skills and knowledge to navigate online platforms effectively. Prof Radebe stated that *in our college of education we have orientation weeks to say to the student this is the platform that you work, this is your email and we will not accepting private email.* Prof Radebe further stated that *before students can work in an online space, they need to be digitally empowered. So, what I've done, I've make short clips for my students and it short clip can be between one and two five minutes so that the students can be in power. And to overcome that I have constant awareness with the students. We use SMS to overcome that barrier, so some of the students is in a rural community so he cannot go on the platform, but he can afterwards, then then study.* This is indicative that these initiatives also need to be done across the different levels within an institution, from the institution level through to the course level, with the relevant academic educator. Another avenue can be support through the regional centres and possible infrastructures that higher education institutions can introduce. Dr Mbatha said *But doing online teaching and versus distributed university, where your students are really in different places, and I think some of the face to face universities came to realise some of the realities of teaching remotely. When COVID struck, so these are these are, and these are a number of issues and these are a number of and support structures that should be in place that is in place. So funnily enough, I think one of the biggest support structures you have for online learning is physical and so it is realising that students don't come to online teaching with the same devices and many of our students can with, well something like 95% of students come to online learning with cell phones, mobile phones and they use that actively for their learning. Even though about 60% of them also come with laptops and would or desktops by going to*

different locations to access, this stops to hand in assessments. But they're they first stop is almost always a phone. And so how do we think about designing for that and how do we think about, and this is I think a uniquely South African problem in terms of distance education in South Africa. They don't come with the and with the knowledge of being a self-directed learner, they need to be taught that and so these specific support that needs to go to students like that. And then there's also issues around and just helping students, especially I think in the first six months. And this is where physical infrastructure comes into play. And how do you and access to learning management system? How do you navigate the learning management system? How do you and submit to multiple choice question? or write an essay question in Word and convert to a PDF or upload it onto the learning management system and those. It's really, really difficult to teach students online how to use online things and so. So, for me these are part in that we, the physical infrastructure of regional centres, for example, plays a big role where you where students can go and somebody sits with them and say, look, here's your phone, this is how you get there or here's your laptop. This is where you go with it. And so, I think it's kind of recognizing that that kind of support that needs to go to students.

Implementing induction programmes *through a short learning programme* (Dr Mangena) for students to familiarise them with online platforms and teaching methodologies can enhance their preparedness and confidence in engaging with digital learning environments. Dr Van Rooyen stated that *students should be well versed with the platforms that the university decides to use for teaching.* These induction programmes and orientation sessions plays a crucial role in preparing students for the digital learning platform. Conducting orientation and training sessions for students on online platforms assists with a smooth transition to virtual learning and ensures that all stakeholders are proficient in using digital tools. *Furthermore, is to have a comprehensive online support programme to assist those who are still behind in using these tools* (Prof Grobler).

4.5.4.3. Student Well-being

The analysis and findings on the importance of addressing *Student Well-being* in virtual teaching and online learning settings suggest strategies for promoting a sense of community and support. By prioritising students' social and emotional needs, institutions and academic educators can create an environment conducive to learning and thriving, especially in virtual and online spaces.

Participants recognise the importance of supporting student well-being, especially in an online educational environment, through humanising the student experience and learning environment. They highlight the need for creating a supportive and empathetic atmosphere, providing comprehensive support services, and creating peer connections. It is important to create an environment where students feel comfortable sharing their personal issues. Academic educators need to be accessible, approachable, and show genuine care and concern for their students' well-being. By establishing this connection, students are encouraged to seek help when needed, creating a sense of belonging and support for them. Dr Mbatha said *So I think I mean, so, so I mean for me we, we need to remember that our students are humans with very complex lives, and we tend to, especially if you don't see your student every day in a class or, you know, once a week in a class, whatever it might be, we tend to forget our students. We tend to think about them as numbers, as you know, and especially when you're talking large numbers of students. So, you become from your side. You become disconnected from your students and your students become disconnected from you. So, it's very easy for students to disappear because they had, you know, they had a personal problem and they just didn't feel that they could ask you and that they had the freedom to come and say, hey, listen, I'm and I, I had this terrible thing happened to me. Can you help me? And so that's kind of on the on the, on the immediate lecturer level and we sometimes forget our students especially when you have large classes because you know if you have 1800 students, it's easy to not you can't be connected to all of your students. It's just humanly impossible. So, you need to create an atmosphere and we use students feel look, if they're gonna come to you with an issue that you will take it seriously. It is easier to forget about your actual students and when you and when you don't see them physically. Uh, so for me an important part is how do I create that atmosphere? Where a student, feel that they can email me or phone me and say listen I am. I am about to give birth or I'm suffering from severe depression. I was ***** and I haven't had food in a week, and I fell behind or I didn't have connectivity and I just couldn't do my assessments. So creating that atmosphere on a personal local level and is for me, it's very important and that's just about being accessible and being seen to care and that's really as I think we overcomplicated sometimes and but really if you are just human to your students and laugh with them when you can and they kind of see you as a person and not just as a as a voice or as words on the screen and so on the personal level that's very important but I Think on there's a variety of things students need, and when you're doing online education, we need they need technology support and it's it sounds weird talking about technology support when you're thinking about, uh, emotional support, but it's a huge barrier to students and it makes them scared if they can't get*

to grips with the technology but you, you need the sort of the full range that you have for face to face students. You need the career counsellor. You need accessible psychology department, or you know in terms of student support. And I think these also especially in the online environment is being very and deliberate in creating opportunities for peers to connect and because online students feel and they are more isolated because there's not the sort of the thing with that makes face to face university lovely is you know you sit next to somebody in English 101 and 20 years later you still best buddies and it's just because you know I chose that chair and you chose that chair. And so, you need to think quite carefully how do you create those opportunities for students to make those kind of connections. And because it's not going to happen automatically, you need to create it. And even if you created, it might not work, but buddying up having peer mentors or slightly older like older as in high you know further on long and the system and peer mentors that students can connect to and those things I think are really important and to support students.

When the participants were asked about the difference between face-to-face teaching and virtual teaching, Prof Radebe responded *the only difference is you are looking into a screen, so the screen is now your partner, but on the other side you don't see the faces. You don't see the emotional, umm, a behaviour coming through, but you only see a flat screen and you have then to deal with that* (Prof Radebe). In virtual learning settings, the social and emotional well-being of students assumes heightened importance, as articulated in the response provided by Dr Chauke who stated that *the social and emotional wellbeing of students is also important in a 'remote' setting as they may feel the loss on in person contact and so finding ways to promote feeling part of a community can be helpful*. Students may experience feelings of isolation, detachment, and disconnection in virtual settings due to the lack of in-person contact. This can adversely affect their social and emotional well-being. Recognising this challenge, academic educators must prioritise initiatives aimed at promoting a sense of community among students. Dr Alexander stressed the use of interactive activities in the online space through her use of blogs, debates and peer reviews. She stated that the use of high-impact practices can assist with students loneliness *So one of the impact practices is writing, and one of the one of the bigger impact practices is to take students out of their lonely space with online education, cause they lonely. The interaction is with the course material in the lecturer and sometimes with the institution and with their computer. So now that I've interaction with their classmates and interaction continuously with classmates and the build-up good relationships, especially with the debate they would do it on WhatsApp and I allowed them to do WhatsApp* (Dr Alexander).

This highlights the use and creation of a learning community or communities of practice, and this creates a sense of belonging which assists students' well-being and knowledge sharing through collaboration, which is important in online environments. It also provides a supportive environment or support system.

The lack of adequate support systems can lead to significant stress and anxiety among students. This emotional turmoil can contribute to higher dropout rates, particularly among first-year students who are still acclimating to the new learning environment. Prof Radebe said that students *suffer with a lot of stress and anxiety emotions going up to the students drop out why because there's not enough support for the students.*

Participants indicated that the concept of well-being is also beyond the virtual environment. They described students as *very distracted and impatient; you have to understand that in itself impacts on their well-being* (Prof Baloyi). Prof Baloyi further said *So for me the well-being is a series of factors that is beyond just the virtual teaching and online environment. Is a state of mind of the student. Is the kind of home environment in which they are coming from. It's also the level of their maturity.* He further alluded to the way students learn across different generations. Some still use a pen and paper, although they are in front of a screen.

Participants highlighted the importance of providing students with what's to come in the course, as well as providing some flexibility as life happens. They also stress the importance of checking up on students throughout the course. Dr Alexander said *Ok, so I don't tell them it's assessments and assignments and exams. I say it's all activities. This is what we're going to do. So, I tell them what they're going to read. I tell them what they're going to do every week and then they said due date every week, but I make the cut-off date much later so the one student that has an accident that happens land up in our hospital and a student that has a, that unfortunately happens often happen. That's they have a baby and then they have. But postpartum depression and things like that. Gee, you know, these are human beings. They're not robots, so I try to build in flexibility, which sometimes isn't enough, you know? So, you will sometimes have to deal with individual students, but every week I post the post and I say if you have a challenge, don't hide it from me. Talk to me so that I can address it, cause they there's always creative ways of solving a problem, so if they talk to you, if they're in a really bad space and they're really the place they want, that's unfortunate. And sometimes you lose the student like that, which is terrible. I had students that wanted to commit suicide, and I almost went crazy because I knew the students in trouble, and I had to call. And luckily I called the Unisa*

councillors, and they got a hold of the student, and they had long sessions with her, so goodness always glad cause I was very worried about the student.

Participants also highlighted the need for awareness for programmes that support students' well-being. At times, these measures are in place; however, students might not necessarily be aware of them. Dr Sithole said *Uh, the kind of support that is are there in around student Wellness, the kind of support that is there around students, you know, health, you know, related methods or security and all of them. So, I think one thing that I've sort of pride myself really is that look, higher education institutions, they do everything possible to make the environment conducive for students. It's only not all of them are taking advantage of this. Some students wait until they hit that crisis. You know, they get into a crisis mode, you know, they face serious challenges now. They start seeking help and often of times you find it is too late. So uh, but I guess it is about awareness also is about, you know, information sharing as well. But also, I find that students tend to take, you know, these kind of ill say. Ohh side or Remote kind of support? That is their student. That is, if it's going to benefit them, you know, at that directly in terms of now probably in terms of credits on. It's unfortunate, but that's the situation we face, students can rarely use the kind of service. If it's not going to benefit them, you know directly. But yes, I think the best we can do is just share information is support, you know, promoting awareness and then encourage people then whether they take up, you know that support or not that different matter, but it's actually agreed certainly we need it. But that's why orientations become important now and why important, because I'm in five months down the line, somebody says I'm struggling.*

4.5.5. Institutional Structure, Resource Availability and Education Equity

Education strives towards the ideal of equal opportunity for all students. However, ensuring education equity within virtual learning environments presents unique challenges. Four sub-themes were identified under this theme, namely (1) Institutional Policy, Procedure and Practice, (2) Strategic Blueprint and Planning, (3) Institutional Infrastructure Distribution for Equitable Access, and (4) Equality and Equity – Know Your Students (KYS).

4.5.5.1. Institutional Policy, Procedure and Practice

The analysis and findings on *Institutional Policy, Procedure and Practice* stress the importance of university rules and guidelines and navigating these policy challenges for virtual teaching and online learning, demonstrating the need for a combined effort to align policies with institutional goals, ensure clarity and transparency and address implementation challenges.

This is necessary for higher education institutions to create a supportive ecosystem that enables the effective use of digital education for virtual teaching and online learning for all stakeholders.

Prof Radebe strongly stated that *policy is very important, right. So, number 1, if you want to bring in virtual you force now the academics to go to teach online in a blended mode, you need to first do revise your policies. You can't do anything without policy. So, you the first thing is the institution must have a policy revision and look at that policies. Whether it's your teaching and learning policy, we call that using policy. Where is your research policy? Whether you assessment policy, you exam policy, your invigilating policy. Your community engagement policy, your ethics policy, all those policies must be revised. Why I'm saying that, students can do can use now generated AI tools. You agree with me? And if this is not stipulated in your policies. I'm talking about the assessment teaching and learning research and ethics. If you did not state in your policy that it will be unacceptable or it will be cheating if you use generated AI tools, for example change GPT, Grammarly and so on. If those things are not articulated or stipulated in your policies, you cannot penalise the student. The student can take the university to task because it's not there. If you want to start, must go blended, learning a staff member that is very informed, he will tell you listen. You force us now as a university management to go blended learning, but your policies are not there. I will not do that. I will not take instructions for you because you not changing your policy. So, what Prof Radebe is saying to you is because I am very sensitive about policies. So, the policies that that drives us and changes us, and the policy must be a top down from management. It must be, umm, from grassroot level up. I mean from your junior lecturer, must have insight, must have implications in that policy must raise his voice in that. So, if management say no, you can have devices and devices every three years, then academics must also have a say. So, there must be a collective agreement between the university management and the council to say we want to go blended learning or we want to upgrade our learning management system. What is the academic saying? If academic saying they are not trained in this, why now. The policy change so first change that and then your policy.* This highlights that the implementation of significant changes within a higher education institution necessitates a proper change management strategy in place. The policy framework should encompass looking at teaching, learning, research, assessment, ethics, and community engagement. Specific policies must address integrating new technologies, like AI-generated content, to avoid legal and ethical issues. Effective policymaking should involve both top-down directives and bottom-up input from all

academic levels to ensure practicality and buy-in. A collective agreement between university management and academic educators is essential for adopting new learning modalities. Without appropriate policy revisions and training, academic educators may resist management directives, especially if policies do not support or fail to address necessary training and resources. Policies must guide the implementation of changes in teaching and learning environments, including the use of virtual teaching and online learning, AI tools, upgrading learning management systems, and ensuring academic educators are adequately trained and supported and provided with the necessary hardware, software and internet access.

Clarity in institutional policies, particularly regarding virtual teaching and online learning, is essential in providing a framework to guide academic educators and students in navigating the digital learning environment. This is emphasised by Dr Rossouw who said that *clear policy from the Higher Education department and institutional policies should stipulate how to introduce and implement virtual [sic] teaching and online learning.*

It is also important to look at policy at different levels. *The first is the kind of regulatory kind of policy. OK, So what is ethical use and how do we protect people's privacy and what is acceptable or not acceptable to put up on a screen kind of thing. So the more sort of regulatory we need to understand the rules or the conventions of practice. And I think they've been quite there's been quite a lot of movement in terms of the, you know, trying to update us on those kinds of policies, because I think many of them were very outdated and we've encountered all sorts of things since moving since 2020 that have needed to be updated. But the second part of the policy is around how do we what is in our teaching and learning kind policies that relates to how we use these things. And I think that's where we sitting still with quite a lot of conceptual confusion for a lack of clarity. but things like having a policy that speaks to our approach is to adopt blended learning. With out dealing with what is everybody understanding by that concept? What is it? What does it mean in practice? And I think they still a lot of work to do on our policies around where are we, where are there things that are absolutely set in stone and where are there things that we created the spaces for the kind of professional autonomy of lecturers to make decisions for things that work best for their students* (Dr Mrwebi). Clear policies provide a framework for implementation and help mitigate uncertainties and ambiguities. At times, despite the presence of policies, challenges related to their implementation and enforcement may arise, leading to delays or inconsistencies in their application. It is important to address these challenges so that implementation follows the policy formulation.

The availability of necessary digital tools and resources, such as laptops and internet access, is crucial for both academic educators and students. This presents the need for institutions to provide financial support for access to tools and resources to address such disparities and ensure equitable access. However, as mentioned by Prof Esterhuizen *for me the main thing is access to the tools required. I find that my institution [sic] offers limited access and then we spend from our own pockets to make the learning achievable for students.* Limited access to these resources can pose challenges, leading academic educators to spend from their own pockets to ensure learning is achievable for students. Access to necessary tools and resources emerges as a significant concern, with academic educators often bearing the financial burden of ensuring equitable access for students. Policy alignment with virtual teaching practices can alleviate these disparities by compelling educational institutions to provide necessary support.

Aligning institutional policies with virtual teaching practices is essential for ensuring clarity and consistency in expectations for both academic educators and students. Prof Magagula said *I believe that alignment of the policy into remote teaching will assist a lot. It will compel the institution to support the lecturers and students; the institution will publish on the module site that this module is online and as a student need to have laptop, access to internet and it will be offered online. This will prevent/limit conflict with students or stakeholders.* Clear policy alignment can induce educational institutions to provide the necessary support and resources, preventing conflicts and facilitating a smoother transition to virtual teaching and online learning. However, it is also important to recognise and mitigate the challenges related to policy implementation and enforcement that persist, highlighting the need for proactive measures to bridge the gap between policy formulation and actual implementation.

Policies should also address quality assurance measures. *The system/product must be tested. E.g. Moodle / Brightspace* (Dr Kemp) for virtual teaching and online learning. Quality assurance measures, including the testing of systems and platforms, are essential to ensure the effectiveness and reliability of technological infrastructure for online learning. This ensures that the technological infrastructure and the platforms used meet the required standards and function effectively to support teaching and learning activities.

4.5.5.2. Strategic Blueprint and Planning

The analysis shows that *Strategic Blueprint and Planning* are crucial components for the successful implementation of digital education initiatives for virtual teaching and online learning within institutional ecosystems. The responses provide insights into the importance of

thorough planning, readiness assessment, resource availability, and stakeholder engagement in ensuring the effectiveness and sustainability of online teaching and learning.

Participants highlighted the importance of planning. Dr Alexander said *training and planning is absolutely essential if you don't plan it, you know that's saying you if you do not plan you plan to fail if you fail to plan you plan to fail that thing*. Strategic planning is stressed as a key factor for successful implementation of virtual teaching and online learning. Dr Kriel states that *planning is key. Hasty changes to online teaching before readiness of both student and educator was determined, result in slow uptake and commitment*.

Prof Ntuli reemphasis the importance of *good planning and proper arrangements* and Dr Lange supports this by stating that *proper planning and availability of resources such as teaching aids, presentations, time, gadgets, and data need to be considered.* Adequate planning also involves assessing readiness, identifying resources, and establishing clear objectives aligned with institutional goals. Dr Mbatha said *it's just down to understanding to do proper online teaching and you need to plan well in advance. And so, it's kind of that was one element of it is just planning study material planning, learning outcomes and thinking of activities that students could do on their own for self-directed learning that that kind of supporters supported your learning outcomes and then planning assessment and that and that's usually planned. So almost six months to six to nine months ahead of time. Like what do I want to achieve with these sets of assessment? So, you can't just go, oh, you know, you wake up tomorrow and I'm like, I feel like my students should write an essay. You know to in order to achieve this learning outcome, this is what I need to do in order to achieve that learning outcome. That's what I need to do, and then then the last set is planning for engagement because, you need to, you need to be very intentional in what activities you plan, how you planning and how you executing it. But for me the bit about planning assessments well in advance and how you're going to run it and what do you want to achieve with your assessments and planning for engagement, those are things that I still think is well worth planning well ahead of time*. Ensuring access to necessary resources enhances the quality of instructional delivery and student participation.

There are also be cost implications involved. Prof Radebe provided an example of an incident during the pandemic. He said that *we were given now new devices to work on because our devices could not handle your learning management systems and learning management systems was also upgraded. There was more cost implications for universities where there is contact and where there is open, we have to open up our platforms much wider to increase*

more capacity. One of the main limitations to infrastructure and resource availability is *budget constraints* (Dr Rasool), which can pose significant challenges in acquiring essential digital tools and resources. Limited financial resources may impede institutions' ability to invest in infrastructure upgrades, software licenses, or digital learning platforms, thereby affecting the quality and accessibility of online education. To address budget constraints, strategic resource allocation and planning are necessary. Allocating adequate funds for infrastructure upgrades and digital resource acquisition ensures that institutions can meet the evolving needs of virtual teaching and online learning effectively.

Budgetary constraints might increase due to the issue of funding scarcity at higher education institutions is on the rise; however, the realisation and use of virtual and online learning to attract a larger student audience can allow HEIs to leverage the ideology of economies of scale. Dr Mbatha said *After Covid I think there's going to be a lot more universities face to face universities that wants to get into the online space. And because I think they see to an extent that there's maybe some answer in that for their, for their funding problems and if it's not even if it's not fully online and it is going to be a much greater blend of an online part in the in the in the face-to-face teaching, so more online courses. So even though student will be doing face to face teaching, they might have either a bigger blend of stuff that's happening online, but also I think more courses that they will take only online. And you see it in the US lots of face-to-face universities, and you know of having large components of their undergraduate teaching for example online. And both because students prefer it, but also because these some economies of scales working. I think in South Africa because these rules around funding and how and how some of these degrees are funded, it's a little bit more complicated because and well from my view and it's these are patent unfairness if and face to face universities offer a larger part of their degrees online, but they get funded as face to face universities while the Unisa gets and funded still at the distance education rate. So, I think these are these are issue there that needs to be addressed in terms of funding.*

Another resource consideration is the integration of digital learning into the curriculum from the outset. Dr Botha stated that *it should be a standard expectation in some courses in specific programmes, from 1st year onwards, that way all planning (curriculum, pedagogy, assessments, etc), resources, and budgeting will take this into consideration.* This implies establishing virtual teaching and online learning as a standard expectation across courses and programmes within an institution. This proactive approach ensures that planning, resource

allocation, and budgeting processes align with the digital learning requirements, facilitating seamless integration into virtual teaching practices.

Involving academic educators in the planning process ensures their input and buy-in through creating a sense of ownership and commitment to the initiative. Dr Kemp suggested that *academics need training in advance before the on-line teaching program is implemented. Academics should be consulted on which on-line teaching program to implement. The on-line teaching program should be tested in advance before implementation.* Providing professional development, training and support to academic educators in advance is essential for building their capacity and confidence in adopting online teaching methods. Institutions should provide technical support and testing of online teaching programmes before implementation. This proactive approach helps address potential challenges and ensures a smooth transition to digital learning environments.

Dr Swart said that the *online learning thread as a strategical plan must be cascaded from all levels of the institution into class environment*. There is a need for cross and multi-layered strategic alignment through the integration of virtual teaching and online learning strategies into institutional plans, which promotes alignment with broader institutional objectives. This ensures that virtual teaching and online education initiatives are embedded within the institutional fabric and receive support at all levels.

4.5.5.3. Institutional Infrastructure Distribution for Equitable Access

The analysis and findings for *Institutional Infrastructure Distribution for Equitable Access* shed light on the critical role of technological infrastructure and digital resource availability in shaping the institutional ecosystem for facilitating effective virtual teaching and online learning. Nurturing a sustainable digital ecosystem for education requires equitable access to hardware, software, and the internet is crucial for successful virtual teaching and online learning, especially in South Africa, where infrastructural challenges, digital divides, and economic disparities exist. Accessibility challenges and digital literacy variation levels are highlighted, underlining the need for solutions to promote inclusivity. Strong institutional, technology-enabled infrastructure is essential to ensure equitable access to education. This encompasses institutional ICT support, regional centre resources etc., in ensuring students have the necessary devices and internet connectivity to access the virtual teaching and online learning environment. The responses highlight various factors that contribute to the equitable

access of essential resources and emphasise the need for addressing these challenges to promote inclusivity in education.

Access to devices and reliable internet connectivity is crucial for both students and academic educators to participate in online learning effectively. Dr Davids said *I believe that access must be considered. Here, access can be explained in different ways. The first is access to devices and internet connectivity. The second is access to knowledge and skills about using LMS platforms for lecturers and students. Also, access can be considered in terms of power supply (electricity) and the environment where the lecturers and students are located.* The Lack of access to technological devices and reliable internet infrastructure poses significant barriers to participating in the virtual course and to the students' learning. *It is very important that the university considers the issue of access and equity when introducing online teaching* (Prof Grobler) and *support for students in areas with unstable and poor internet structures* (Dr Meyer). Addressing these issues requires comprehensive support and solutions tailored to the needs of marginalised students.

Access to a reliable power supply, for both academic educators and students, is essential for uninterrupted teaching and learning activities. As noted by Dr Masondo, *access to back-up powers supplies (generators, UPS, solar panels)* is critical to mitigate disruptions caused by power outages, ensuring continuity in online learning environments. Providing *suitable facilities for staff members* (Dr Sekhukhune) on campus is vital for supporting their work in delivering quality education. This includes access to functional workspaces, equipment, digital tools and digital resources necessary for course design, development and delivery. Prof Radebe says a solution that his university does is that it gives *the academics and support staff every three years a new laptop, not a new laptop but a funding incentive, they call it a cash allowance incentive and that incentive is used to get a laptop*. This is also the case with most of the other higher education institutions within South Africa. Providing *support in terms of buying resources for colleagues* (Dr Hoffman) promotes a collaborative and supportive environment within the institution. Collaborative efforts in resource procurement enable academic educators to access the necessary tools and technologies for delivering high-quality online education, despite budget constraints. Recognising the need for *availability of technical support for the teachers* (Dr Molefe) entails ensuring that *technical and administrative support should be more easily accessible* (Prof Fick) and the responsibilities for technical and administrative issues are appropriately delegated. *The amount of IT, admin and professional support academics will get* (Dr Kgosana) is essential for addressing IT-related issues and aiding academic educators in

course development and delivery. Ensuring easy accessibility to such support services facilitates smooth operations and enhances the overall learning experience. It also involves holding institutions accountable for providing adequate support to academic educators and students throughout the learning process.

The *availability of necessary equipment* (Dr Zondi), such as computers and internet-enabled devices, is critical for facilitating virtual learning experiences. Dr Mrwebi suggests the substitution of tablet provisions to students in place of printed copies of course materials. She said *so one of the key things that I wish we could think about moving towards is, we print at the moment we printing all of these course packs with readers at the beginning of the year and that's kind of what the students are paying for in terms of their course fees. You, you know their printing fee as part of their what they're paying for and my in an ideal world, my kind of idea for that would be to say actually when you come in to the university, we don't we are never going to print readings for you. But we are giving you a tablet. You can download your readings. You can read it, but the tablets got a much bigger screen and we instead of spending the money to print stuff they've already got access to. Although I know some people like a hard copy and I would trade off the hard copy endless printings of readings that they've already got on the LMS [sic]. I would trade off to make sure that every student actually had the tab at least a tablet. Umm, because that I'm telling you would be the equivalent to what? That what we spending on printing*. Dr Alexander acknowledged this costs and said that she was informed by someone in her university *that the money Unisa is going to save not printing and sending study material is millions. They're going to give the student devices. Ok, so there are they're all giving the students, but only some students you have to qualify to give the device.* Higher education institutions must ensure that students have access to the hardware required to engage effectively in online education. Prof Radebe said that his institution provides laptops to their students *so we doing that with the different gadgets and so we help our students where we can. Our students can request a loan laptop, but that loan laptop it's only for a certain period. It's like, for example, the student within three months, a student need to submit the refurbished.*

In addition to providing access to a device, Dr Mrwebi highlights the importance of differentiating between formal and epistemological access, so moving beyond access to the device but also to knowledge and skills. She said *you know, but it's to use inclusive Ed terminology from for a minute, we talk about the difference between formal access and epistemological access, so the difference between actually having access to formal access to an institution or whatever it is, you're there, you you've got it. But epistemological access*

actually having access to the deeper kind of knowledge, so not just access to the institution, but access to the to being able to work with knowledge. If you giving a kind of basic how to navigate orientation you are making sure they've got a formal access to a device that they have the skills of being able to get into those platforms. For HEIs to achieve true educational equity, they are required to not only focus on providing formal access but also on ensuring that students have epistemological access. By implementing strategies that enhance students' ability to engage deeply with knowledge and develop essential skills, institutions can create an equitable and inclusive educational environment.

Ensuring equitable access to technology and ICT equipment such as computers and smartphones, along with reliable internet connections, is essential for promoting equity in online education. Students must have access to these resources to fully participate in digital learning. This is highlighted by Dr Rossouw, who shared that *access to the ICT equipment such as computers and smart phones by students, and also the reliable internet connections.* Ensuring *student and staff access to hardware, software, connectivity, and data* (Dr Biko) is vital. The lack of access to computers and reliable internet connectivity limits students' participation and engagement in online learning activities. Providing affordable internet options, as mentioned by Dr Klaasen that *student should access to cheap internet*, is essential for overcoming barriers related to connectivity and data accessibility. Offering subsidised or low-cost internet plans can significantly enhance students' ability to access online educational resources and participate in virtual classrooms.

Higher education institutions' engagement with network service providers and partnering with *other service providers for network connectivity* (Dr Jordaan) can help address connectivity challenges and ensure reliable internet access for students and academic educators. Prof Radebe stated that *we also and look at the uh, negotiate with mobile or service providers that that provided the data for students*. Collaborative efforts with these providers can lead to the development of tailored solutions to improve network infrastructure. Dr Alexander said that *there must be a partnership, a partnership with private companies and government. And when you government if, when your government say, OK, this is what I'm gonna do and this is what Tanzania said, this is what we're going to do. And they got the private sector involved. Consideration and involvement of ICT and external stakeholders specifical of telecommunication* (Dr Marx) companies like Vodacom, MTN and Telkom, is crucial for enhancing technological infrastructure. Partnerships with these entities can lead to improved network connectivity and access to resources. Prof Radebe shared some information on what

his institution does by saying that that *our university created agreements, a partnership with your mobile service providers like your MTN, Telkom, Your Vodacom and each one of our students receive 30 gigabytes. So, ten is during the day data bundles gigabytes is a lot of data, so ten is during the day and 20 is after hours. So, during the day, we expected our students. So, there's no excuse. So, all our students from our undergrade to our postgraduates, they receive that data.* Prof Radebe further shared another strategy of the *University having 159 centres in education centres, which we have agreement partnerships within the Department of Basic Education. So, if our students have a problem with the laptop and the laptop is not working, they can go to the teacher centres around the country. They can also go to the regional office and at the regional office there is clear well-designed infrastructure they can use. There is Wi-Fi for them to use if they don't want to use this to doing that, they can use their smartphones. Each smartphone is adapted and synchronised to the ODL platform that we working on, which is MyUnisa that you can use that.*

The establishment of regional centres by educational institutions, as described by Prof Radebe and also proposed by Dr Mangena, who says that *centres for online learning across regions* is necessary. This is further supported by Dr Kruger who said that *making sure that students have access to resources. Perhaps regional centres should be built by said institution where students who don't have access to the required technology at home, could come and do their work.* These can serve as hubs for students who lack access to required technology at home. These centres can provide students with the necessary resources, including computers and reliable internet connections, to engage in online learning effectively. Dr Sithole said *I think certainly it can, I think Unisa at some stage, I'm not sure where they still, I mean this I know for example they had a I would say what's the right word I'm looking for agreements with you know various centres you know libraries and you know and organisations especially in townships where students can you know just walk in and use computers for example in submitting assignments anything also right. So, I think that's a noble thing to do for them. I think if we can open up those spaces, I think it will help.* Leveraging educational technology centres, as mentioned by Dr Cronje, who highlighted the importance of *Knowledge of Educational Technology Centres* as they can enhance institutional capacity in implementing and supporting digital learning initiatives. These centres can provide expertise, training, and resources to support educators and students in using technology effectively for teaching and learning.

4.5.5.4. Equality and Equity – Know Your Student (KYS)

The analysis and findings for *Equality and Equity – Know Your Student (KYS)* emphasise the importance of understanding the socio-economic and socio-cultural context of students, particularly in South Africa, where disparities in access and resources are ubiquitous. The responses highlight the importance of knowing students' backgrounds, resources, and readiness to navigate the challenges associated with online education.

Equity in learning and accessibility to learning. It is logical fair that learning institutions make sure to go all lengths to create a learning platform in which a student's social, cultural, of economic background and or status does not determine their access to knowledge and skills provided by the institution. This could be in the form of provision of essential technologies to all students (Dr Phakathi). Factors such as socio-economic status and living space influence students' access to essential resources like electricity, Wi-Fi, and ICT devices, as noted in Dr Cele who said *socio-economic statuses of my students-living space, ICT devises, electricity, WiFI etc.* Recognising these disparities is crucial for designing equitable and inclusive learning experiences. Dr Kubyane emphasised the point of *appropriateness from student's perceptive, accessibility to technology. Online availability and speeds*, while Dr Mogale emphasise the importance of the *Student profile. Eg. Location and access to Internet, WiFi, network stability etc.* This is indicative of the level of accessibility to technology and internet connectivity varies among students. Understanding students' access to devices, internet availability, and network stability helps tailor instructional strategies and content delivery methods accordingly. Dr Mbeki highlights the considerations of *student readiness, capacity, experience, finance, familiarity, access to bandwidth, ICT ownership, computer literacy.* Ensuring equitable access to resources and support is essential for promoting student success. This was also emphasised by Dr Phakathi, who says *equity in learning and accessibility to learning. It is logical fair that learning institutions make sure to go all lengths to create a learning platform in which a student's social, cultural, of economic background and or status does not determine their access to knowledge and skills provided by the institution. This could be in the form of provision of essential technologies to all students.* Higher education institutions must strive to create a level playing field where students' social, cultural, or economic backgrounds do not determine their access to educational resources. Providing essential technologies and support to all students is essential for achieving this goal. Dr Van Niekerk goes as far as to advise that *personal computers and internet data should be provided to students.*

Psychological readiness (Dr Mofokeng) is crucial for student engagement and success in online learning. Understanding students' emotional and psychological needs can help address potential barriers and enhance their overall learning experience. Conducting a *student needs analysis e.g. understanding their demographics* (Dr Xaba) as well as the *Students' profiles, ages, learning styles and geographical residence/location* (Dr Lange), provides valuable insights into their diverse backgrounds and learning preferences.

4.5.6. Contextual Realities of National Infrastructure Readiness and Political Climate

The analysis and findings for *Contextual Realities of National Infrastructure Readiness and Political Climate* are a fundamental prerequisite for successful virtual teaching and online learning initiatives. The responses highlight various aspects of infrastructure and access that must be considered to ensure inclusivity and effectiveness in digital education.

Prof Radebe highlighted the critical issues and initiatives related to the preparedness of students, technological access and infrastructure in the context of South African higher education. Prof Radebe said that *one of the challenges was students in the rural areas could not have access. So, accessibility was a major issue because of that that there was also the digital divide. So, students from the rural area or from their well, they're in the city, but because of the digital divide, they did not have the smartphones or the laptop that they can work on in the beginning. And so those students must be brought to the middle. They need to be empowered so we empower them. We provided them with devices and internet access. We instructed them as a college and how college is 109,000 students this year, so we brought them in and another issue that I want to say many of our students came directly from the basic education schooling system and some of them are not used to working in an online space or in a contact. So that created a problem with learning umm how to learn.* This reminds us of the challenges faced by students, particularly those from rural areas, and the measures that are necessary to address these challenges.

Infrastructure challenges like load shedding and power instability due to infrastructure limitations, such as load shedding, pose significant challenges to consistent access to electricity, impacting students' ability to engage in online learning effectively. Dr Booysen highlighted this by saying that *there are a myriad of factors that need to be taken into consideration for both students and teaching staff. These may include considerations with regard to infrastructure, access and cost. South Africa has been struggling with load shedding*

for the last few years, data costs are infamously high and not all of our students have access to devices and their associated requirements. Addressing these issues requires innovative solutions and vigorous infrastructure planning to minimise disruptions. Additionally, the infamously high data costs further exacerbate the accessibility barrier, hindering students' ability to access online resources and participate in virtual learning environments. Mitigating these costs or providing affordable alternatives is crucial for ensuring equitable access to educational opportunities.

Infrastructure challenges related to power supply, such as load shedding, disrupt teaching and learning activities, as mentioned by Dr Khumalo who stated that *disruptive electricity supply factors impacting on our teaching and learning* whilst Dr Biko emphasised the need to consider *loadshedding; accessibility; integration of older hardware and software versions; connectivity* given the contextual realities of South Africa. *Alternative power sources* (Dr Crous) and strategies to mitigate the impact of power disruptions are necessary to maintain continuity in online education. Factors such as cost and accessibility to internet cafes further compound challenges related to infrastructure readiness and equitable access, as highlighted in responses like *loadshedding, costs, lack of access to internet cafes* (Dr Kgosana).

Given the infrastructural challenges at a national level, the provision of comprehensive supportive measures for students in areas with unstable internet structures and marginalised backgrounds is crucial for promoting inclusivity in online education, as suggested in a response by Dr Jordaan, who said that there should be *comprehensive to cover marginalised students*.

Participants highlighted the importance of infrastructure beyond providing students with devices and data access Dr Sithole said *it was hard, but my must be honest, you know, because I think that time, remember, there was this debate about rural urban, huh? Where the connectivity was strong, where deep rural students said they have data but can't connect and it was difficult for the student. I think came out from a lot of universities and so I think the experience that I probably you know, and I took from learn from that you know during COVID period was that the university did you know everything they could they can do in terms of providing data because that was the issue. But another issue that came to the floor now was the connectivity issue. Students just saying I'm I have the data yes, thanks to the university. But I'm not able to connect, you know because of my surrounding and all of that.* This is indicated that it is important for the National government and private telecommunications companies to assist in infrastructure development because even when students have access to data provided

by higher education institutions, they may still face connectivity issues due to their geographical location. Dr Sithole further shared the provisions provided by his institution *so I think you can do as much as you can, you know, in terms of support, in terms of providing, you know, students were given laptops, you know they were given data and that's how that's what this university was able to do and that's how far they could go. But a lot of students did benefit, but like I said, we had to deal really with, you know, locations now because saying look, I'm in KZN deep rural but unfortunately connectivity is very bad.* It should be noted here that beyond educational institutions providing access to the devices and data, the lack of national infrastructure plays a vital role in providing access at a network level.

National government, the private sector and higher education institutions must work together to implement measures to address the specific challenges faced by students and ensure that no one is left behind. The geographical location, particularly in remote areas, poses challenges to digital learning due to limited infrastructure and accessibility in terms of access to technology and internet connectivity. Dr Ngcobo highlighted the *place of residence for the students. If students are from remote areas, will digital learning be conducive? certainly, not but policies could coerce them to adapt and adopt digital learning.* This indicates that institutional policies may mandate the adoption of digital learning, but infrastructure limitations can hinder its effectiveness. While policies may promote the adoption of digital learning, they must also address the unique challenges faced by students from remote areas. Simply coercing adaptation without addressing infrastructure gaps may exacerbate inequalities in access to education.

4.5.7. Socio-economic and Socio-cultural Context

The virtual teaching and online learning setting is not a one-size-fits-all environment. Student experiences can be significantly influenced by the socio-economic and socio-cultural context in which they live and learn. Two sub-themes were identified under this theme, namely (1) Social and Cultural Climate, and (2) Societal Imbalances and Economic Conditions.

4.5.7.1. Social and Cultural Climate

The analysis and findings show that the *Social and Cultural Climate* significantly influences the implementation and effectiveness of educational initiatives, particularly in the transition to digital learning environments. The responses shed light on various factors, including cultural competence, societal culture, university culture, multimodal teaching, and socio-political challenges, that shape virtual teaching and online learning environments.

Acknowledging and addressing cultural diversity is essential, as highlighted by Dr du Plessis who said that *cultural competence because lecture rooms are now diverse with students from different backgrounds including students who have no access to ICTS.* South African lecture rooms are increasingly diverse, with students from various backgrounds, including those with limited access to ICTs. Cultural competence ensures that teaching methods and resources are inclusive and relevant to all students, irrespective of their cultural backgrounds. The *university culture: way of doing things* (Prof Naidoo) or the established norms and practices also play a role, as they influence the way educational activities are conducted. Understanding and navigating university culture is crucial for effectively implementing digital learning initiatives and a supportive learning environment. As such, cultural competence emerges as a crucial aspect, ensuring that educational practices are sensitive to the diverse backgrounds and needs of students. It becomes apparent to acknowledge cultural diversity and incorporate inclusive teaching methods for educational institutions to create learning experiences that resonate with students from various socio-economic and cultural backgrounds.

The *use of multimodal teaching and learning platforms should be embedded in institutions* (Prof Ngubane). Multimodal approaches accommodate diverse learning styles and preferences, making them particularly suitable for the South African context, which encompasses a wide range of socio-economic backgrounds and technological access levels. *Multimodal teaching is more appropriate for the South African context* (Dr Zitha) as this approach acknowledges the socio-economic and cultural diversity within the country and leverages various modes of delivery to enhance accessibility and inclusivity in education.

Socio-political challenges such as *issues that lead to disruption e.g. load-shedding. and student protests* (Prof Fick) can disturb educational activities. These issues pose logistical and operational challenges, impacting the continuity and stability of virtual teaching and online learning environments. As presented in the planning component, it is imperative to address these challenges through proactive measures and flexible strategies to ensure uninterrupted learning experiences.

4.5.7.2. Societal Imbalances and Economic Conditions

The analysis and findings show that *Societal Imbalances and Economic Conditions* significantly impact the accessibility and equity of education, particularly in the transition to virtual teaching and online learning. The responses highlight key issues related to disadvantaged students, access to resources, and the importance of considering societal needs.

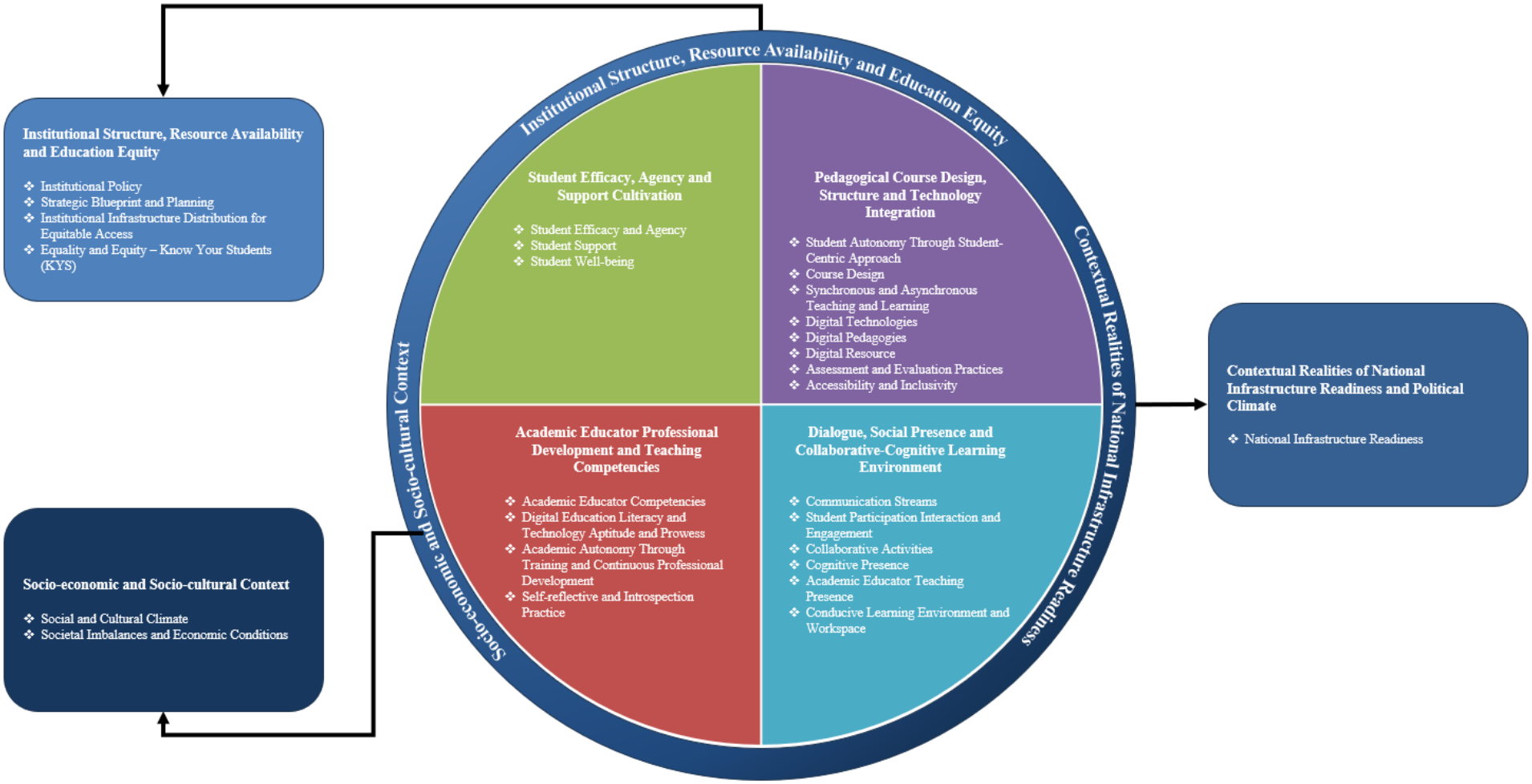
We should be aware of *societal imbalances - student affordability, demographic of students, economic conditions* (Dr Jordaan). Participants highlighted the disparities of societal imbalances and economic conditions and how they impact students' experiences in the virtual teaching online learning environments. Dr Alexander said *there is just, there is just really nothing holding them back. We live in an area we don't have load shedding, so my children have no excuse if they tell me they can't study. But I'm very, very aware of the students and I think it's because I tend to communicate with them often. I want my students to see me in my course, although I focus on asynchronous, they can study where they are, when they want to study any place, anytime, any way they want to do it. So, I'm not fond of the synchronous online thing because some students say, but you always excluding me because of work or whatever.*

Disadvantaged students face significant barriers due to resource inequity, such as a lack of access to essential resources, such as devices or internet connectivity. Dr Ndou says that *disadvantaged students who do not have access to gadgets or anything required to allow them to participate*. Economic disparities exacerbate these challenges, widening the gap in educational opportunities between privileged and disadvantaged students. Ensuring access and equity in education is paramount, especially in the context of virtual teaching and online learning. This is emphasised by Prof Grobler, who stated that *it is very important that the university considers the issue of access and equity when introducing online teaching.* Higher education institutions must prioritise addressing the needs of marginalised students and mitigating disparities to ensure equal opportunities for learning and participation. They *should consider the needs of the country and societal issues* (Dr Mangena) when implementing educational initiatives. Dr Sithole said *We're sort of rallied behind that call to say we need to hold hands and we need to support as much as you can as lecturers, as universities, as communities and we have to do the best we can. But like I said, you know, for some students it was really hard, and I will be quite right. It brings our social and economic conditions, all of them.* This highlights the need to consider socio-economic factors, cultural diversity, and infrastructural challenges, which must be considered to develop inclusive and sustainable educational strategies.

4.5.8. Thematic Analysis Summary

Figure 20 illustrates a summary of the thematic analysis, providing an overview of some of the various intrinsic and extrinsic factors that impact virtual teaching and online learning.

Figure 20: Summary of Intrinsic and Extrinsic Factors for Virtual Teaching and Online Learning



4.6. Chapter Summary

In this chapter, the data was analysed using a thematic analysis of qualitative data and simple descriptive statistics, data visualisation and correlation analysis for quantitative data. Through the analysis of the data, the perspectives and experiences of the research participants are reflected, providing a theoretical exploration of providing equitable education through virtual teaching and online learning. It encompassed gaining insight on how the affordances of digital education can be harnessed to enhance virtual teaching and online learning and the factors (intrinsic and extrinsic) that can support equitable educational experiences while considering the intricate interplay of contextual, social, economic, technical, cultural and institutional factors that influence successful virtual teaching and online learning environments. These insightful responses and discussions with participants offered a base to deeper explore the components, developing a comprehensive understanding of the key elements and strategies required for the successful implementation of virtual teaching and online learning in higher education institutions. While exploring the prominent themes relating to virtual teaching and online learning, the analytical interpretation highlights key themes, including (1) Pedagogical and Student-Centred Course Design, Structure and Technology Integration, (2) Dialogue, Social Presence and Collaborative-Cognitive Learning Environment, (3) Academic Educator Professional Development and Teaching Competencies, (4) Student Efficacy, Agency and Support Cultivation, (5) Institutional Structure, Resource Availability and Education Equity, (6) Contextual Realities of National Infrastructure Readiness and Political Climate, and (7) Socio-economic and Socio-cultural Context. The succeeding chapter will reflect and examine the literature reviewed in Chapter Two concerning the research themes and findings, and discuss the key concepts integral to the narrative presented by this research study.

5. Chapter 5: Discussion

5.1. Chapter Overview

This research study aimed to explore how the power of digital education can be strategically harnessed to facilitate virtual teaching and online learning while considering the structural factors, systemic barriers and the contextual realities in South African higher education. The researcher considered and analysed the intricate interplay of contextual, social, economic, technical, cultural and institutional factors influencing virtual teaching and online learning at a microsystem, mesosystem, exosystem, macrosystem and chronosystem level. Leveraging from the literature review and the theoretical frameworks in Chapter 2, this chapter explores the intricacies of virtual teaching and online learning using a multifaceted lens comprising the Socio-Technical Theory, Ecological Systems Theory, Transactional Distance Theory, and the Community of Inquiry Framework. The researcher highlights the factors influencing the effective, accessible and equitable considerations of virtual education. This chapter presents the discussion of the understandings and insights gained from the simple descriptive statistical analysis, correlation analysis and the thematic analysis of the diverse perspectives on the:

1. Ways in which digital education can be harnessed to facilitate virtual teaching and online learning for diverse student populations,
2. Critical factors influencing the design and development of effective virtual teaching and online learning environments across multiple ecological levels,
3. Intrinsic factors that can provide and optimise educational experiences in virtual teaching and online learning ecosystems, and
4. Extrinsic factors and systemic barriers impeding digital inclusion and equitable access to virtual teaching and online learning in higher education.

From the simple descriptive statistics, correlation and thematic analysis of the data collected from the questionnaires and semi-structured interviews, the overall results highlight six definitive areas for discussion (1) Harnessing the Power of Digital Education to Facilitate Virtual Teaching and Online Learning, (2) Core Elements Facilitating Virtual Teaching and Online Learning, (3) Optimising Virtual Teaching and Online Learning Environments Through Pedagogical and Student-Centred Design, (4) Higher Education Institutions Facilitating Support for Virtual Teaching and Online Learning, (5) Addressing External Macro Factors to Enhance Virtual Teaching and Online Learning Environments, and (6) Learning from the Past

and Continuous Advancements to Build the Future of Virtual Teaching and Online Learning. The discussion of the analysis leads to answering the following research questions:

1. How can digital education be harnessed to enhance virtual teaching and online learning across diverse student populations?
2. What factors should be considered in the design and development of virtual teaching and online learning across multiple ecological environments?
    a. What intrinsic factors should be considered in designing and developing virtual teaching and online learning environments to optimise educational experiences?
    b. What extrinsic factors and systemic barriers must be addressed to implement effective and equitable virtual teaching and online learning?

Furthermore, presented in this chapter is one of the overarching goals of this research study, which is establishing a sustainable Virtual Teaching and Online Learning Ecosystem Framework (VTOLE-Framework) specifically tailored to South Africa's unique needs and challenges.

It needs to be noted that given the multifaceted nature of this research study and the interconnectedness of the multiple theories and frameworks used, a comprehensive application of each theory and/or framework to every section or concept of the discussion would result in redundancy. Therefore, the researcher took a holistic approach to the discussion framed through a conscious awareness of the underlying theoretical perspectives, allowing for a more nuanced and integrated interpretation of the findings to enhance the clarity and maintain coherence in the discussion. The underlying theoretical lens and thought processes of the researcher included that virtual teaching and online learning should be designed with:

- A socio-technical perspective, recognising the interplay between society, technology, infrastructure, processes, culture and people,
- An ecological systems perspective in understanding the complex interplay of factors influencing virtual teaching and online learning spaces. The emphasis on the interconnectedness of multiple environments, ranging from learning in a virtual space to the broader societal influences on virtual teaching and online learning, makes it important to consider the ecological context and develop strategies to address these disparities and create more equitable learning opportunities,

- Minimising transactional distance between the academic educator and the student, as this is essential for effective virtual teaching and online learning. This can be achieved through strategies that can help to bridge the physical, psychological and pedagogical distance between students and academic educators, and
- A community of inquiry perspective to examine the influences of social, cognitive, and teaching presence in the context of designing supportive and intellectually stimulating learning virtual teaching and online learning educational experiences.

5.2. Harnessing the Power of Digital Education to Facilitate Virtual Teaching and Online Learning

As future careers and technologies remain unpredictable due to the nature of their continuous evolution, HEIs and academic educators must adopt a continuous, flexible and adaptable approach to the delivery of education. The rapidly evolving job market necessitates a problem-solving education model beyond technical skills and should include 21st century skills through the integration of digital education to address socio-economic inequalities and contribute to job creation and innovation (Dlamini, 2022). Thriving in this dynamic time requires a shift from traditional teaching to digital educational strategies to afford student-centred learning that encourages critical thinking, creative thinking, communicating, collaborating and problem-solving skills (Bucăţa & Tileagă, 2024). This necessitates the reimagining of academic educator roles and educational practices to equip students for an uncertain future. Additionally, digital technologies have fundamentally transformed education, shifting from traditional and location-bound learning to flexible and student-centred approaches beyond time and space. The rise of digital communication tools has empowered students to access knowledge independently, challenging the traditional model of educator-centric instruction. Therefore, the rapid evolution of technology demands a fundamental shift in the roles of students, academic educators, higher education institutions and researchers. We must adapt to a digital era characterised by constant change, new tools, and evolving work structures. This transformation requires a focus on lifelong learning, collaboration, and the development of a diverse contemporary skill set encompassing technological proficiency, critical thinking, and emotional intelligence. In this contemporary era, we must prioritise a skillset and willingness to embrace emerging technologies and pedagogical approaches in the digital economy.

The world and country are transforming into a digital economy, and this suggests that the education system needs to align with this transition. Digital education is an important step

towards this transformation as it can help with the alignment and in resolving some of the key challenges that South Africa is currently facing with the existing education system. Some challenges faced are high costs, poor content, poor quality, low retention rates and unfortunately, unskilled and untrained academic educators. These challenges can act as barriers to the average South African student with a desire for education. The benefits of online learning in education promote its rapid growth and one of the most obvious benefits is that newer generations of students are comfortable using technology (Ally, 2011). Other benefits also include the aid to those who cannot travel due to distance or family obligations or disabilities or even the remoteness of their residency (Ally, 2011).

Digital education has become an integral part of contemporary learning (Singh, 2021). Therefore, it is imperative to scrutinise the various components that contribute to its effectiveness in a virtual teaching and online learning setting. A foundational consideration in creating an effective learning environment is the choice of a user-friendly LMS (Emelyanova & Voronina, 2014). Ensuring an intuitive interface and providing clear instructions support seamless navigation for both academic educators and students. An effective LMS should integrate easily with other digital tools and third-party applications to support features and facilitate easy access to learning materials (Simelane-Mnisi, 2023). Additionally, effective communication is imperative in virtual teaching and online learning settings (Garrison et al., 2000). Academic educators should leverage the communication tools within the LMS, as well as use independent tools such as emails and social media tools like WhatsApp (Grammens et al., 2022; Makhoere et al., 2020). These digital platforms allow academic educators to send messages, share documents, and maintain ongoing communication with students, thus developing a connected and supportive learning environment.

Digital technologies and online learning platforms have become essential tools for virtual teaching and online learning. These technologies and platforms facilitate communication, content delivery, and assessment. However, the success of virtual teaching and online learning is not limited to the technology but depends on a combination of technological infrastructure, pedagogical expertise, and student engagement (Elliott, 2010). It is important to recognise that the integration of technology is not merely a technical process but a socio-technical one. The success of digital initiatives hinges on the interplay between technology, pedagogy, and the broader social educational context. Academic educators can harness the potential of digital technology to create more effective and equitable learning environments through understanding these interconnections. A socio-technical perspective assists with the

understanding of the intricate relationship between technology and human factors in shaping digital transformations into virtual teaching and online learning environments.

Academic educators should enhance engagement and interactivity with the incorporation of various digital tools and content types. Authoring tools, along with multimedia elements such as videos, simulations and quizzes, contribute to a dynamic learning experience (Lachs, 2013). These elements align with constructivist learning theories, emphasising collaborative activities for knowledge construction. Collaborative tools, both within the LMS and through third-party applications, facilitate communication and group work, rooted in socio-cultural learning theories. These tools afford both synchronous and asynchronous interactions, making learning flexible and accessible. Virtual classrooms, discussion forums, and collaborative documents support real-time and delayed communication, catering to different learning preferences and schedules (Aloni & Harrington, 2018). Digital education in virtual teaching and online learning must also prioritise interactivity and collaboration to effectively engage students in the learning process (Nanjundaswamy et al., 2021). By creating opportunities for interactive learning experiences, academic educators can facilitate active participation and collaboration among students, bringing in a more caring and inclusive approach to virtual pedagogy (Carrillo & Assuncao Flores, 2023).

Adaptive learning pathways, guided by data and learning analytics, personalise the learning journey based on individual student progress. Digital platforms have features that allow academic educators to customise content to meet diverse student needs. This personalisation helps address varying levels of prior knowledge, learning speeds, and preferences, ensuring a more inclusive and equitable educational experience. In the area of data analytics, learning analytics tools provide insights into student engagement and performance, facilitating data-driven decision-making. This is especially beneficial for providing feedback to students on their assessments. Regular feedback mechanisms, both formal and informal, assist in maximising students' learning benefits and create a continuous improvement cycle for the digital education environment (Mandernach, 2018). These analytics help academic educators identify at-risk students, understand learning patterns, and adjust instructional delivery and pedagogical strategies accordingly.

e-Assessment strategies within the digital space should also be considered. They include a variety of tools embedded in the LMS, such as online quizzes, assignments, and discussion forums etc. Peer assessments and self-assessment tools contribute to a comprehensive

evaluation process, supporting a formative approach to learning (Wanner & Palmer, 2018). These methods help in providing immediate feedback, a deeper understanding of the material, and encouraging self-reflection among students.

Academic educators also need to prioritise accessibility, inclusivity and the effective use of technology to enhance learning for all students when implementing the use of digital education (Carrim & Bekker, 2022). Ensuring compliance with accessibility standards and providing alternative formats for content adheres to ethical standards and supports a diverse student body, aligning with the principles of universal design for learning (Basham et al., 2020; Espada-Chavarria et al., 2023). This includes making sure that all digital content is accessible to students with disabilities and providing accommodations such as captioning for videos and text-to-speech options. Multimodal teaching approaches, which accommodate diverse preferences and learning styles, are particularly suitable for the South African context. By leveraging various modes of instructional delivery, academic educators can enhance accessibility and inclusivity in education (Mhlongo et al., 2023).

To achieve this, professional development and training for academic educators to integrate digital tools and pedagogies effectively is crucial. HEIs should provide opportunities for continuous professional development as this ensures that academic educators are well-equipped to navigate and use digital technologies and pedagogies, developing a culture of innovation and excellence in virtual teaching and online learning (Pham, 2021). Strategic planning, resource allocation, and infrastructure readiness are essential to support digital education. HEIs must prioritise investments in technology, professional development for academic educators, ensure adequate support for both academic educators and students and develop comprehensive policies to guide the implementation of virtual teaching and online learning initiatives. This is especially important given the ever-evolving technologies in enhancing educational experiences. Keeping up to date with technological advancements and integrating them effectively ensures that teaching and learning processes are innovative, engaging, and effective (Haleem et al., 2022). While keeping up to date with the changes in instructional delivery, it is important to understand and address students' diverse socio-economic and cultural contexts, as this is crucial to ensure equitable access to virtual teaching and online learning (Achieng & Mlitwa, 2024; Fischer et al., 2020). Providing necessary resources, such as devices and internet connectivity, and designing inclusive educational strategies help bridge the digital divide and promote equal opportunities for all students (Alenezi et al., 2023; Bekele, 2021; Mhlanga, 2024).

5.3. Micro Level (System Environment) – Core Elements of Technology Facilitating Virtual Teaching and Online Learning

5.3.1. Student and Student Competencies

The effectiveness of virtual teaching and online learning is significantly influenced by students and the competencies of the students participating in these ecosystems. Key competencies such as digital literacy, digital skills, and digital fluency form the foundation of successful engagement in digital education.

In the context of this study, digital literacy encompasses a range of skills, from basic computer operation to the effective use of various digital tools and platforms. Given the increasing importance of digital education in South African society, improving students' digital literacy is crucial (Alenezi et al., 2023; Monteiro & Leite, 2021). It has become as essential as traditional competencies like reading, writing, and arithmetic. For students to thrive in an online learning environment, they must possess a fundamental understanding of how to operate digital devices, navigate the internet safely, and use educational software and platforms (Monteiro & Leite, 2021). This basic level of digital literacy ensures that all students can access and engage with course materials, participate in online discussions, and complete e-assessments effectively. Students must possess a foundational level of digital abilities or computer literacy to effectively participate in virtual teaching and online learning. This competency includes understanding and navigating various digital learning tools and platforms used by higher education institutions. The efficiency of a platform's use and the technology supporting it are crucial from the student's perspective. If the platform functions well and students can efficiently use it, their learning experience is significantly enhanced (Fischer et al., 2020).

Beyond basic digital literacy, students need to develop specific digital skills that enable them to use technology effectively for learning purposes. Digital skills are essential for full participation in society, yet disparities in access and proficiency persist. While technology offers opportunities for equitable education, factors like socio-economic status, cultural background, and educational resources significantly influence digital literacy. To bridge the digital divide, it is imperative to provide equitable access to technology, develop comprehensive digital skills training programmes, and create supportive learning environments. Addressing these challenges allows HEIs to harness the power of digital education and digital technologies to promote inclusivity and ensure that all students can

succeed in the digital age. Students should be comfortable navigating the LMS used by their HEI, whether it is Moodle, Blackboard, Canvas or another platform (Fischer et al., 2020). Mastery of the effective use of communication tools like email, discussion boards, and video conferencing software like MS Teams, Zoom, BigBlueButton or other video conferencing platforms is essential for students interacting with their peers and academic educators. Students should also develop the ability to organise and manage digital files, including the use of cloud storage solutions like Google Drive, OneDrive, Dropbox or other storage platforms to assist them in keeping track of coursework and resources. Developing these digital skills not only supports academic success but also prepares students for the digital demands of the contemporary workplace (Chomunorwa et al., 2023).

In addition to the foundational level of digital literacy, students should also possess digital fluency. It goes a step beyond digital skills, encompassing the ability to seamlessly integrate digital tools into learning processes and use them to create new knowledge (Bozkurt et al., 2020). Students with digital fluency can adapt to new technologies quickly as they are comfortable in exploring and using digital technologies that become available, which is an important skill to have, given the continuous technology advancements. By being digitally fluent, students can use technology to innovatively solve problems, engage easily with the course content and complete their activities. Academic educators should provide students, through their online courses, ongoing opportunities to engage with a variety of digital tools and platforms, creating an environment of continuous learning and adaptation, allowing students to develop their digital skills and become more digitally savvy. HEIs should also ensure that students receive adequate training and support to develop these competencies. This includes providing orientation sessions, technical support, and ongoing resources to help students navigate the digital learning environment.

5.3.2. Student Efficacy and Agency

Successful virtual teaching and online learning environments rely heavily on students' competencies in digital literacy, digital skills, and digital fluency. However, equally critical are students' self-efficacy and agency, which significantly impact their ability to navigate and succeed in virtual teaching and online learning environments (Bandura, 2006; Bandura, 1977). For students to be successful in online learning, they must have confidence and believe in their ability to effectively use digital tools and platforms (Bandura, 2006; Bandura, 1977; Pham, 2021). This confidence can be developed through initial training offered by HEIs at an institutional level and continuous support from academic educators at a course level. Students

with self-efficacy take control of their learning and are more likely to take initiative, seek out resources, and persist in the face of challenges (Pham, 2021). They are confident in their ability to influence their learning outcomes, which is crucial in a less structured, self-directed learning environment (Pham, 2021). The use of asynchronous activities can help in promoting independent study, reflection, and resource exploration (Amiti, 2020).

Student agency allows students to have a voice and choice in their learning process, which increases student engagement and motivation (Marín et al., 2024). When students can choose topics of interest or decide how to approach an assignment, they are more likely to invest effort and take ownership of their learning (Sze-Yeng & Hussain, 2010). Therefore, academic educators should encourage students to initiate their own learning activities, as it promotes deeper understanding and retention of knowledge. This might involve academic educators facilitating opportunities for students to conduct independent research, selecting projects that align with personal interests, or engaging in activities that have real-world relevance. This approach not only enhances comprehension but also promotes critical thinking and problem-solving skills in students. No matter the extent of the provision of resources, support mechanisms and institutional policies designed to address socio-economic imbalances, the ultimate success of online learning hinges on student agency (Marín et al., 2024; Moore, 1972). This intrinsic motivation and drive play an important role in overcoming external barriers and achieving academic goals. In other words, while institutional support and resources are essential, there needs to be a balance and student agency ensures that students can capitalise on these support structures. Students who are proactive and self-motivated can better navigate and leverage available resources to their advantage.

Self-directed learning is an integral aspect of student agency (Sadhukhan, 2023), emphasising the importance of self-discipline and the ability to take charge of one's educational journey. In an online learning environment, where traditional classroom structures are absent, students need to be self-disciplined to manage their time effectively, stay on task, and meet deadlines (Sze-Yeng & Hussain, 2010). Maintaining motivation in an online learning setting can be challenging for students; however, there is a need for them to persevere and cultivate intrinsic motivation to keep themselves engaged and committed to their studies and completion of their courses.

5.3.3. Academic Educator Competencies

Academic educators play a crucial role in virtual teaching and online learning ecosystems. Their competencies span across knowledge of educational theories, technological adeptness, innovative teaching methods, and continuous self-improvement.

Academic educators must possess deep subject content knowledge to effectively think through and apply various pedagogical methods (Koehler & Mishra, 2009; Mishra & Koehler, 2006). This foundational knowledge enables academic educators to adapt their teaching strategies to suit the digital environment, ensuring that their instruction is both relevant and impactful. Pedagogical knowledge is also deemed crucial as academic educators need to understand various teaching methods and how to implement them effectively in a virtual setting (Koehler & Mishra, 2009; Mishra & Koehler, 2006). This includes the ability to design and develop online courses and to create engaging teaching materials. Resource development and the ability to find applicable and appropriate resources is another significant competency necessary for academic educators to have to develop and curate resources that enhance the learning experience. Technological knowledge is similarly critical. Digital literacy and technology aptitude form the bedrock of further competency development. Academic educators need to understand and use digital tools to their full potential, which involves continuous adaptation and experimentation. Proficiency in the use of digital tools enables academic educators to integrate technology effectively into their teaching practices, enhancing student engagement and learning outcomes (Moorhouse et al., 2023).

Academic educators need to possess a deep understanding of both educational learning theories and educational technology theories. This knowledge is essential for designing courses that leverage digital technologies and platforms to support effective learning, as these theories provide a foundation for creating impactful virtual teaching and online learning environments. Academic educators understanding of learning theories such as behaviourism (Skinner, 1954), constructivism (Vygotsky, 1978), cognitivism (Bruner, 1960; Piaget, 1952; Neisser, 1967), and connectivism (Siemens, 2005) offers valuable insights into how students learn, which in turn can shape the design of online courses. For example, behaviourist principles can be applied to reinforce learning through feedback and assessments, while constructivist approaches can inform the creation of interactive and collaborative activities that engage students in deeper learning. Similarly, cognitivism emphasises the structuring of information to support memory and understanding, which is essential in digital environments where content must be presented in a clear and accessible manner. Connectivism, with its focus on the role of networks and

technology in learning, is particularly relevant in online settings, guiding the use of digital tools to facilitate knowledge sharing and connection. While an online course might predominantly align with one theoretical approach, the most effective digital learning experiences often leverage concepts from multiple theories. For instance, an online course could use behaviourist techniques to motivate students with rewards, employ constructivist strategies to encourage exploration and interaction, integrate cognitive principles to enhance knowledge retention, and apply connectivism ideas to develop an online networked community. Academic educators can design and develop online courses that cater to diverse learning needs and preferences by leveraging multiple learning theories.

Educational technology theories such as Technological Pedagogical Content Knowledge (TPACK) (Mishra & Koehler, 2006) and the Substitution, Augmentation, Modification and Redefinition (SAMR) (Puentedura, 2006, 2013) model help academic educators integrate digital technologies seamlessly into their pedagogical approaches. Academic educators must be proficient in using technology as an effective tool for knowledge integration. Fundamental digital skills, including computer literacy and familiarity with standard software are essential (Johnson et al., 2019). Advanced skills in creating and managing digital content and designing interactive online lessons are also critical. Academic educators should be competent in using LMSs like Moodle, Blackboard and Canvas and video conferencing tools like MS Teams, Google Meet, and Zoom, to facilitate online teaching. Thus, academic educators need to have competency in digital pedagogies and innovative teaching methods to develop effective learning experiences (Singh et al., 2023). They can implement innovative approaches like flipped classrooms, make use of gamification and other contemporary teaching strategies. They should also possess competency in multimodal strategies so that they can design, develop and deliver teaching across various virtual platforms. Designing online courses requires adapting traditional pedagogical methods to the online environment, ensuring coherence and connection. Academic educators need to have the ability to structure and organise online courses effectively, facilitating a clear and logical progression of content, creating learning pathways. They should also be able to create active engagement by designing activities that facilitate active student participation and engagement, which are crucial for maintaining student interest and promoting deep learning (Garrison et al, 2000).

Academic educators need to have a level of proficiency in designing assessments and providing constructive feedback, which is critical for evaluating student learning and supporting their academic development (Ally, 2019). Additionally, academic educators should have a level of

soft skills which extend beyond subject matter expertise and are essential for engaging students and creating dynamic learning experiences. They should provide clear and effective communication, which is vital for conveying information and expectations to students (Ally, 2019; Raja & Nagasubramani, 2018). Furthermore, through a teaching presence, academic educators should also have emotional and social skills to build relationships in a virtual environment, as it requires emotional intelligence and the ability to create a supportive learning community (Garrison et al., 2000). This is especially important as it was found that students feel isolated in online learning environments.

Academia and teaching involve continuous self-reflection and learning. So, academics have a dual role as educators and students. Self-reflective and introspective practices are crucial for academic educators to adapt to the rapid changes in technology and the demands of virtual teaching (Benade, 2016). Lifelong learning and continuous professional development are necessary for academic educators to stay current with emerging technologies and integrate innovative and inclusive pedagogical practices to address the unique needs of emerging economies (Dlamini, 2023a). Regular reflective practice involves critically assessing teaching methods and outcomes to identify areas for improvement (Benade, 2016). Academic educators must drive their self-development, moving beyond institutional professional development to take personal initiatives for skill enhancement.

5.3.4. Digital Technologies

Digital technologies are an important element of an effective virtual teaching and online learning ecosystem. The effective use of digital technologies is crucial in virtual teaching and online learning environments. This encompasses not only the use of digital tools and platforms but also understanding their functionalities and ensuring they enhance the quality of education.

The study highlights the critical and central role of a stable and user-friendly LMS as foundational to facilitating online learning. A well-chosen LMS enables academic educators to design, develop and deliver course materials effectively (Simelane-Mnisi, 2023), including, but not limited to, online lessons, multimedia, teaching videos and assessments, and teaching videos. HEIs need to select an LMS that ensures ease of use for both academic educators and students. An intuitive user interface reduces the learning strain and helps both parties focus more on the educational content rather than technical difficulties. The LMS should also provide functionalities that support the design, development and delivery of relevant online teaching content, like uploading assignments, providing feedback, tracking student progress etc.

The use of a variety of digital technologies, tools, and digital platforms is recommended to create a dynamic and interactive learning environment (Nanjundaswamy et al., 2021). Academic educators need to be aware of the affordances and limitations of the digital platforms and tools they use. Understanding these aspects ensures that technology is used effectively and purposefully. The selection of digital tools should be fit for purpose and guided by their suitability for specific instructional objectives and delivery. It's important to ensure that the chosen technologies enhance, rather than compromise, the quality of education in terms of delivery and comprehension (Mishra & Koehler, 2006). Certain digital tools can be selected based on academic educators' comfort and proficiency with these tools, as it can impact the effectiveness of their use in teaching. Many academic educators are familiar with and rely on tools like MS PowerPoint. This comfort level can lead to effective presentations when used well, allowing academic educators to focus on content delivery rather than grappling with new technologies. On this note, academic educators must keep up to date with changing technologies and consider students' digital literacy levels to ensure the technology used remains engaging and relevant.

The integration of various digital tools can significantly enhance the learning experience and support specific modes of instructional delivery. Tools with interactive features like note annotation, interactive whiteboards, and chatbots can make learning more interactive and engaging. These features support active learning and can be integrated into the LMS to provide a seamless educational experience. Other third-party applications can be assisted in the learning process too (Simelane-Mnisi, 2023). Knowledge of third-party applications that can be integrated into the LMS platform is essential as these applications can offer additional functionalities, such as virtual labs (Raman et al., 2022), simulations, and collaborative tools, that enrich the online learning environment. While academic educators leverage the affordances of digital technologies, it's important to ensure they do not compromise the quality of education. Academic educators must stress the importance of ensuring that digital technology is fit for purpose. The selection and use of technologies should align with educational goals and enhance learning outcomes. In other words, the technology rationality and selection are important. The selected technologies should be meaningful and used to keep students engaged and motivated, promoting learning. Interactive and multimedia elements can help maintain student interest and facilitate deeper understanding of the content (Careaga-Butter et al., 2020).

5.4. Meso Level (Transactional Environment) – Optimising Virtual Teaching and Online Learning Environments Through Pedagogical and Student-Centred Design

5.4.1. Innovative Digital Pedagogies and Learning Theories

To create effective virtual teaching and online learning environments, academic educators must harness the affordances of learning theories and digital pedagogies to design engaging, culturally sensitive, and technologically integrated learning experiences.

Learning theories provide a foundational framework for understanding how students acquire, process, and retain information (Harasim, 2012). They offer valuable insights into the complexities of human cognition and behaviour, informing the design and implementation of effective teaching and learning experiences. In the context of virtual and online learning, the significance of these theories is amplified. By grounding instructional strategies in sound learning theories, academic educators can create more engaging, effective, and student-centred online environments. These learning theories help understand how students interact with digital content, build knowledge, and develop problem-solving skills in virtual settings. For instance, constructivist theory emphasises the importance of student autonomy and collaboration, guiding the design of online discussion forums and group projects. Similarly, cognitive theories inform the development of interactive multimedia materials that facilitate information processing and knowledge acquisition. Ultimately, the application of learning theories in virtual teaching and online learning leads to improved student outcomes.

Digital pedagogies involve more than just uploading materials to an LMS or taking traditional materials and replicating them online or using technologies for teaching. It requires designing learning experiences that fully leverage the potential of digital tools and environments underlined by correctly selecting and applying the appropriate learning theory and pedagogical innovation (Bucăţa & Tileagă, 2024; Nanjundaswamy et al., 2021; Rapanta et al., 2021). Academic educators should not merely transfer traditional content online but should create interactive and engaging learning experiences (Nanjundaswamy et al., 2021). This could include the use of multimedia presentations, interactive simulations, and virtual labs (Heradio et al., 2016). Incorporating digital pedagogies that engage students through various formats like videos, discussion forums, peer reviews and other digital pedagogies helps maintain students' interest and promotes active participation (Aloni & Harrington, 2018; Jones-Roberts, 2018; Simelane-Mnisi, 2023).

It is essential for academic educators to adapt their pedagogical strategies to fit the online learning environment rather than force traditional approaches into digital spaces. Academic educators need to regularly evaluate and adapt the pedagogy of courses to ensure they are suitable for online delivery (Garrison et al., 2000). Additionally, they should develop and implement pedagogical strategies specifically designed for the online learning environment, considering the unique dynamics and interactions it involves. Developing culturally sensitive pedagogies that incorporate students' diverse backgrounds and experiences is imperative, especially in the context of South Africa, a rainbow nation. Academic educators need to ensure course materials and activities reflect the diversity of the student body with inclusive content (Carrim & Bekker, 2022). They should also be aware of and sensitive to cultural differences and incorporate this understanding into teaching methods and content delivery.

The use of video conferencing tools to bring in experts from various fields, providing students with unique insights and perspectives (Haleem et al., 2022). Incorporating a variety of online activities can make virtual learning more engaging and effective. The inclusion of asynchronous debates, discussion forums, blogs, and peer reviews allow students to engage with the material and each other at their own pace (Aloni & Harrington, 2018; Simelane-Mnisi, 2023). Academic educators can also provide students with collaborative projects, thus encouraging students to collaboratively create wikis or OERs or other shared resources, developing an environment of teamwork and collective knowledge-building, resulting in a sense of community among students (Gilpin et al., 2023).

It is also important for academic educators to consider accessible and inclusive pedagogical teaching, which involves using digital tools effectively to cater to diverse students. Academic educators require strong pedagogical, technological, and content knowledge (TPACK) to create inclusive learning environments. While technology offers opportunities for personalised and engaging learning, it's essential to move beyond simply replacing traditional methods with digital ones. Academic educators should embrace innovative teaching methods and pedagogies (Chigbu et al., 2023). To truly promote inclusion, academic educators must adopt a transformative approach that reimagines teaching and learning, focusing on student-centred and interactive experiences (Annansingh, 2019). A predominant teaching model that was highlighted was the use of the flipped classroom. This was also found in Careaga-Butter et al. (2020). Flores-Alarcia et al., (2022) also advocate for the flipped classroom method as the authors found it to assist with the transition between traditional teaching methods to virtual modes of instructional delivery. The flipped classroom approach involves students accessing

lecture materials beforehand and using class time for interactive discussions and activities. This model encourages active learning and better use of synchronous class time (Liang et al., 2020).

5.4.2. Course Structure and Design

There has been a significant shift from traditional educator-centred approaches to student-centred learning. This paradigm shift emphasises active learning, where students engage with content interactively and collaboratively. Digital tools facilitate this shift by offering various modalities of learning, such as videos, simulations, and interactive activities (Jones-Roberts 2018; Raynault et al., 2022). The student-centric approach is advocated among participants as this approach shifts the focus from academic educators to students, encouraging student autonomy and self-directedness, empowering students to take control of their educational journey (Annansingh, 2019). Through a student-centric approach, academic educators can nurture student autonomy, critical thinking, and problem-solving skills, which are essential in the digital age (Nanjundaswamy et al., 2021). By designing and developing an environment where students are encouraged to take ownership of their learning, HEIs can produce graduates who are not only knowledgeable but also skilful and capable of navigating complex problems independently (Marín et al., 2024). Using student-centred approaches, incorporating digital technologies and digital pedagogies, and considering the number of student enrolments and their learning methods are important for creating engaging and student-centric online platforms. Designing virtual teaching and online learning environments around interaction with content provides opportunities for substantive engagement, meaningful participation, and interaction with others. This approach aligns with contemporary educational philosophies that prioritise lifelong learning and adaptability, skills that are increasingly vital in today's rapidly changing world (Dhurve et al., 2023).

It is important to align the design of courses with fundamental educational principles to enhance the learning experience. A multifaceted approach that prioritises student-centeredness, clarity of objectives, engagement, and accessibility is essential in creating effective online learning experiences. This alignment ensures that teaching methods, learning activities, and assessment strategies are customised to meet the needs of individual students, thereby promoting deeper engagement and understanding. Study materials, module learning outcomes, and assessment criteria should be clearly defined to provide a basis for academic educators (Kim et al., 2022). Clarity in learning outcomes enables the design of coherent, focused courses that are conducive to effective teaching and learning experiences (Kim et al., 2022). This ensures that both academic educators and students have a well-defined path to follow,

enhancing the overall learning experience. Aligning online learning activities with learning objectives is essential (Biggs, 1996). Effective teaching presence involves ensuring that instructional activities are purposeful and well-aligned with the intended learning outcomes (Garrison et al., 2000). Academic educators must design online learning experiences that meaningfully realise learning objectives, thereby enhancing the quality and relevance of the educational experience. Academic educators need to be equipped to navigate digital platforms and adopt pedagogies adapted to the online environment (Rapanta et al., 2021). Promoting equity in learning opportunities, aligning their teaching philosophy, and ensuring discipline and curriculum alignment with learning objectives are critical for creating effective online learning environments.

Additionally, effective and meaningful assessment requires thoughtful planning, aligning learning outcomes, teaching activities, and assessment tasks, known as constructive alignment (Biggs, 1996). This approach ensures that assessments are an integral part of the learning process, not just a separate activity. The design of online assessments is a crucial aspect of pedagogical course design (Ghouali et al., 2020). It is important to ensure that assessments align with learning objectives and provide effective communication and meaningful feedback to students (Huber et al., 2024; Mphahlele, 2024; SAQA, 2014). Academic educators should be knowledgeable in assessment design, aligning assessments with course content, and using various types of assessment tasks to facilitate learning and improvement. The integration of authentic assessment, which tests students' skills rather than just content knowledge, is crucial (Raynault et al., 2022; SAQA, 2014).

Digital education allows for dynamic and interactive assessments that are integral to the learning journey (Ortiz-Lopez et al., 2024). These assessments should be designed to ensure validity and reliability, accurately measuring student learning. Using a variety of assessment tasks, such as quizzes, case studies, essays, peer reviews, and e-portfolios, can enhance the learning experience (Perera-Diltz & Moe, 2014). Peer review promotes critical thinking, analytical skills, and communication skills (Ghouali et al., 2020; Raynault et al., 2022). The iterative process of peer review and resubmission encourages students to reflect on their work and understand the importance of feedback, promoting continuous improvement and lifelong learning. Peer-to-peer learning is a valuable component of collaborative activities in virtual teaching and online learning settings. Encouraging students to learn from their peers promotes a dynamic learning environment where knowledge sharing and collaboration thrive (Jeong &

Hmelo-Silver, 2016; Raynault et al., 2022). Interactive activities that align with course content and facilitate peer-to-peer learning can enhance comprehension and retention of concepts.

Effective course design also requires academic educators to have a deep understanding of the subject matter, ensuring that course materials are relevant, engaging, and aligned with learning objectives and the assessments (Biggs, 1996). This includes integrating learning theories and educational technology to create pedagogically sound and best-practice-aligned courses. The course content should balance theoretical and practical components to facilitate deep learning, providing a comprehensive understanding of the subject matter (Annansingh, 2019). The integration of technology in course design is another significant finding. The use of virtual reality (VR), augmented reality (AR), and mixed reality (MR) can provide practical components in online learning, offering immersive experiences that facilitate deep learning (Kumbo et al., 2023). These technologies enable the practical application of theoretical knowledge, making learning more engaging and effective. Incorporating culturally relevant and inclusive content is critical in reflecting the diversity of the student population (Carrim & Bekker, 2022). Recognising the diverse requirements of students and designing online instruction to accommodate individual abilities and preferences is essential for promoting engagement and understanding. This involves making courses interactive and engaging to promote active learning and facilitate a deeper understanding of the material. The principles of Universal Design for Learning (UDL) play an important role in this process, ensuring inclusivity and accessibility through flexible and adaptable course design (Basham et al., 2020; Espada-Chavarria et al., 2023). The pandemic accelerated the adoption of online learning, highlighting the importance of UDL in designing inclusive virtual learning environments (Basham et al., 2020). Digital tools offer numerous opportunities to implement UDL principles, but their effectiveness relies on intentional design. It is imperative for academic educators to proactively integrate UDL into course design and development so that academic educators create learning environments that support all students, including those with disabilities, other first language speakers and other students who may face challenges (Rao, 2021).

Accessibility goes beyond having access to technology, it also encompasses knowledge of how to use digital platforms and the usability of tools (Dlamini & Nkambule, 2020). It is important to balance course material for students using mobile devices, ensuring content is accessible without overwhelming them. Additionally, sources should be designed to accommodate students with special needs and disabilities, providing features such as screen readers, captions, and adaptable interfaces. UDL principles should be incorporated to enhance inclusivity. This

includes providing accommodations such as captions for students who are hard of hearing and ensuring accessible formats for visually impaired students. Ensuring all digital resources are accessible to students with disabilities and providing features like transcripts and alternative text can enhance inclusivity (Capp, 2017). Video content should be accompanied by transcripts, and learning platforms should be designed with accessibility features to support diverse learning needs.

Flexibility and adaptability emerged as key principles in course design, accommodating the diverse needs and preferences of students across different disciplines. Providing flexible assessment deadlines and extensions for assignments allows students to manage their workload effectively in challenging environments. However, this should be managed well. Moreover, the structure of the course itself is crucial in supporting students to navigate tasks and content effectively. Innovation and creativity in course design can enhance student participation, engagement, and effectiveness in online learning environments. Academic educators must be provided with adequate time and support to fully engage in the (re)design of courses. This support from HEIs is essential for developing innovative strategies that address the unique challenges of online education.

Exclusive reliance on either asynchronous or synchronous learning methods proves insufficient for optimal teaching and assessment in education. A blended learning approach, combining a balance of both modalities, is more likely to equip academic educators with the necessary tools for effective instruction (Moorhouse & Wong, 2022). The balance between synchronous and asynchronous teaching and learning is critical in the context of online education (Moorhouse & Wong, 2022). Course materials should be accessible asynchronously, particularly in areas with unstable internet connections or frequent power outages due to loadshedding. Designing courses for students in rural areas with limited internet connectivity involves providing offline resources and flexibility in course delivery. This ensures that all students, regardless of their location or connectivity issues, have equitable access to education. Providing access to lessons post-learning, along with all related materials and resources, ensures that students can review content at their own pace and mitigate the impact of connectivity issues. Most students prefer pre-recorded lectures (Chung et al., 2020). Academic educators can also record lectures, allowing students to re-engage with course lectures and materials (Liang et al., 2020). To maintain engagement, it is essential to alternate between recorded lecture videos and live lectures, accommodating different learning preferences. This approach allows students to engage with course material in a way that suits their individual learning styles, whether they

prefer interactive live sessions or self-paced video content (Moorhouse & Wong, 2022). However, this approach requires careful consideration of teaching strategies and techniques to maintain student engagement throughout the course. In the context of South Africa and loadshedding schedules, recorded lectures offer accessible and equitable education, ensuring all students can participate fully (Makumbe, 2020). Therefore, acknowledging extrinsic factors such as load-shedding and power outages and offering flexibility in course deadlines enables students to manage their learning effectively amidst unforeseen circumstances, enhancing accessibility and reducing stress.

Social presence is important in an online environment because it makes students feel connected to both their peers and instructors (Garrison et al., 2000). This connection is essential for students' participation, sharing ideas, engaging in discussions, and facilitating meaningful interactions with peers. Developing a sense of community and belonging is crucial for reducing student isolation and promoting student well-being (Epp et al., 2017). It's important to acknowledge the inadequacies of the virtual classroom, such as the inability to fully capture class reactions, facial expressions, and body language, as well as challenges in assessing student participation and concentration. This makes it imperative to develop strategies that combat these limitations using digital technologies and digital pedagogies, such as discussion forums or break rooms for collaborative activities. The way content is presented in an online setting needs to be engaging and interactive. Incorporating visual elements and interactive tools into presentations can significantly enhance student engagement. Tools like Slido, Mentimeter, and Padlet can be used to engage students and keep them active during synchronous sessions. These tools support various types of interactive content, such as live polls, quizzes, and Q&A sessions, making the learning experience more dynamic and participatory (Haleem et al., 2022). Facilitating interactive and engaging lessons, creating a supportive learning community, and providing clear guidance, structure, and feedback are crucial to supporting students' cognitive and social processes (Annansingh, 2019). Academic educators should actively participate in discussions to guide, challenge, and support students, providing regular and constructive feedback on assignments and activities to keep students on track (Mandernach, 2018).

Effective communication and interaction with students are essential components of successful teaching and learning experiences in the virtual space (Garrison et al., 2000). Academic educators need to establish clear channels of communication to engage with students, provide support, and facilitate learning activities. Participants emphasised the importance of ensuring

clear and constant communication throughout the learning process. A structured approach to teaching is important for ensuring that students understand course expectations and have clear guidance on accessing course materials and participating in online activities (Biggs, 1996). Regular communication helps keep students informed about course expectations, assignments, and deadlines, while also providing guidance and support as needed (Garrison et al., 2000). Continuous communication and guided practice are key aspects of effective teaching and learning. Regular communication helps to keep students engaged and motivated, while guided practice provides opportunities for students to apply their learning and receive feedback from academic educators (Huber et al., 2024). Feedback can even be provided in audio format rather than the traditional text based. This increases the social presence of an online course (Jones-Roberts, 2018). Additionally, flexibility in synchronous and asynchronous learning approaches is crucial for accommodating students' needs and ensuring continuous learning despite external challenges. A variety of activity types, such as synchronous flipped classrooms, asynchronous debates, discussion forums, blogs, and peer reviews, must be incorporated as they can enhance the online learning experience. These varied approaches engage students effectively and cater to diverse learning preferences.

Collaborative activities in the online environment should extend beyond the confines of the traditional classroom, providing opportunities for effective learning and collaboration in both individual and group settings (Jeong & Hmelo-Silver, 2016). Collaborative activities serve as catalysts for meaningful exchanges of ideas, experiences, and perspectives, nurturing deeper understanding and engagement with course material. Academic educators can leverage digital tools and platforms to create flexible learning environments that accommodate various learning preferences. Whether students are working independently or together, the goal is to create a collaborative-cognitive learning environment that promotes dialogue, social presence, cognitive presence, and effective learning outcomes. Stimulating discussions and creating opportunities for dialogue among students are essential. Through sharing experiences and engaging in trial and error, students can learn from each other and actively participate in the learning process (Jeong & Hmelo-Silver, 2016). Academic educators should implement strategies that encourage active engagement and participation to ensure that students effectively interact with and comprehend the course material. They should also promote deep learning through reflection, discussion, and application of new knowledge is crucial. Presenting real-world problems for students to solve stimulates critical thinking and exploration. Using open-ended questions can provoke thought and deeper understanding. Courses and e-assessments

should be designed to promote critical thinking and student engagement, aligning with the need for interactive and thought-provoking activities. Incorporating formative assessments and authentic evaluations contributes to cognitive presence (Hussin et al., 2019).

Effective course design requires a systematic approach to ensure optimal learning outcomes. The process begins with clearly defining the course's focus and selecting essential topics. By examining current textbooks and research, academic educators can identify a consensus on core content areas. Structuring these topics logically forms the course's structure. Developing engaging teaching methods and tools is crucial for effective delivery. Sequencing learning experiences to build upon prior knowledge is essential. Assignments and teaching strategies should align with course objectives. A well-designed course outline provides a roadmap for both students and academic educators. Comprehensive assessment strategies, including assignments and exams, are vital for measuring student learning. Establishing clear course policies, incorporating best practices, and leveraging technology enhances the overall learning experience. Ensuring accessibility for all students is paramount in inclusive course design.

5.4.3. Conducive Learning Environment and Workspace

A conducive learning environment and workspace are another critical success factor of virtual teaching and online learning. Students and academic educators need to set up an environment with minimal distractions so that they can enhance productivity, focus, and engagement (Sim et al., 2023). The interactions between students and academic educators directly impact students' learning outcomes (Garrison et al., 2000; Moore, 1997). Transactional Distance Theory (TDT) highlights the psychological and communication space between students and academic educators. Reducing the transactional distance is essential for effective online education (Moore, 1997). Distractions can significantly impede the learning process (Ocloo et al., 2023). Common distractions include noise, interruptions from family members and non-educational digital activities (Lao et al., 2021). To mitigate these distractions, students and academic educators can implement strategies like a designated area, noise-cancelling headphones, and clear boundaries with the people around them can help minimise these distractions. Academic educators can also provide guidelines on creating a distraction-free environment for their students. Once students and academic educators choose a workspace environment, a well-equipped and supportive workspace is also essential for maintaining focus and productivity. They need to ensure that the workspace is comfortable so that they can reduce physical strain and improve concentration (Fathy et al., 2020). Access to necessary technological tools, such as reliable internet connections, up-to-date computers or laptops, and

relevant software, is crucial for both teaching and learning. HEIs should provide support to ensure that all participants have access to these essential resources.

HEIs play a significant role in facilitating and equipping conducive learning environments. They should provide resources and support for creating effective learning environments so that students and academic educators can access the virtual teaching and online learning space. This can include providing students with a necessary device, data and internet connection to address structural factors and systemic barriers and bridge the gap of inequalities. Ensuring equitable access to technology and providing support for navigating digital platforms can help reduce transactional distance and enhance student autonomy and knowledge acquisition. In addition to providing access to devices, HEIs should also provide technical assistance, offer training and guidance on how to set up effective workspaces.

5.5. Exo Level (Institutional Environment) – Higher Education Institutions Facilitating Support for Virtual Teaching and Online Learning

5.5.1. Infrastructure and Resources

The increasing push towards virtual teaching and online learning, while driven by the imperative to enhance accessibility and flexibility in education, is fraught with challenges that necessitate careful examination. The digital divide persists as a formidable issue, with disparities in technology access hindering the equitable participation of students from diverse socio-economic backgrounds (Alenezi et al., 2023). Addressing these complexities is essential to ensure that the integration of virtual teaching and online learning aligns with the principles of equality, equity and quality education. While equality strives to treat everyone the same, equity ensures that everyone has the resources and opportunities they need to succeed. This means that addressing individual students' differences and providing support to ensure that all students have a fair chance to learn.

South Africa's pronounced economic and social inequality is compounded by disparities in digital access and skills. The Covid-19 crisis accentuated these challenges, demonstrating that technology ownership is essential for effective education. The transition to online learning in HEIs has exacerbated inequalities, as access to online programmes is primarily determined by socio-economic factors (Makumbe, 2020). Central to digital transformation is the provision of adequate internet connectivity, hardware, and software to both academic educators and

students. Access to internet, hardware, and software is not evenly distributed as the digital divide brings the disparities between different socio-economic groups, with marginalised communities often facing significant barriers to accessing these resources. This inequity has exacerbated educational inequalities, emphasising the need for targeted interventions to bridge the digital gap (Makumbe, 2020; Woldegiorgis, 2022).

The foundation of effective and equitable virtual teaching and online learning lies in strong infrastructure and equitable access to digital resources (Makumbe, 2020). In South Africa, addressing infrastructural challenges, digital divides, and economic disparities is crucial in designing and developing an inclusive educational environment. HEIs play a crucial role in ensuring that both students and academic educators have the necessary tools and support to succeed in a digital learning environment. Strong institutional ICT support is essential for maintaining a sustainable online learning ecosystem. This includes ensuring that students and academic educators have access to necessary devices and internet connectivity (Makumbe, 2020).

HEIs need to prioritise providing these resources to students and academic educators alike. For academic educators, this includes ensuring access to a laptop, data and alternate reliable power supplies, such as on-campus generators and UPS systems, to mitigate disruptions caused by power outages. To provide equitable access for students, access to devices such as laptops, tablets, and reliable internet connectivity is fundamental for effective participation in online education (Woldegiorgis, 2022). Offering subsidised or low-cost internet plans can significantly enhance students' ability to access online educational resources. Collaborative efforts with network service providers, such as Vodacom, MTN, Cell C and Telkom, can improve connectivity and provide tailored solutions to overcome data accessibility barriers and ensure uninterrupted learning experiences. There needs to be institutional support provided to students, especially for marginalised students, to ensure equitable access to education.

To achieve true educational equity, HEIs must differentiate between formal access (providing devices) and epistemological access (ensuring students can engage deeply with knowledge). While devices are essential, they are not sufficient as true educational equity involves not only providing access to devices but also nurturing students' ability to engage with educational content meaningfully (Bekker & Carrim, 2021).

Educational technology hubs, community learning centres, and regional online learning centres can play a crucial role in bridging the digital divide and enhancing access to education in South

Africa. These hubs and centres can provide essential infrastructure, resources, and support to underserved communities, including laptops, internet connectivity, and technical assistance (Netanda, 2020; Peters, 2023; Pretorius et al., 2021). By doing so, they can help students engage meaningfully with online courses and programmes (Netanda, 2020; Wright et al., 2024). However, the success of these initiatives depends on factors such as adequate funding, qualified staff, and strong partnerships (Netanda, 2020; Pretorius et al., 2021). The development and sustainability of educational technology hubs, community learning and regional centres in South Africa face numerous challenges, which include infrastructure limitations, limited access to electricity and internet connectivity, and a shortage of skilled personnel. Additionally, the digital divide and low levels of digital literacy among students and academic educators pose significant obstacles. Despite these challenges, there are opportunities for community learning, educational technology hubs and regional centres to make a substantial impact on education in South Africa. By leveraging partnerships between HEIs, government, non-profit organisations and the private sector to address these challenges and expand access to virtual teaching and online learning. Providing essential resources and support, educational technology hubs, community learning centres and regional online learning centres can play a vital role in bridging the digital divide and enhancing educational opportunities for underserved communities in South Africa.

5.5.2. Student Support

Transitioning from basic education to higher education presents significant challenges for many students, especially in the context of online learning environments. Computer exposure before entering university significantly influences technological competence among university students (Faloye & Faniran, 2023). The diverse educational backgrounds of students, with varying levels of digital literacy and access to technology, highlight the importance of early exposure to digital tools and online learning environments in primary and secondary education (Floris et al., 2021). This foundational preparation can help mitigate the digital divide and ensure students are better equipped to succeed in university-level digital learning environments.

Integrating digital education into the curriculum at all educational levels is important. This includes using digital tools for assignments, incorporating online collaborative projects, and familiarising students with virtual classrooms and LMSs. Academic educators must also be cognisant and accommodate the varying levels of digital literacy among students (Woldegiorgis, 2022). This awareness allows HEIs and academic educators to adjust their

support and instructional strategies, ensuring equitable access to educational resources and opportunities for all students. Effective online learning requires a structured approach that aligns with the mode of instructional delivery while considering the constraints and affordances of digital tools. HEIs must invest in comprehensive support systems to ensure students receive adequate and tailored support in online learning contexts (Paudel, 2021).

Providing training and orientation programmes for students on navigating virtual and online learning environments is essential, especially considering the different levels of digital capital that students enter higher education with (Ragnedda et al., 2020). This includes technological support and orientation programmes to equip students with the necessary skills and knowledge to effectively use online platforms. Additionally, the implementation of such as short learning programmes and induction sessions can enhance students' preparedness and confidence in engaging with digital learning environments (Paudel, 2021). These programmes play a crucial role in ensuring a smooth transition to virtual learning and proficiency in using digital tools. This can be done at the beginning of the year or the beginning of the course through the educational technology hubs, community learning centres and regional online learning centres.

Continuous support is also necessary for online educational environments, especially for student well-being (Carambas & Espique, 2023; Moosa & Bekker, 2022). Humanising the student experience and online learning environment involves creating a supportive and empathetic atmosphere, providing comprehensive support services and peer connections. Academic educators should be accessible, approachable, and show genuine care for their students' well-being. Establishing a connection where students feel comfortable sharing personal issues is crucial for encouraging them to seek help when needed and creating a supportive learning environment. HEIs should ensure that students are aware of these available support programmes. Comprehensive support systems should address students' social and emotional needs, reducing stress and anxiety that can lead to higher dropout rates, especially among first-year students (Moosa & Bekker, 2022). Additionally, to combat isolation and promote a sense of community, academic educators must prioritise initiatives that promote a sense of community among students to support their social and emotional well-being (Epp et al., 2017; Moosa & Bekker, 2022). Online learning often leads to feelings of isolation and detachment due to the lack of in-person contact. Academic educators can implement interactive activities through high-impact practices, such as interactive online activities (e.g., blogs, debates, peer reviews), which can assist in alleviating feelings of loneliness and create a sense of belonging. Deliberate efforts to create opportunities for peer connections are crucial.

Strategies such as peer mentoring, buddy systems, and virtual spaces for informal interactions help students build relationships and support networks. These connections provide emotional support, collaborative learning opportunities, and create a sense of community (Palloff & Pratt, 2007). These proactive measures assist in addressing student well-being in virtual learning environments and allow academic educators to cultivate an inclusive and nurturing learning environment through interaction, collaboration, and support through virtual forums, group projects, peer support networks, and regular communication channels (Carrillo & Assuncao Flores, 2023).

Creating an environment where students feel connected and valued is essential for their overall well-being and success in online learning environments. Integrating activities that encourage regular interaction and social engagement, and emotional expression can contribute to students' overall well-being. Virtual meetups, online forums, and wellness workshops provide avenues for students to connect, share experiences, and seek support. Academic educators can create a sense of belonging and support mental health by prioritising these social and emotional support initiatives. This holistic approach to student well-being ensures that students feel connected and valued in the digital learning space.

5.5.3. Academic Educator Support

Professional development is essential for academic educators to create transformative online learning experiences. As digital education becomes increasingly prevalent, acquiring the necessary skills and competencies is crucial for optimising student outcomes (Johnson et al., 2019). Professional development equips academic educators with the digital skills needed for effective virtual teaching (Turnbull et al., 2021). These skills enable them to employ innovative teaching methods and leverage digital tools to enhance learning outcomes. Training should not only focus on technical aspects but also on incorporating digital tools' pedagogical affordances (Turnbull et al., 2021). Understanding the effective integration of digital technologies into teaching practices is vital for supporting and enhancing student learning while considering epistemological access. To prioritise epistemological access and maintain course quality in an increasingly digital higher education area, a fundamental shift in teaching practices is essential (Bekker & Carrim, 2021). Academic educators must incorporate digital pedagogies, which involve using digital tools and applying new teaching methods that leverage technology to enhance learning outcomes (Johnson et al., 2019). Therefore, HEIs should prioritise ongoing training initiatives that enhance digital literacy and pedagogical competencies (Woldegiorgis, 2022). Continuous professional development is crucial for staying abreast of these

advancements and integrating them effectively. Additionally, digital literacy has become an essential skill for both academic educators and students (Alenezi et al., 2023). Understanding how to navigate and use digital tools effectively is critical in the digital age. HEIs must prioritise training programmes that enhance digital literacy and provide ongoing support (Almada et al., 2014).

To support academic educators, comprehensive training programmes should be implemented by HEIs. These programmes should cover both digital skills and pedagogical approaches, ensuring academic educators are well-equipped to navigate online teaching and learning environments (Johnson et al., 2019). Training programmes should provide academic educators with the necessary skills to use digital interfaces and tools effectively, including understanding the pedagogical implications of digital tools and how they can be used to promote student engagement and learning. The training should be conducted by qualified pedagogues who can guide academic educators on maintaining assessment integrity and ensuring quality assurance in virtual learning environments (Pedro & Kumar, 2020). Bekker and Carrim (2021, p. 1) stated that "if one is to accept that the so-called new normal in education will largely be online, then the quality assurance of online teaching and learning will become unavoidable."

Continuous professional development (CPD) is essential for academic educators to remain current with developing educational trends and technological advancements. CPD ensures that academic educators can meet the changing needs of their students and adapt to new educational practices. Investing in the professional development of academic educators develops a culture of innovation, autonomy, and excellence in virtual teaching and online learning (Pham, 2021). These opportunities should focus on familiarising academic educators with the application of digital technologies and innovative teaching methods, as well as the benefits of successfully implementing these methods. As digital education becomes increasingly integral, training programmes should provide academic educators with foundational digital skills that enable them to adapt to evolving technologies and educational practices. Recognising the importance of digital literacy and providing continuous training initiatives is vital for enhancing academic educators' digital skills (Woldegiorgis, 2022). Training sessions should equip academic educators with the digital skills and knowledge needed to navigate the complexities of virtual teaching and online learning.

By investing in the professional development of academic educators, HEIs can ensure that virtual teaching and online learning environments are conducive to student engagement and

learning. Training and support should focus on strategic alignment of teaching methodologies with the mode of delivery, ensuring effective student support in online learning environments (Bucăţa & Tileagă, 2024). Institutions must invest in comprehensive support systems that prioritise the diverse needs of students, providing academic educators with the necessary skills and knowledge to create transformative educational experiences (Pedro & Kumar, 2020). This continuous learning process helps academic educators remain proficient in using digital tools and methodologies. At times, training for virtual teaching and online learning platforms should be mandatory rather than optional. This ensures that all academic educators possess the necessary skills and competencies to effectively utilise digital tools in their teaching practices.

5.5.4. Institutional Planning

Higher education institutions' strategic planning is crucial for the successful implementation of virtual teaching and online learning (Zhu & Liu, 2020). HEIs must focus on comprehensive planning to ensure that virtual education initiatives are effective and sustainable (Moore & Piety, 2022). Good planning involves assessing readiness, identifying necessary resources, and establishing clear objectives that align with institutional goals (Moore & Piety, 2022). Adequate planning ensures the availability of teaching aids, presentations, time management, devices, and data, which are essential for high-quality instructional delivery and student participation (Paudel, 2021). They should ensure access to necessary resources for students and academic educators, as this is vital for enhancing instructional quality and student engagement in virtual environments.

Budget constraints can pose significant challenges to acquiring essential digital tools and resources. Limited financial resources may hinder institutions' ability to invest in infrastructure upgrades, software licenses, or digital learning platforms, affecting the quality and accessibility of online education. Therefore, to address these budgetary constraints, strategic resource allocation and planning are necessary. Allocating funds for infrastructure upgrades and digital resource acquisition helps institutions meet the evolving needs of virtual teaching and online learning. Virtual teaching and online learning can attract a larger student audience, allowing HEIs to leverage economies of scale, potentially mitigating some financial constraints (Adeniyi et al., 2024).

Integrating digital learning into the curriculum from the onset establishes it as a standard expectation, guiding planning, resource allocation, and budgeting processes to align with digital learning requirements effectively. This proactive approach facilitates seamless

integration into teaching practices, ensuring that academic educators are adequately prepared to leverage digital tools and platforms. Also, establishing virtual teaching and online learning as a standard expectation across courses and programmes ensures that planning and resource allocation are aligned with digital learning needs. Moreover, socio-political challenges such as load-shedding and student protests can significantly disrupt educational activities, posing logistical and operational challenges (Khoza, 2024). These disruptions can impact the continuity and stability of virtual teaching and online learning environments. It is essential for institutions to adopt proactive measures and flexible strategies to mitigate these challenges (Dlamini, 2023a). This includes contingency planning, ensuring access to reliable infrastructure, and implementing flexible scheduling to maintain uninterrupted learning experiences.

It is important to involve academic educators in the planning process to ensure their input and buy-in, developing a sense of ownership and commitment to the initiative (Archambault et al., 2022). Cross and multi-layered strategic alignment through the integration of virtual teaching and online learning strategies into institutional plans promotes alignment with broader institutional objectives (Mhlanga, 2024). Embedding virtual teaching and online education initiatives within the institutional fabric ensures support at all levels and promotes sustainability. Ensuring that virtual education initiatives are aligned with broader institutional goals helps create a cohesive and supportive environment for digital learning. Providing training and support to academic educators in advance builds their capacity and confidence in adopting online teaching methods (Johnson et al., 2019). HEIs should provide technical support and conduct testing of online teaching programmes before implementation to address potential challenges and ensure a smooth transition to digital learning environments.

5.5.5. Institutional Policy, Procedure and Practice

Implementing significant changes within an HEI necessitates a good change management strategy (Bartusevičienė et al., 2021; Kirkpatrick, 2009). This strategy is essential for ensuring that transitions to virtual teaching and online learning are smooth and effective. Effective change management involves planning, communication, and support for all stakeholders, helping them adapt to new methods and technologies (Kirkpatrick, 2009).

A comprehensive policy framework should address various aspects of institutional operations, including teaching, learning, research, assessment, ethics, and community engagement. Effective policymaking should involve both top-down directives and bottom-up input from all

academic levels to ensure practicality and buy-in. A collective agreement between university management and academic educators is crucial for adopting new learning modalities. Without appropriate policy revisions and training, academic educators may resist management directives, especially if policies do not support or fail to address necessary training and resources (Bekker & Carrim, 2021). Clarity in institutional policies, particularly regarding virtual teaching and online learning, is essential for providing a framework to guide academic educators and students in navigating the digital learning environment (Makhaya & Ogange, 2019). Policies must guide the implementation of changes in teaching and learning environments, including the use of virtual teaching and online learning, AI tools, upgrading learning management systems and ensuring academic educators are adequately trained and supported. Policies should mandate the provision of necessary hardware, software, and internet access to both academic educators and students. Continuous professional development for academic educators is another critical aspect of institutional policies. By mandating training programmes, policies ensure that academic educators are well-prepared to integrate digital tools into their teaching practices effectively (Johnson et al., 2019). These programmes can cover a range of topics, from basic digital literacy to advanced instructional design for online learning.

Policies need to be clear at different institutional levels, providing a framework for implementation and helping mitigate uncertainties and ambiguities. Despite the presence of policies, challenges related to their implementation and enforcement may arise, leading to delays or inconsistencies in their application. Addressing these challenges is crucial for ensuring that implementation follows policy formulation. HEIs need to implement digital inclusion policies that prioritise digital equity and inclusion at all levels. The availability of necessary digital tools and resources, such as laptops and internet access, is crucial for both academic educators and students. Institutions should provide financial support for access to tools and resources to address disparities and ensure equitable access. Limited access to these resources can pose challenges, leading academic educators to spend from their own pockets to ensure learning is achievable for students (Oakes et al., 2018). Aligning institutional policies with virtual teaching practices can alleviate these disparities by compelling educational institutions to provide necessary support. Institutional policies must also address infrastructure limitations, especially for students from remote areas. While policies may promote the adoption of digital learning, they must also address the unique challenges faced by students from remote

areas (Mataka et al., 2020). Simply coercing adaptation without addressing infrastructure gaps may exacerbate inequalities in access to education.

Aligning institutional policies with virtual teaching practices is essential for ensuring clarity and consistency in expectations for both academic educators and students. Clear policy alignment can induce educational institutions to provide the necessary support and resources, preventing conflicts and facilitating a smoother transition to virtual teaching and online learning. It is important to recognise and mitigate the challenges related to policy implementation and enforcement, highlighting the need for proactive measures to bridge the gap between policy formulation and actual implementation (Dlamini, 2023a). Work towards institutional policies that support online learning, including faculty training, administrative support, and resource allocation. Policies should mandate continuous professional development and training for academic educators to enhance their digital skills and pedagogical approaches. Institutions must provide good administrative support to handle the technical and logistical aspects of virtual teaching (Maphalala & Adigun, 2021). Adequate resource allocation is necessary to ensure that both students and academic educators have access to the tools and resources required for effective online learning.

5.5.6. Equity and Equality

To ensure educational equity "we must also consider addressing the issue of digital equity which remains a complex, 'wicked' problem" (Willems, 2019, p. 152) in South Africa. The persistent digital inequities can exacerbate existing social and economic disparities, hindering educational opportunities, particularly for marginalised students.

Understanding the socio-economic and socio-cultural context of students is imperative, especially in a country like South Africa, where disparities in access and resources are significant. Recognising students' backgrounds, resources, and readiness to navigate online education challenges is crucial for designing equitable and inclusive learning experiences (Mhlanga, 2024). Factors such as socio-economic status and living space influence students' access to essential resources like electricity, Wi-Fi, and ICT devices. This understanding is essential for creating a supportive and fair learning environment.

To provide equitable access for students, it is imperative for HEIs to conduct a needs and risk analysis so they can 'Know Your Student' (KYS). This is in terms of access in digital literacies and access to devices. Understanding students' profiles and technology access levels, like students' access to devices, internet availability, and network stability, helps customise

instructional strategies and content delivery methods. Knowledge of students' locations and access to internet, Wi-Fi, and network stability is indicative of the level of accessibility to technology and internet connectivity, which varies among students (Alenezi et al., 2023). Ensuring equitable access to resources and support is essential for promoting student success. HEIs must strive to create a level playing field where students' social, cultural, or economic backgrounds do not determine their access to educational resources. Providing essential technologies and support to all students is crucial for achieving educational equity (Dlamini, 2022). Institutions should consider providing personal computers and internet access to students to ensure they have the necessary tools for online learning. Ensuring all students have access to necessary devices and internet connectivity helps bridge the digital divide and promotes inclusivity (Bekele, 2021).

The accessibility of technology, including online availability and speeds, is influenced by students' socio-economic backgrounds, geographical location, and other factors. Technological access is a fundamental prerequisite for effective online teaching (Izhar et al., 2022). Without reliable and equitable access to technology, academic educators and students are significantly hindered in their ability to fully participate in and benefit from online learning experiences. While factors such as pedagogical knowledge and resource availability are crucial, they are contingent upon the foundational element of technology access (Izhar et al., 2022).

Psychological readiness is crucial for student engagement and success in online learning (Moosa & Bekker, 2022). Understanding students' emotional and psychological needs can help address potential barriers and enhance their overall learning experience. Conducting a student needs analysis, including understanding their demographics, profiles, ages, learning styles, and geographical residence, provides valuable insights into their diverse backgrounds and learning preferences. Assessing students' readiness to use online learning platforms helps tailor support and training to meet their needs, promoting a more effective and engaging learning experience.

To promote equity, HEIs and academic educators should implement instructional strategies tailored to the diverse needs and backgrounds of their students. Developing customised learning experiences based on students' profiles and needs ensures that all students have an equal opportunity to succeed (Resta et al., 2018). Establishing support systems, including technical support, psychological counselling, and academic advising, helps address the diverse challenges faced by students in online learning environments.

Higher education institutions should develop policies and practices that prioritise digital equity, ensuring that all students have access to the resources and support they need to succeed. Policies should be developed with input from diverse stakeholders, including students, to ensure they address the unique challenges faced by different student groups (Paudel, 2021). Strategic allocation of resources to support students from disadvantaged backgrounds helps promote equity and reduce the digital divide.

5.6. Macro Level (Contextual Environment) – Addressing External Macro Factors to Enhance Virtual Teaching and Online Learning Environments

5.6.1. Socio-economic Context

South Africa's status as one of the most unequal countries in the world stresses the significant challenges within its education system, many of which are rooted in the legacy of apartheid (Letseka et al., 2018; McKeever, 2017). This socio-economic context is crucial for understanding the disparities in virtual teaching and online learning ecosystems. The remnants of apartheid have left a deeply unequal education system, further compounded by issues of poverty and unemployment (Letseka et al., 2018). As the demand for access to education and the need for digital literacy grow, there is an urgent need to provide access to education through virtual teaching and online learning, which can play a transformative role in equipping students with knowledge and contemporary skills.

The challenges faced by low-income students in accessing and succeeding in higher education in South Africa, despite government initiatives and policy efforts, significant disparities persist in participation rates. Virtual teaching and online learning emerge as a potential solution to overcome these barriers. While technology has advanced, enabling innovative delivery methods, the success of virtual education relies heavily on factors beyond technology, including student support, institutional commitment, and addressing the complex interplay of financial, personal, and academic challenges faced by students from low-income backgrounds (Elliott, 2010). Societal imbalances, educational affordability, and the diverse demographics of students are key factors that influence virtual learning environments (Van Dijk, 2017). Economic disparities significantly impact students' ability to access and benefit from these environments. Many disadvantaged students lack essential resources, such as devices and internet connectivity, which are crucial for participating in online education (Woldegiorgis, 2022). These disparities widen the educational gap between privileged and underprivileged

students, making it imperative to ensure equitable access to education, particularly in virtual settings. Addressing these imbalances requires a concerted effort from HEIs, supported by government policies. Prioritising the needs of marginalised students involves providing necessary resources and support to ensure equal and equitable learning opportunities for all (Willems, 2019). This includes ensuring that all students, regardless of their socio-economic status, have access to devices and reliable internet connectivity. Institutions must strategically allocate resources to bridge the digital divide and develop educational strategies that consider the socio-economic challenges faced by students, including financial constraints and living conditions (Alenezi et al., 2023).

Implementing policy and educational initiatives at a national level that consider these societal issues will contribute to a more equitable education system. This effort may require partnerships between the government, educational institutions, and private sector stakeholders to provide the necessary resources and support (Mhlanga, 2024). Such collaborations can help create a more inclusive and supportive environment for all students, ensuring that virtual education is accessible to everyone, regardless of their socio-economic background (Woldegiorgis, 2022).

5.6.2. Socio-cultural Context

While technology offers unprecedented opportunities to transform learning, education, and collaboration, it is essential to recognise that it is a tool, not a determinant of social change. Technology can facilitate new social practices and influence individual, group, and community behaviours, but it is human agency that ultimately drives meaningful transformation (Fischer et al., 2020). The socio-cultural context of South Africa significantly shapes the effectiveness of educational initiatives, particularly in virtual teaching and online learning environments. The diversity of cultural backgrounds among students, many of whom have limited access to ICTs, emphasises the need for inclusive and relevant teaching methods and resources (Carrim & Bekker, 2022). Embracing cultural diversity in educational strategies is also crucial for creating inclusive learning environments where all students feel represented and supported. Cultural capital and competence are crucial in this setting, as they ensure that education is accessible and resonant for all students, regardless of their backgrounds (Dlamini, 2022).

Navigating the university digital culture is critical for the successful implementation of digital learning initiatives (Ndibalema, 2022). This involves understanding the established norms and practices that influence educational activities. To accommodate the diverse learning styles and

preferences of students, multimodal approaches are particularly effective in the South African context (Dlamini, 2023b). Addressing cultural diversity in educational settings is not just about inclusive teaching methods; it also involves creating an environment that respects and incorporates the varied socio-economic and cultural backgrounds of students. This cultural competence is vital for academic educators, who must navigate and integrate these diverse perspectives into their teaching practices (Fischer et al., 2020). It includes understanding and respecting students' cultural beliefs and practices, which can significantly influence their attitudes toward education and technology.

Moreover, overcoming negative perceptions of online learning is crucial for both students and academic educators. Understanding these attitudes helps in designing effective training and support programmes, which are essential for creating a positive and engaging online learning environment (Bekker & Carrim, 2021). Academic educators must be equipped with the skills and cultural competence to effectively engage with a diverse student body, ensuring that all students feel valued and supported in their educational journey.

5.6.3. National Infrastructure

South Africa's status as one of the most unequal countries globally, due to historical and socio-economic factors, significantly impacts its educational space. The residue of apartheid has entrenched deep educational inequalities, exacerbated by poverty and unemployment (Letseka et al., 2018). Addressing these disparities is crucial for creating an inclusive online learning environment, as disadvantaged students often face significant barriers such as a lack of access to essential resources like devices and internet connectivity, which hamper their online learning experience (Van Staden & Naidoo, 2022). Economic disparities widen the gap in educational opportunities between privileged and disadvantaged students, making access and equity in education paramount, especially in the context of virtual teaching and online learning. Addressing infrastructural challenges, such as ensuring reliable internet and electricity, is vital for the success of virtual teaching and online learning initiatives (Woldegiorgis, 2022).

Higher education institutions, with government support at a national level, must prioritise the needs of marginalised students to ensure equal learning opportunities. This involves providing necessary technologies and support, considering socio-economic factors, cultural diversity, and infrastructural challenges to develop inclusive and sustainable educational strategies. Understanding the socio-economic context of students helps tailor support and resources to

their specific needs, ensuring all students have an equal opportunity to succeed in a digital learning environment (Mhlanga, 2024).

Infrastructure limitations, such as load-shedding and power instability, significantly impact students' ability to engage in online learning (Reddy Moonasamy & Naidoo, 2022). High data costs further exacerbate accessibility barriers, hindering students' ability to access online resources and participate in virtual learning environments (Woldegiorgis, 2022). Mitigating these costs or providing affordable alternatives is crucial for ensuring equitable access to educational opportunities. Students from rural areas face additional challenges related to technological access, making comprehensive supportive measures essential for promoting inclusivity in online education. This includes providing access to devices, data, and addressing connectivity issues due to geographical location (Woldegiorgis, 2022).

Collaboration between the national government, private telecommunications companies, and higher education institutions is essential to address the specific challenges faced by students (Chung et al., 2020). The development of national infrastructure will assist in addressing the unique challenges of students from remote areas, ensuring infrastructure gaps do not exacerbate educational inequalities (Woldegiorgis, 2022). Proactive measures and strategic planning are necessary to bridge the gap between policy formulation and actual implementation, ensuring all students have equitable access to education (Dlamini, 2023a).

5.6.4. National Education Policy

National policies play a critical role in shaping the cultural acceptance and integration of digital learning platforms within the educational sector. These policies provide a structured framework that normalises and standardises the use of digital tools in teaching and learning processes (Mays, 2022). By offering specific guidelines and resources, national policies are essential for the effective implementation of digital education. They ensure that educational institutions have the direction and support needed to incorporate technology into their curriculum and teaching methods. Effective educational practices require alignment with supportive policies and good infrastructure. National education policies should facilitate the adoption of digital learning, provide necessary resources, and address infrastructural challenges (Dlamini, 2022).

The South African government should develop comprehensive policies that address digital transformation and the socio-economic needs of the country, including investments in digital infrastructure and targeted support for disadvantaged students (Mhlanga, 2024). Furthermore, effective policy implementation is crucial for realising the potential benefits of these policies

(Chomunorwa et al., 2023). While there is often a wealth of well-intentioned policies in place, challenges arise in translating these into tangible actions. Therefore, collaborative efforts between the government and HEIs are essential to bridge this gap and ensure successful policy execution (Palvia et al., 2018).

Promoting the benefits of digital learning through national policies can influence its cultural acceptance, helping all stakeholders, including students, academic educators, and parents, understand the value of digital education. This cultural shift is necessary for the successful integration of technology in education. Additionally, these national policies can address infrastructural challenges by allocating resources for reliable internet connectivity, devices, and other technological tools (Bekele, 2021). Prioritising these aspects helps bridge the digital divide and promotes equitable access to education. National education policies should also consider the socio-economic context of students and aim to mitigate disparities that affect access to digital education. Providing financial support for students from disadvantaged backgrounds ensures they have the necessary tools and resources to participate in online learning.

Aligning virtual teaching and online learning initiatives at a higher institutional level with the broader educational goals, such as improving student outcomes, enhancing educational quality, and promoting lifelong learning, ensures that digital education contributes to achieving national educational objectives. Effective policymaking involves input from various stakeholders, including academic educators, students, parents, and industry experts. This collaborative approach ensures that policies are practical, address the real needs of the educational community, and have broad support, which is crucial for successful implementation.

5.7. Chrono Level (Change Environment) – Learning from the Past and Continuous Advancements to Build the Future of Virtual Teaching and Online Learning

The educational environment has undergone significant change due to technological advancements, historical events, and changes in educational practices. Understanding these shifts is crucial for shaping the future of virtual teaching and online learning, as technological advancements have transformed education by introducing a variety of digital tools and platforms (Makda, 2024). From basic email to sophisticated LMSs, interactive multimedia resources, discussion forums and AI-driven personalised learning, technology has greatly expanded the possibilities for virtual education. The proliferation of Information and

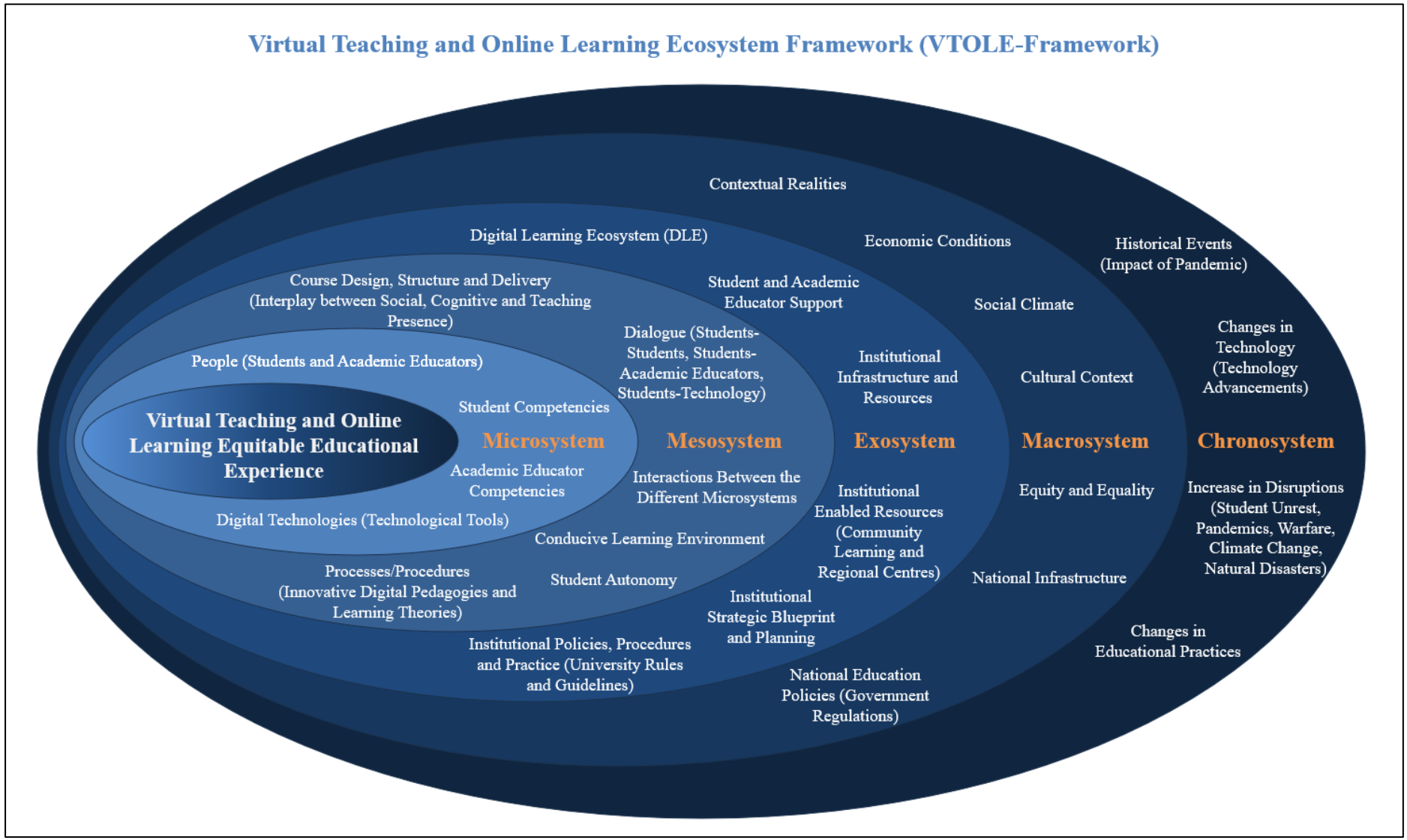
Communication Technology (ICT) has made education more accessible and inclusive. However, disparities in access to these technologies remain, particularly in countries like South Africa, where socio-economic conditions vary widely (Pather & Booi, 2020). Addressing these disparities by providing necessary devices and affordable internet access is essential for ensuring equitable educational opportunities. Stable and widespread internet connectivity is fundamental for the success of online learning (Aldhafeeri & Male, 2016; Bekele, 2021). While urban areas might have better access, rural areas often struggle with connectivity issues. Solutions such as government and private sector partnerships to improve infrastructure and alternative power sources to counteract load shedding are vital.

South Africa's education system still feels the legacy of apartheid, which created significant disparities in access to quality education (Letseka et al., 2018). These historical inequalities necessitate targeted efforts to create inclusive and equitable online learning environments for disadvantaged students. The global Covid-19 pandemic accelerated the adoption of virtual teaching and online learning, forcing educational institutions worldwide to transition to online platforms almost overnight. This shift highlighted both the potential and the challenges of digital education, stressing the need for strong infrastructure, effective online pedagogies, and comprehensive support systems for academic educators and students. Additionally, events such as student protests and socio-political unrest can disrupt educational activities. In South Africa, issues like load shedding and social unrest pose significant challenges to the continuity of virtual teaching. HEIs must develop flexible and resilient strategies to ensure uninterrupted learning (Bartusevičienė et al., 2021).

5.8. Virtual Teaching and Online Learning Ecosystem Framework (VTOLE-Framework)

Digital Learning Ecosystems (DLEs) and Virtual Learning Environments (VLEs) play an important role in facilitating effective virtual teaching and online learning. For these ecosystems to thrive, all elements must operate in harmony across all levels, ensuring that the needs of a diverse student body are met and that educational experiences are enriched. The write-up provided in the previous sections (5.2-5.7) explored the six core levels and areas essential to creating and sustaining a Virtual Teaching and Online Learning Ecosystem, culminating in a detailed Virtual Teaching and Online Learning Ecosystem Framework (VTOLE-Framework). The VTOLE-Framework is depicted in Figure 21.

Figure 21: Virtual Teaching and Online Learning Ecosystem Framework (VTOLE-Framework)



5.9. Chapter Summary

This chapter discusses the findings and insights drawn from a combination of the simple descriptive statistical analysis and thematic analysis of data collected through questionnaires and semi-structured interviews presented in chapter 4 in relation to the literature review and the developed theoretical framework presented in chapter 2. This was done while focusing on the complex interplay of various contextual, social, economic, technical, cultural, and institutional factors. The chapter systematically addressed six core areas. First, it explored how digital education could be effectively used to enhance virtual teaching and online learning for a diverse student body. Second, it examined the fundamental components that supported virtual education. Third, it focused on pedagogical and student-centred design principles that could improve virtual educational experiences. Fourth, it discussed the role of higher education institutions in providing necessary support for virtual education. Fifth, it looked at broader systemic and external factors that impacted the efficacy of virtual teaching and online learning. Lastly, it reflected on past experiences and continuous advancements to shape the future of virtual education. This was done in preparation for responding to the three research questions in Chapter 6. Finally, the chapter presented the overarching goal of the research: establishing an equitable and sustainable Virtual Teaching and Online Learning Ecosystem Framework (VTOLE-Framework) tailored to South Africa's unique needs and challenges.

6. Chapter 6: Conclusion, Implications and Recommendations

6.1. Chapter Overview

This chapter concludes the research study by providing an overview of the study, addressing the research questions, suggesting recommendations for the various stakeholders, discussing the contribution to research and practice, presenting the theoretical and practical implications and proposing areas for future research.

6.2. Overview of the Study

This research study aimed to explore how the power of digital education can be strategically harnessed to facilitate virtual teaching and online learning while considering structural factors, systemic barriers and the contextual realities in South African higher education. By considering and analysing the intricate interplay of contextual, social, economic, technical, cultural and institutional factors influencing virtual teaching and online learning at a microsystem, mesosystem, exosystem, macrosystem and chronosystem level. Leveraging from the theoretical framework described in Chapter 2 and the Literature Review, the research study shared insights gained through the analysis of data collected from the questionnaires (containing open-ended and close-ended questions) and semi-structured interviews. Using simple descriptive statistical analysis and thematic analysis, the following research objectives were addressed:

1. Describe the ways in which digital education can be harnessed to facilitate virtual teaching and online learning for diverse student populations,
2. Identify and analyse the critical factors influencing the design and development of effective virtual teaching and online learning environments across multiple ecological environments,
3. Determine the intrinsic factors that can provide and optimise educational experiences in virtual teaching and online learning ecosystems, and
4. Determine the extrinsic factors and explore the systemic barriers impeding digital inclusion and equitable access to virtual teaching and online learning ecosystems in higher education.

In addressing the research questions, this study reveals six crucial aspects for facilitating equitable educational experiences in virtual teaching and online learning environments (1) Harnessing the Power of Digital Education to Facilitate Virtual Teaching and Online Learning,

(2) Core Elements Facilitating Virtual Teaching and Online Learning, (3) Optimising Virtual Teaching and Online Learning Environments Through Pedagogical and Student-Centred Design, (4) Higher Education Institutions Facilitating Support for Virtual Teaching and Online Learning, (5) Addressing External Macro Factors to Enhance Virtual Teaching and Online Learning Environments, and (6) Learning from the Past and Continuous Advancements to Build the Future of Virtual Teaching and Online Learning.

Furthermore, presented in this chapter is the overarching goal of this research study, which was to establish a sustainable Virtual Teaching and Online Learning Ecosystem Framework (VTOLE-Framework) specifically tailored to South Africa's unique needs and challenges.

6.3. Overview of the Results

Virtual teaching and online learning is a key technology driving the global digital revolution, offering opportunities to overcome existing barriers to human development and social inclusion, and supporting the achievement of the Sustainable Development Goals (SDGs) 4 (quality education) and 10 (reduced inequalities).

To meet the objective of the research study, the following research questions were developed and addressed:

1. How can digital education be harnessed to enhance virtual teaching and online learning across diverse student populations?
2. What factors should be considered in the design and development of virtual teaching and online learning across multiple ecological environments?
    a. What intrinsic factors should be considered in designing and developing virtual teaching and online learning environments to optimise educational experiences?
    b. What extrinsic factors and systemic barriers must be addressed to implement effective and equitable virtual teaching and online learning?

6.3.1. Harnessing Digital Education for Virtual Teaching and Online Learning

How can digital education be harnessed to enhance virtual teaching and online learning across diverse student populations?

Digital education, encompassing the integration of digital technologies, digital pedagogies and educational practices, offers a transformative opportunity to enhance education across diverse student populations. Digital education is transforming the teaching and learning paradigm through its affordances of multimodal, accessible and inclusive student-centred learning. It can

bridge the rural-urban divide by providing accessible education for all students and equipping them with the 21st century skills needed to succeed in today's digital age through effectively leveraging the affordances of digital technologies and digital pedagogies for virtual teaching and online learning. Virtual teaching and online learning transcend geographical boundaries and provide accessible learning opportunities through leveraging the affordances of digital education to create more equitable, inclusive, adaptable, and sustainable educational environments. To fully harness the potential of digital education for virtual teaching and online learning, a comprehensive strategy is essential, one that addresses the intersection of social, technology and pedagogy with the application of inclusive instructional design, consideration of universal design of learning, institutional support for academic educator training and support, consideration of access and the equitable distribution of the necessary resources to students and academic educators.

The emergence of digital and online education has irrevocably transformed the mode of instructional delivery in higher education. The development of online learning has closely paralleled the evolution of the internet. Initially, online learning was characterised by static content (Web 1.0), like the early days of the internet. As the internet became more interactive (Web 2.0), online learning platforms began to incorporate features like forums, blogs, and wikis, encouraging collaboration and communication among students. With the development of the semantic web (Web 3.0), e-learning platforms became increasingly interconnected, leveraging technologies like blockchain and artificial intelligence to create more personalised and immersive learning experiences. The emergence of the symbiotic web (Web 4.0), characterised by direct human-machine interaction, is poised to further revolutionise online learning. These technological shifts have significantly impacted digitalisation in education. One of the most notable advancements in education has been the proliferation of LMS use. These platforms have evolved from simple course delivery tools to sophisticated teaching and learning environments that facilitate the delivery of course content, communication, interaction, engagement, collaboration, assessment and learning analytics.

Equitable access to technology and online education is a critical factor in ensuring that all students can benefit from access to an LMS and the use of digital education in virtual teaching and online learning environments. The digital divide, characterised by unequal access to digital devices, internet connectivity, and digital literacy skills, remains a significant barrier to digital and educational equity. To bridge this divide, HEIs must invest in providing students with the necessary resources, such as laptops, tablets, and reliable internet access, along with training

in digital literacy to equip students with the competencies needed to effectively navigate virtual teaching and online learning environments. To cultivate a culture of digital literacy and fluency among students, HEIs can offer comprehensive training programmes, technical support, and integrate digital skills development into curricula. These efforts in addressing the issue of the digital divide ensure that students from disadvantaged backgrounds and students with low digital capital are not left behind but can fully participate in online learning. For digital education to have a lasting impact, efforts must be scalable and sustainable, involving the development of cost-effective solutions, securing long-term funding, and creating policies that support the continued growth and accessibility of digital education. Partnerships between HEIs, different levels of government and the private sector (technology and telecommunication companies) can facilitate the distribution of resources and the necessary support needed for digital equity initiatives to expand virtual teaching and online learning to reach diverse student populations across multiple geographical locations. Support services and technological infrastructure are essential for expanding access to technology, internet infrastructure and affordable internet access to deliver high-quality online learning experiences, especially in underserved communities. These collaborations and partnerships are crucial for scaling virtual teaching and online learning efforts, making digital transformation sustainable over time.

The successful implementation of virtual teaching and online learning as a pedagogical approach in education demands more than just technological access and proficiency. It requires the harmonious integration of technology, social factors, and effective teaching strategies to bridge the gap between educators and students. Beyond infrastructure, for digital education to be effective in virtual teaching and online learning settings, academic educators must have institutional support and be adequately trained and supported. These support systems are essential for helping academic educators create engaging, effective, and inclusive online learning environments for students. Ongoing professional development is critical to equip academic educators with the competencies needed to integrate digital technologies and innovative pedagogies into their teaching practices. This includes, inter alia, training on how to use an LMS, create engaging multimedia content and apply data analytics to personalise students' learning experiences. HEIs should support academic educators and provide training for them in developing culturally responsive teaching methods that can connect with diverse student populations. Additionally, providing academic educators with access to virtual mentoring, peer collaboration, and continuous learning opportunities can ensure they remain adept at navigating the virtual teaching and online learning environment. However, it should

be acknowledged that there can be potential resistance from academic educators to adopting new technologies. Therefore, making it necessary for institutional support through the provision of ongoing support and guidance, demonstrating how technology can enhance teaching practices and overall creating a culture of collaboration where academic educators can share best practices and learn from each other, which can encourage wider adoption of digital technologies, virtual teaching and online learning.

Inclusive instructional design and universal learning design are instrumental in the design and development of virtual teaching and online learning materials and platforms, considering the diversity of students in South Africa. Learning experiences must be designed to accommodate students with varying needs, including those with disabilities, different learning styles, and diverse socio-economic backgrounds. By prioritising equity, accessibility and inclusivity, digital education can be used to offer personalised learning pathways that engage all students in virtual teaching and online learning environments. For instance, in South Africa, digital education has the potential to overcome socio-economic challenges and promote inclusivity in higher education, however, this requires a strategic focus on developing platforms and designing content that is accessible to all students while being mindful of the structural and systemic barriers that exist. Moreover, culturally relevant content and teaching methods should be integrated to reflect the diverse backgrounds of students. Ensuring that digital curricula are not only inclusive but also culturally sensitive can significantly enhance student engagement and success. By leveraging digital education for virtual teaching and online learning, engaging, collaborative and interactive learning experiences can be facilitated. Online discussion forums, collaborative activities, and virtual synchronous and asynchronous opportunities enable students to connect, share ideas, and engage in meaningful discussions. Additionally, leveraging multimedia resources, simulations, and interactive content can enhance students' understanding and engagement. Engagement and motivation are key to successful virtual teaching and online learning, making it necessary for academic educators to enhance engagement and interactivity through incorporating various digital tools and content types. A balance between asynchronous and synchronous learning approaches is most effective for supporting student success in online environments. Digital pedagogies, such as flipped classrooms, gamification, and blended learning, leverage these digital technologies to create interactive and personalised learning experiences that keep students engaged and motivated. Digital education offers numerous tools to create interactive and personalised learning experiences that keep students engaged. For example, incorporating multimedia elements, such

as videos, simulations, discussions, and quizzes, can enhance student participation. Collaborative tools like virtual classrooms and discussion forums facilitate knowledge sharing and interaction, catering to diverse learning preferences and schedules. Additionally, personalised learning, guided by data analytics and learning analytics, allows academic educators to tailor instruction to individual student needs, improving learning outcomes. Continuous feedback and adaptive assessments can help students track their progress, stay motivated, and achieve their learning goals. Assessment strategies in the digital age should incorporate various tools embedded in learning management systems. These tools can be used to effectively evaluate student learning. Furthermore, peer assessments and self-assessment tools can contribute to a comprehensive evaluation process, promoting a formative approach to learning. These methods provide timely feedback, enhance understanding of the material, and encourage students to reflect on their learning. Moreover, providing student support services is also crucial to assist students in navigating the challenges of virtual teaching and online learning. These support mechanisms are particularly important for students who may struggle with the transition to digital education, ensuring they receive the help they need to succeed.

Digital education holds immense potential to enhance virtual teaching and online learning across diverse student populations. By strategically harnessing digital education for virtual teaching and online learning and addressing the key factors outlined in this research study, HEIs in South Africa can create inclusive virtual teaching and online learning environments that provide equitable educational experiences to diverse student populations contributing to achieving Sustainable Development Goals (SDGs) 4 (quality education) and 10 (reduced inequalities).

6.3.2. Designing and Developing Virtual Teaching and Online Learning: Considerations Across Multiple Ecological Environments

What factors should be considered in the design and development of virtual teaching and online learning across multiple ecological levels?

The emergence of digital technologies has revolutionised the instructional delivery of higher education, giving rise to virtual teaching and online learning. This paradigm shift presents both opportunities and challenges, necessitating careful consideration of various factors to ensure effective and equitable learning experiences. It is important to be cognisant of designing and developing virtual teaching and online learning environments across multiple ecological levels,

from individual students to broader societal contexts. These levels include: (1) core elements of technology-facilitated virtual teaching and online learning, (2) optimising virtual teaching and online learning environments, (3) higher education institutions facilitating support for virtual teaching and online learning, (4) addressing external macro factors to enhance virtual teaching and online learning environments, (5) learning from the past and continuous advancements to build the future of virtual teaching and online learning.

Core Elements of Technology-Facilitated Virtual Teaching and Online Learning

Effective virtual teaching and online learning necessitate the congruous interplay of various elements. At the individual level, student competencies in digital literacy, skills, and fluency are crucial. Students must possess the ability to navigate digital platforms, use tools effectively, and engage with online content critically. Moreover, student efficacy and agency play an important role. Student autonomy, student-centric development, and support can empower students to take ownership of their learning and develop essential skills. Academic educator competencies are equally important. Subject content knowledge, coupled with digital education literacy and technology prowess, enables academic educators to effectively leverage digital tools and resources. A deep understanding of learning management systems and the ability to develop and source appropriate resources are essential for creating engaging and effective online learning experiences. Additionally, pedagogical knowledge and technological knowledge are indispensable for designing and delivering high-quality virtual instruction.

Optimising Virtual Teaching and Online Learning Environments

To create optimal virtual learning environments, it is imperative to adopt innovative digital pedagogies and learning theories to provide valuable frameworks for designing engaging and meaningful learning experiences. Course structure and design are also critical. Factors such as synchronous and asynchronous teaching and learning, digital resources, assessment practices, accessibility, communication streams, student participation, collaborative activities, cognitive presence, and academic educator teaching presence all contribute to the overall effectiveness of virtual learning.

Higher Education Institutions Facilitating Support for Virtual Teaching and Online Learning

Higher education institutions play a crucial role in supporting virtual teaching and online learning. Infrastructure and resources are essential to ensure equitable access and effective delivery. Institutional infrastructure distribution must be carefully planned to address disparities and ensure that all students have the necessary tools and support. Student support in

terms of efficacy, agency, and well-being is vital for creating a positive learning environment. Academic educator support through training, professional development, and mentorship can enhance teaching competencies and develop a supportive community. Institutional planning is also crucial. A strategic blueprint outlining institutional structures, resource availability, and education equity can guide decision-making and ensure that virtual teaching and online learning align with institutional goals. Institutional policies must be developed to address issues such as equity, equality, and student support. Equality and equity are paramount, and higher education institutions must strive to address the diverse needs of their student population.

Addressing External Macro Factors to Enhance Virtual Teaching and Online Learning Environments

External factors can significantly influence the success of virtual teaching and online learning. Socio-economic context plays a vital role, with societal imbalances and economic conditions impacting access to technology and educational opportunities. The social and cultural climate can also shape student engagement and learning outcomes. National infrastructure readiness, including internet connectivity and technological infrastructure, is essential for effective virtual learning. National education policy and the influence of political climate can also impact the implementation and success of virtual teaching and online learning initiatives.

Learning from the Past and Continuous Advancements to Build the Future of Virtual Teaching and Online Learning

The evolution of virtual teaching and online learning has been shaped by changes in technology and historical events. As technology continues to advance, it is essential to adapt instructional practices to leverage new tools and opportunities. Learning from past experiences and staying abreast of emerging trends can inform the design and development of future virtual learning environments.

6.3.2.1. Key Intrinsic Factors in Optimising Educational Experiences in Virtual Teaching and Online Learning Environments

What intrinsic factors should be considered in designing and developing virtual teaching and online learning environments to optimise educational experiences?

Intrinsic factors need to be carefully considered when designing and developing virtual teaching and online learning environments to enable equitable and inclusive educational experiences. Central to the intrinsic factors in the design of virtual teaching and online learning is the adoption of a student-centred approach that prioritises active learning, critical thinking,

and problem-solving, while integrating technology in a manner that is both intentional and pedagogically sound. The development of virtual teaching and online learning environments needs to be engaging, inclusive, and conducive to diverse learning styles and the needs of students to afford them an effective educational experience. A student-centred approach to online course design is imperative in developing virtual teaching and online learning environments that resonate with contemporary students. This approach demands a shift from traditional educator-centred models to student-centred models, placing students at the core of the learning process. Course design must be clear, well-structured, and aligned with learning objectives, providing students with the necessary tools and resources to actively engage with the content and guiding students through the learning process. Such a design should incorporate a variety of teaching methods, pedagogical considerations and activities that cater to the different learning styles of students. Technology integration plays an important role in enhancing virtual teaching and online learning; however, the use of technology must be intentional and purposeful, supporting the learning objectives and pedagogical goals rather than overshadowing them. For instance, learning management systems should be user-friendly, accessible and equipped with tools that facilitate interaction, collaboration, and assessment. The integration of digital technologies, such as discussion forums, video conferencing, and interactive simulations, can significantly enhance the students' educational experience by making it more interactive and engaging. Thus, making the alignment between technology and pedagogy crucial for creating a virtual teaching and online learning environment that is not only effective but also engaging for students.

Incorporating student-centred pedagogical approaches emphasises the importance of creating engaging, interactive, and personalised learning experiences that cater to the diverse needs of contemporary students. By integrating collaborative learning, active learning, multimedia resources and authentic assessment into the curriculum, academic educators can enhance student engagement and participation. Moreover, ensuring that the content and teaching methods are culturally relevant and reflective of the diverse backgrounds of students is crucial for encouraging inclusivity and deeper connections with the course content and learning materials. This cultural relevance assists students in immersing themselves in the content, which can significantly enhance their engagement and overall educational learning experience. Academic educators providing opportunities and empowering students with autonomy is another key factor in successful virtual teaching and online learning environments. A student-centred approach that provides students with choices and opportunities for self-directed

learning can significantly enhance their motivation and engagement. This includes offering flexible pacing options, personalised learning paths, and opportunities for independent learning. By providing students with a sense of autonomy and control over their learning process, academic educators can promote a deeper sense of ownership and responsibility, which in turn can lead to higher levels of academic success and lifelong learning.

The effective integration of synchronous and asynchronous teaching and learning activities is essential in virtual teaching and online learning environments. A well-balanced combination of these approaches can provide students with the flexibility they need to manage their learning while ensuring that they receive the necessary guidance and interaction from academic educators. Synchronous sessions, such as live video lectures and real-time discussions, offer real-time interaction, which is important for building relationships and providing immediate feedback. While asynchronous activities such as recorded lectures, discussion boards, and self-paced assignments allow students to engage with the content at their own pace, accommodating diverse learning styles and schedules of students who may be juggling various responsibilities, such as work commitments or family obligations. This dual approach caters to different learning preferences and helps create a more inclusive and supportive learning environment. Digital technologies play a crucial role in balancing the use of synchronous and asynchronous approaches and in the overall success of virtual teaching and online learning environments. The selection and use of these digital technologies should be guided by their affordances and their ability to enhance communication, collaboration, and assessment. Digital tools and applications that are user-friendly, accessible, and aligned with pedagogical goals can significantly improve the quality of the educational learning experience. High-quality digital resources, including electronic textbooks, OERs, multimedia and simulations, are also essential in supporting student learning, ensuring that they have access to relevant and accessible materials that align with the course objectives.

Assessment and evaluation practices must also be carefully considered in the design of virtual learning environments. These practices should be aligned with learning objectives and provide constructive and meaningful feedback to students. A variety of assessment methods should be used to evaluate student progress, including formative assessments (e.g., quizzes, peer assessments, self-assessments) and summative assessments (e.g., final projects, capstone projects, exams). Formative assessments are valuable in virtual environments as they offer ongoing feedback, helping students to monitor their progress and make necessary adjustments to their learning strategies. Ensuring that students receive timely and constructive feedback that

helps them improve their understanding and performance. Self-assessment tools can also contribute to a comprehensive evaluation process, promoting a formative approach to learning that encourages reflection and self-improvement.

Ensuring accessibility and inclusivity in virtual teaching and online learning environments is imperative. This involves academic educators designing online environments that are accessible to all students, including those with disabilities and diverse learning needs. Compliance with accessibility standards, such as providing alternative formats for content (e.g., transcripts for videos, screen reader-compatible materials), the use of multimodal instructional delivery of content, and the accommodation of different learning styles are essential components of an inclusive virtual learning environment. Furthermore, students with disabilities should have access to assistive technologies and appropriate accommodations to fully participate in online learning. Additionally, creating a supportive and collaborative learning environment that promotes dialogue, builds social presence, and facilitates collaborative-cognitive learning is crucial for student engagement and academic success. Dialogue and social presence are key elements in building a sense of community among students and academic educators. Multiple communication means, such as email, discussion forums, video conferencing, and messaging applications, should be available to facilitate interaction and ensure that students feel connected and supported. This type of activity encourages student participation, interaction, and engagement through various strategies, including small group discussions, collaborative projects, interactive activities and peer-to-peer learning. Collaborative-cognitive activities should also form part of the online learning environments, where students engage in meaningful discussions, share ideas, and work together on projects, as they are particularly effective in virtual settings. These types of activities promote cognitive presence, where students are intellectually engaged and encouraged to think critically and apply their knowledge. Academic educators can strengthen cognitive presence by posing thought-provoking questions, facilitating discussions, and providing opportunities for students to reflect on their learning.

The role of academic educators is central to the success of virtual teaching and online learning environments. Their teaching presence, including their development of course materials and activities, provision of communication, feedback, and support, significantly impacts student engagement, educational experience and overall students' academic success. Ongoing professional development is essential for academic educators to stay current with the latest trends and best practices in virtual teaching and online learning. This includes training on

digital technologies, innovative digital pedagogical approaches and student support strategies. Academic educators should possess a range of competencies, including subject content knowledge, pedagogical knowledge, technological skills, communication abilities, and cultural sensitivity, all of which are essential for creating effective and inclusive virtual learning environments. They should be proficient in using various digital technologies and platforms, such as learning management systems, communication tools, and assessment tools. They should also be capable of integrating these tools effectively into their teaching practices to enhance the online learning experience. Furthermore, academic educators must also be empowered with autonomy and provided with opportunities for continuous professional development. This empowerment can assist in creating a sense of ownership and innovation in their teaching practices, leading to more effective and engaging teaching and learning environments. Moreover, academic educators should be encouraged to engage in self-reflection and introspection, as this helps them improve their teaching practices and identify developmental areas for growth. This reflective practice, coupled with professional development opportunities, can ensure that academic educators are well-equipped to meet the challenges of virtual teaching and online learning.

Cultivating student efficacy, agency and autonomy is another critical factor in optimising virtual teaching and online learning environments. Students who believe in their ability to succeed are more likely to be motivated and engaged in their own learning. Academic educators can encourage student efficacy by providing positive feedback, setting achievable learning outcomes, and creating a supportive online learning environment. Empowering students with self-efficacy, agency and autonomy allows them to take ownership of their learning, make informed decisions, and develop critical thinking and problem-solving skills. This sense of ownership and responsibility is crucial for student success in virtual learning environments and in the digital age. Students should also be equipped with the necessary digital literacy skills to navigate online learning environments effectively. This includes understanding how to use digital tools, access and evaluate online resources, and participate in online discussions and activities. HEIs and academic educators should provide opportunities for students to develop these skills as they are essential for their success in virtual learning environments and the digital era. Moreover, providing students with the necessary support, including technical assistance, counselling, and mentoring, is essential for their success in virtual learning environments. Virtual and online learning can sometimes lead to feelings of isolation, stress, and anxiety, which can negatively impact student performance and engagement. Academic educators

should be aware of these potential challenges and take proactive steps to support student well-being as well as provide resources and details to institutional support services to help students navigate the demands of online learning. Student well-being must be prioritised, with efforts made to address issues such as isolation, stress and anxiety. By creating a positive and supportive learning environment that addresses the holistic needs of students, academic educators can help them navigate the challenges of online learning and achieve their educational goals for academic success.

6.3.2.2. Addressing Extrinsic Factors and Systemic Barriers for Effective and Equitable Virtual Teaching and Online Learning

What extrinsic factors and systemic barriers must be addressed to implement effective and equitable virtual teaching and online learning?

The implementation of effective and equitable virtual teaching and online learning in South Africa is significantly challenged by a complex interplay of a range of extrinsic factors, structural influences and systemic barriers. These challenges, deeply intertwined with the country's historical and socio-economic background, create significant disparities that impact access to equitable education. The legacy of apartheid, infrastructural deficiencies, digital inequality, and inadequacies in policy frameworks all contribute to a complex environment where the full potential of virtual teaching and online learning is often hindered by the realities on the ground.

Although three decades ago, the enduring impact of apartheid continues to manifest in South Africa's educational system, creating a divide that hinders the equitable distribution of educational opportunities. The deep-rooted historical inequalities created by apartheid have left a lasting impact on the education system, with a large segment of the South African population economically disadvantaged, with poverty and unemployment being prevalent issues that further exacerbate the situation. For many students, particularly those from historically marginalised communities, access to the necessary resources for virtual teaching and online learning, such as reliable internet connectivity, suitable devices, and even a stable learning environment, remains a significant challenge. The digital divide is not just a matter of access to technology but is also reflective of broader socio-economic disparities that limit the ability of many students to engage fully in the educational opportunities provided by virtual teaching and online learning environments. As a result, these economic barriers widen the educational gap between privileged and underprivileged students, making access and equity in education increasingly elusive and paramount.

Infrastructure challenges represent another major barrier to the effective implementation of virtual teaching and online learning in South Africa. The country's infrastructure is often inadequate to support the demands of digital education, particularly in rural areas where internet connectivity is limited or non-existent. The lack of access to devices further compounds the issue, leaving many students unable to participate in virtual teaching and online learning. Even in urban areas, where infrastructure might be more developed, the high costs of data remain a significant impediment for many students, limiting students' ability to access online resources consistently. Moreover, the frequent power outages and load shedding that plague the country add another layer of difficulty, disrupting the continuity of online education and making it challenging for students to maintain a stable learning environment. These infrastructure-related issues are not just technical obstacles but are reflective of broader systemic challenges that must be addressed to make virtual education a viable option..

Digital inequality, which is closely related to infrastructure challenges, further complicates the prospect of virtual teaching and online learning in South Africa. Digital equity encompasses more than just unequal access to technology; it also includes the disparities in digital skills that are necessary for academic educators and students to navigate and benefit from virtual teaching and online learning platforms. For many students, particularly those from disadvantaged backgrounds, the lack of digital capital and digital literacy poses a significant barrier to their ability to engage effectively with digital education. Digital inclusion is crucial for addressing the inequalities that persist due to South Africa's historical and socio-economic context. It highlights the need for both physical access to technology and the development of the competencies required to use that technology effectively. Without addressing both aspects, physical access to technology and epistemological access, the potential of virtual teaching to democratise education remains largely unrealised. The inequalities that stem from South Africa's historical and socio-economic context must be acknowledged and tackled to ensure that all students can benefit from virtual teaching and online learning.

In response to these challenges, the development of digital literacy and the development of digital capital among students becomes essential to equip students with the necessary skills to navigate the digital environment in higher education. Higher education institutions have an important role to play in equipping students with the skills they need to succeed in a digital learning environment through the delivery of comprehensive induction and orientation programmes that introduce students to the digital tools and platforms they will be using in their learning process. These initiatives should equip students with the skills needed to engage

effectively in online learning environments. Beyond these initiatives and training, ongoing support is necessary to help students navigate the complexities of online learning and develop the confidence to use digital technologies effectively. Moreover, it is not only students who need to be upskilled, but academic educators must also be provided with the necessary training to integrate digital tools and innovative pedagogies into their teaching practices. With institutional support, academic educators can create more engaging and effective online educational experiences that meet the diverse needs of their students.

The successful implementation of virtual teaching and online learning also depends heavily on the support provided by higher education institutions and the presence of a clear and supportive policy framework. National policies are also crucial in shaping the cultural acceptance and implementation of digital learning platforms within the educational sector, particularly in terms of promoting the integration of digital learning platforms and promoting digital transformation. These policies need to be comprehensive, providing specific guidelines on the use of digital tools in education, allocating the necessary resources to support their implementation, promoting the implementation of digital education and addressing the infrastructural challenges that hinder access to virtual teaching and online learning. However, the current policy environment in South Africa and South African higher education institutions is often characterised by a lack of clarity and insufficient support, which undermines the efforts to integrate virtual teaching and online learning effectively. Issues such as unclear ownership rights for digital content, a lack of incentives for academic educators to adopt new teaching methods, and inadequate institutional support are significant barriers that need to be addressed.

In addition to policy support, higher education institutions must nurture a culture of innovation that encourages the development of new ideas and solutions for harnessing digital education. This involves not only the adoption of new tools and platforms but also the creation of an environment where academic educators and students feel empowered to experiment with different approaches to teaching and learning. Higher education institutions should also provide the necessary resources and support to facilitate this innovation, recognising that the effective use of digital technologies can lead to significant improvements in educational outcomes. This approach not only benefits the higher education institution but also contributes to the societal progress of South Africa as a whole. Additionally, institutional policies should be aligned with the socio-economic realities of students, offering financial support to those from disadvantaged backgrounds to ensure that they have the necessary tools and resources to participate fully in online learning. Developing clear and supportive institutional and national policies that

promote the adoption of digital education and address infrastructural challenges can provide a structured framework that normalises and standardises the use of digital tools in teaching and learning processes. This approach will help to level the playing field, making virtual teaching and online learning more accessible and equitable for all students.

The challenges faced in implementing virtual teaching and online learning in South Africa are numerous and complex, requiring a multifaceted approach that addresses both the immediate barriers to access and the broader systemic issues that perpetuate inequality. While the integration of digital education has the potential to revolutionise education, making it more accessible, the reality is that without addressing the extrinsic factors and systemic barriers, the benefits of virtual teaching and online learning will remain out of reach for many students. A concerted effort is needed from all stakeholders, including government, higher education institutions, and the private sector, to address these challenges and create an educational environment that is both effective and equitable.

6.4. Recommendations

The following recommendations are made for the various stakeholders:

6.4.1. Students

- Develop student autonomy, improve self-efficacy and have student agency for self-directed learning capabilities.
- Enhance self-regulation by developing strategies for staying focused and motivated during independent study.
- Improve digital literacy by developing proficiency in using various digital tools and platforms.
- Build strong collaborative support networks by connecting with peers and forming study groups to facilitate collaborative learning.
- Actively participate in activities by engaging in discussions, asking questions, and interacting with peers and academic educators, as this can enhance understanding and retention of the content.
- Create a dedicated study space that is quiet, comfortable and a distraction-free area for learning.
- Prioritise tasks and stay organised by leveraging the affordances of the LMS, such as the functionality of the calendar and to-do lists, to keep track of activities, deadlines, and synchronous virtual sessions.

6.4.2. Academic Educators

- Develop a strong foundation of competencies in pedagogy, technology, and subject matter, as this is essential for overcoming the challenges posed by the digital learning environment.
- Embrace continuous professional development by attending workshops, seminars, webinars and training offered by higher education institutions to stay updated on the latest educational technologies and pedagogical approaches in virtual teaching environments.
- Participate in Community of Practice (CoP) and Professional Learning Community (PLC) as it will allow collaboration with colleagues where academic educators can share and learn best practices and resources with other colleagues.
- Provide guidelines to students on creating a distraction-free environment for students to engage in virtual teaching and online learning platforms.
- Design courses to provide students with ongoing opportunities to engage with a variety of digital tools and platforms, creating an environment of continuous learning and adaptation, allowing students to develop their skills.
- Design and develop effective online courses which are student-centred, collaborative, and authentically assessed. While designing, academic educators must carefully consider the technological capabilities of students, factors such as internet connectivity, load shedding and access to specific platforms.
- Explore and learn more about instructional design and universal design for learning to prioritise equity and accessibility. This will ensure that course materials and activities are accessible to all students, including those with disabilities.
- Use a variety of instructional strategies to incorporate diverse teaching methods to make the virtual teaching environment more inclusive and to cater to different learning styles.
- Design interactive lessons by incorporating multimedia elements like videos, quizzes, polls, and discussions to keep students engaged.
- Establish a strong cognitive and online social presence by incorporating appropriate, engaging and interactive activities and being available and approachable. Additionally, regularly interact with students through discussion boards and provide prompt feedback to create a positive virtual teaching and online learning environment.
- Cultivate a sense of community by creating a supportive and inclusive online environment where students feel connected to their peers and their academic educator.

This can be done through regular communication, check-ins, icebreakers, and social activities to assist with building a community. This will also assist with students feeling isolated and improve their overall well-being.

- Provide clear and concise instructions and expectations for each lesson and assessment to ensure students understand the material and what is required of them.
- Incorporate different methods and types of assessments like quizzes, presentations, and discussions etc., to allow students to demonstrate their understanding in various ways. Additionally, always provide constructive and timeous feedback to students.
- Continuously improve through self-reflection and by soliciting feedback from students about what's working and what isn't. Use this input to iteratively adjust teaching methods, course design, and improve the virtual learning experience.

6.4.3. Higher Education Institutions

- Eradicate systemic barriers and expand access to high-quality learning resources by continually developing open educational platforms and investing in providing or subsidising access to devices, data and internet connectivity to ensure that students and academic educators can engage effectively in the virtual teaching and online learning environment.
- Invest in induction and orientation programmes for students to ensure that they receive adequate training and support to develop the necessary competencies. Students with strong digital literacy skills are more likely to excel academically and secure better job opportunities. Additionally, these programmes contribute to a more inclusive learning environment by reducing digital disparities and closing gaps in students' digital capital.
- Provide technical support and ongoing resources to help students navigate the virtual teaching and online learning environment.
- Dismantle systemic barriers hindering educational equity by focusing on enhancing the capacity of academic educator through training and developing a supportive university care culture by offering professional development as a requirement on topics of digital education, digital literacy, effective technology integration, learning management systems, competencies in the 21st century, digital equity and virtual teaching and online learning environments.
- Develop comprehensive policies governing the use of virtual teaching and online learning platforms. Collaborating with other higher education institutions that excel in online learning can provide valuable insights and best practices.

- Enhance digital transformation and equitable access by building strong community partnerships and collaborations between other higher education institutions, governments and the private sector.
- Develop financial strategies for digital education and digital transformation, which should focus on sustainable and scalable funding models, as well as support for innovative initiatives.
- Invest in technology infrastructure to ensure reliable and secure online learning platforms are available. This includes providing high-speed internet access, cloud storage, and a highly functional and user-friendly learning management system.
- Adopt a proactive approach to virtual teaching and online learning to stay at the forefront of educational innovation.

6.4.4. Policymakers, National and Provincial Government

- Enhance and support digital and telecommunication infrastructure development by investing in nationwide broadband expansion, particularly high-bandwidth connectivity, especially in underserved and rural areas, to ensure equitable access to online education for all students, especially those from marginalised groups.
- Address systemic challenges such as inequality, digital divide, and skill disparities through the development of comprehensive policy frameworks and initiatives that support the implementation of virtual teaching and online learning, addressing issues such as infrastructure development, digital equity, and digital transformation. Furthermore, regulate its implementation to address these gaps to ensure that all students, regardless of their socio-economic background, have equal access to digital resources and opportunities to ensure equitable access to quality education.
- Collaborative efforts between government bodies, higher education institutions and telecommunication companies are essential to bridge the digital divide. Providing free or affordable data and internet connectivity to students is crucial for equitable access to virtual teaching and online learning opportunities, especially in underserved communities and promotes digital inclusion.
- Promote digital literacy by incorporating Information and Communication Technology (ICT), digitalisation, Fourth Industrial Revolution (4IR) and digital literacy elements into early education curricula across all levels of education, from primary to tertiary, to equip students with the necessary competencies for the digital age. This proactive

approach will enable the identification of specific challenges and the development of practical solutions.

- Ensure that curricula are designed to effectively integrate digital tools and resources, promoting student-centred and interactive learning experiences.
- Promote digital literacy through the implementation of national and provincial initiatives for both academic educators and students. Offer public education campaigns, workshops, and resources to build essential digital skills.
- Develop comprehensive online education policies by developing clear guidelines and standards for online education to ensure consistency in quality and accessibility across higher education institutions. This includes defining accreditation processes for online programmes.

6.5. Contributions for Research and Practice

The research study makes a significant contribution to the field of education by addressing the critical challenge of creating accessible, equitable, and sustainable tertiary education in an unequal society. This research study highlights the importance of digitalisation and digital transformation in streamlining the delivery of educational content, integrating digital technologies, pedagogical innovation, and developing an equitable digital learning environment. These advancements are essential for achieving more inclusive and equitable quality education. The primary aim of this research study was to explore how digital education can be strategically harnessed to enable virtual teaching and online learning, ultimately leading to the development of a sustainable and adaptable Virtual Teaching and Online Learning Ecosystem Framework (VTOLE-Framework). By identifying the critical factors that influence South African students' success in virtual and online education, the research study contributes valuable insights into the complexities of this rapidly evolving field. This understanding is crucial for developing equitable and effective educational policies and practices. The VTOLE-Framework is a key outcome of this research study, offering a comprehensive approach to addressing critical gaps in virtual teaching and online learning in higher education. By carefully identifying and analysing systemic barriers that hinder student success in virtual teaching and online learning environments, the framework provides a foundation for creating equitable and accessible educational experiences. Furthermore, it serves as a catalyst for innovative digital and pedagogical approaches that prioritise equity and enhance student outcomes in virtual teaching and online learning. Building the capacity of higher education institutions, students and academic educators to implement equity-focused strategies is another crucial component

of this research study. By providing recommendations and actionable insights, the findings of this study and the VTOLE-Framework empowers higher education institutions, academic educators, and students to optimise virtual teaching and online learning experiences and outcomes as well as lays the groundwork for meaningful and sustainable improvements in the digitalisation of education and the practice of virtual teaching and online learning. Overall, this research study contributes to the broader knowledge base on the intersection of digital and equitable education, digital inclusion, virtual teaching and online learning.

6.6. Implications

6.6.1. Theoretical Implications

The research study provides insights into harnessing the power of digital education for virtual teaching and online learning, which can lead to the development of specific guidelines or best practices for designing effective online courses, using digital technologies effectively, applying digital pedagogies and creating engaging student-centred learning experiences. It further offers perspectives on virtual education integration and virtual teaching adoption, which can influence the development of professional development programmes for academic educators to support their transition and implementation to virtual teaching and help them integrate technology into their teaching practices. The investigation of intrinsic and extrinsic factors in virtual teaching and online learning success can inform the development of targeted interventions to address specific challenges and improve student outcomes in virtual learning environments. By exploring the systemic barriers impeding digital inclusion and equitable access to virtual teaching and online learning in higher education, the research study provides insight that can lead to policy recommendations or advocacy efforts to address these barriers and ensure that all students have equal opportunities to benefit from virtual teaching and online learning. Furthermore, the research study contributes to the literature and body of knowledge for virtual teaching, online learning, and equitable and sustainable education. The proposed Virtual Teaching and Online Learning Ecosystem Framework (VTOLE-Framework) emerges as a theoretical construct aimed at understanding the intricate interplay of people, technology, pedagogy, and social context within virtual teaching and online learning environments. This VTOLE-Framework outlines the key components and principles for effective and equitable virtual teaching and online learning and positions itself as a holistic approach, emphasising the integration of course design and pedagogical strategies, institutional support, technological infrastructure, policy, equity, community engagement, and sustainability into a cohesive virtual

teaching and online learning system. A fundamental theoretical underpinning of the VTOLE-Framework is its focus on digitalisation, equity and inclusion. It aligns with critical theories of education that challenge marginalisation and advocate for digital transformation and digital inclusion by prioritising the dismantling of systemic barriers and ensuring equitable access to education. The VTOLE-Framework's emphasis on sustainability and inclusivity further highlights the importance of creating online learning environments that are not only accessible but also responsive to the evolving needs of diverse students. This perspective resonates with ecological theories that emphasise interconnectedness and interdependence. The understanding of the multiple layers of influence on virtual teaching and online learning, ranging from the microsystem (system environment) to the mesosystem (transactional environment) to the exosystem (institutional environment) to the macrosystem (societal and contextual environment) to the chronosystem (change environment), emphasises the importance of creating virtual teaching and online learning environments that reduce transactional distance and responsive to the diverse contexts of students creating equitable educational experiences. The VTOLE-Framework invites a systems-theoretic lens by conceptualising virtual teaching and online learning as an ecosystem. It suggests that the components of this ecosystem; people, technology, social aspects, pedagogy, policy, etc.; are interdependent and influence each other in multiple ways. This approach moves beyond reductionist views and offers an understanding of the dynamics at play in virtual teaching and online learning. The VTOLE-Framework's potential to contribute to systems theory lies in its ability to identify key components and their interactions, thereby providing new insights into the functioning of these complex environments. A critical theoretical contribution of the VTOLE-Framework is its potential to contribute towards the longstanding divide between technological determinism and social constructivism. Through examining the interplay between technology, pedagogy, stakeholders, and social context, the framework offers an understanding of the relationship between these two perspectives. Therefore, the VTOLE-Framework offers a theoretical lens for understanding and improving virtual and online education by providing a comprehensive and holistic approach to addressing the complexities of virtual teaching and online learning in higher education in a developing country. Its potential to inform policy, practice, and future research is significant, as it offers a guide or set of best practices for creating inclusive, equitable, effective and sustainable virtual teaching and online learning environments.

6.6.2. Practical Implications

The research study on virtual teaching and online learning translates theoretical concepts into practical actions that can significantly enhance the quality and accessibility of equitable education. A key finding of this study is the recognition of the critical role of technological infrastructure, reliable internet access and suitable digital devices, which are prerequisites for effective and equitable online learning. Addressing the digital divide, which often manifests in disparities in access to technology, is paramount to ensuring equitable participation. Beyond infrastructure, the research study emphasises the importance of innovative pedagogical strategies. Integrating digital tools into teaching and learning processes can create engaging and interactive learning experiences. Multimedia resources, for instance, can cater to diverse learning styles and enhance content comprehension. Similarly, interactive assessments can provide real-time feedback and facilitate personalised learning. To fully realise the potential of online education, supportive policy and institutional support systems are essential. Policies need to be developed that promote equitable access to technology and support the integration of digital education into curricula. Professional development for academic educators is crucial to equip them with the necessary skills to navigate the virtual teaching and online learning environments. Implementing student support services in higher education institutions, such as academic and digital literacy enrichment programmes, can help students overcome challenges and succeed in their studies. Inclusive policies that accommodate the needs of diverse students are equally important for creating welcoming and accessible online learning environments.

Equity and inclusion are fundamental to the success of virtual teaching and online learning in South Africa, a developing country. Practical strategies must be implemented to bridge the digital literacy gap and address socio-economic disparities. Providing digital literacy training and offering affordable access to technology can empower students from marginalised communities. Furthermore, creating inclusive learning environments that respect diversity and accommodate different learning needs is essential for ensuring all students can thrive in their academic success. Building a strong social presence and sense of community is another crucial aspect of online learning. Moreover, the study emphasises the importance of prioritising student well-being in the online context. Practical steps such as regular communication, collaborative group activities, and creating online spaces for interaction can contribute to a supportive learning culture. Addressing the challenges faced by academic educators and students in transitioning to online teaching is essential. Higher education institutions need to

provide adequate professional development and support for the successful implementation of virtual teaching and online learning.

6.7. Recommendations for Future Research

To further deepen the understanding of virtual teaching and online learning, future research could benefit from expanding the study's scope. Increasing the sample size to encompass a larger number of South African higher education institutions or even data collection from higher education institutions in other developing countries would provide a more comprehensive overview of the phenomenon. Additionally, including a broader range of participants, such as students and support staff, would offer diverse perspectives and enrich the findings and strengthen the reliability and validity of the VTOLE-Framework. As the study was conducted in the period during and post-pandemic, most responses provided by academic educators could have been focused on their experiences of virtual teaching during the pandemic, in other words, under the thoughts of ERT. Future research could explore the experiences of academic educators in different contexts, such as those with prior experience in online teaching or those teaching in disciplines. This would allow for a better comparison and identification of best practices. Although the research questions were able to address the "what" and "how" questions, a "why" question can be further explored to provide a more philosophical level of analysis relating to the research topic at hand.

The VTOLE-Framework developed in this study offers a foundation for future research. A comprehensive evaluation of the framework's effectiveness in various institutional settings is recommended. Researchers can test the VTOLE-Framework in different contexts to assess its transferability and identify areas for improvement. Additionally, exploring the integration of emerging technologies within the VTOLE-Framework could inform the development of innovative teaching and learning approaches. Furthermore, longitudinal studies are essential to track the evolution of virtual teaching and online learning over time. Researchers can contribute to the ongoing development of effective and sustainable online learning environments by examining changes in practices, challenges, and opportunities, as well as exploring the affordances of virtual teaching and online learning.

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Appendices

A1 – Ethics Clearance Certificate

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

Research Office

HUMAN RESEARCH ETHICS COMMITTEE (NON-MEDICAL)
R14/49 Makda

CLEARANCE CERTIFICATE	**PROTOCOL NUMBER: H22/06/19**
PROJECT TITLE	Online Education Ecosystem: A Proposed Framework for Remote Teaching and Online Learning
INVESTIGATOR(S)	Miss F Makda
SCHOOL/DEPARTMENT	Wits School of Education/
DATE CONSIDERED	24 June 2022
DECISION OF THE COMMITTEE	Approved Risk Level: Minimal
EXPIRY DATE	14 September 2025

DATE 20 February 2023 **CHAIRPERSON** _____
(Professor J Watermeyer)

cc: Supervisor : Dr R Dlamini

DECLARATION OF INVESTIGATOR(S)

To be completed in duplicate and **A SIGNED COPY** returned to the Secretary electronically. Unreported changes to the application may invalidate the clearance given by the HREC (Non-Medical)

I/We fully understand the conditions under which I am/we are authorized to carry out the abovementioned research and I/we guarantee to ensure compliance with these conditions. Should any departure be contemplated from the research procedure as approved I/we undertake to submit an amendment of the protocol to the Committee. **I/we agree to completion of a regular progress report. For Minimal and Low Risk studies, this is due annually on 31 December. For Medium and High Risk studies, this is due twice annually on 30 June and 31 December.**

_____ _____/_____/_____
Signature **Date**

PLEASE QUOTE THE PROTOCOL NUMBER ON ALL ENQUIRIES

A2 – Information Sheet for Questionnaire

Dear Sir / Madam,

My name is Fatima Makda. I am a PhD student in the School of Education at the University of the Witwatersrand, Johannesburg. My supervisor is Dr Reuben Dlamini. I am conducting a research study about Online Education Ecosystems. The purpose of the research project is to understand the ways in which digital education can be designed and developed to facilitate remote teaching and online learning. This will assist in the development of a remote teaching and online learning framework. The study title is Online Education Ecosystem: A Proposed Framework for Remote Teaching and Online Learning.

I am inviting you to take part in answering a questionnaire. There are no incorrect answers as your responses will be based on your personal opinions and experiences. Information required is general and you can complete the questionnaire at your earliest convenience. The questionnaire consists of three parts: (1) The consent form, (2) General information, and (3) Open-ended questions. The questionnaire assists me in gaining some insights into the type of digital technologies, digital pedagogies, and theories of learning that you use. It will also assist in getting some demographic information in terms of your location, years of educational experience and years of digital education experience. If you decide to take part in this research study, I will require 10-15 minutes of your time to complete the questionnaire.

Please be assured that all information you provide will be kept strictly confidential. The researcher will make use of pseudonyms for both the institution and participants in the research report to attempt to maintain confidentiality and anonymity. With your permission, other researchers may use the data collected from this research study, but your name and any personal information will not be used or passed on. All research data will be retained in a secured environment that only the researcher will have access to. This will be kept for approximately five years from the date of completion of the researchers PhD.

If you decide to take part in the research study, it should be because you want to volunteer. You do not have to take part. You can stop being in the study at any time. You do not have to answer any questions if you do not want to. You will not get any direct benefits if you choose to join the research study. You will not lose any services, benefits or rights you would normally have if you decide not to join. Taking part in the research study will not cost you anything. The risks for this research study are no more than what happens in everyday life.

This research study will be written up as a research report and possible publications may result in the future. The report will be available on the university library website. If you would like to receive a summary of this report, I will be happy to send it to you.

If you have any questions during or afterwards about this research study, feel free to contact me or my supervisor on the details listed below. If you have any concerns or complaints about the ethical procedures of this research study, you are welcome to contact the University Human Research Ethics Committee (Non-Medical), telephone +27(0) 11 717 1408, email hrecnon-medical@wits.ac.za.

Yours sincerely,

Fatima Makda

Researcher:
Fatima Makda
Fatima.makda@students.wits.ac.za

Supervisor:
Dr Reuben Dlamini
Reuben.Dlamini@wits.ac.za

A3 – Questionnaire

1. Do you consent to participate in this questionnaire? *

   Mark only one oval.

   ◯ Yes

General Information

2. Which age group do you belong to? *

   Mark only one oval.

   ◯ 21-25 years
   ◯ 26-30 years
   ◯ 31-35 years
   ◯ 36-40 years
   ◯ 41-45 years
   ◯ 46-50 years
   ◯ 51-55 years
   ◯ 56-60 years
   ◯ >60 years

3. Which higher education institution are you affiliated with? *

   _____

4. How many years have you been teaching at the higher education institution? *

   Mark only one oval.

   ◯ <1 year
   ◯ 1-3 years
   ◯ 4-6 years
   ◯ 7-10 years
   ◯ 11-15 years
   ◯ > 15 years

5. Which faculty are you with? *e.g. Humanities* *

   _____

6. What School/Division are you from? *e.g. School of Education or Division of Science and Mathematics* *

   _____

7. What is your field of specialization? *e.g. Mathematics* *

   _____

8. What is your job title within the university? *

Mark only one oval.

- ◯ Associate Lecturer
- ◯ Lecturer
- ◯ Senior Lecturer
- ◯ Associate Professor
- ◯ Professor
- ◯ Other: _____

9. Have you previously made or currently make use of remote teaching and online learning? *

Mark only one oval.

- ◯ Yes
- ◯ No

Considerations for Remote Teaching and Online Learning

10. What do you think should be considered when introducing or using remote teaching and online learning? *

_____

_____

_____

_____

_____

11. What teaching competencies do you think are important when using remote teaching and online learning?

A competency is the knowledge or skill required to teach in the online environment.

_____

_____

_____

_____

_____

Internal Factors (Factors that you do have control over)

12. Select your level of agreement on the importance of the internal factors when using remote teaching and online learning. *

Mark only one oval per row.

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Subject Content Knowledge	◯	◯	◯	◯	◯
Method and Practice of Teaching	◯	◯	◯	◯	◯
Technological Knowledge	◯	◯	◯	◯	◯
Digital Literacy	◯	◯	◯	◯	◯
Online Course Design and Development	◯	◯	◯	◯	◯
Teaching Material Development	◯	◯	◯	◯	◯
Resource Development	◯	◯	◯	◯	◯
Digital Competencies of Academic	◯	◯	◯	◯	◯

13. What other internal factors should be considered when using remote teaching and online learning?

External Factors (Factors that you do not have direct control of)

14. Select your level of agreement on the influence of external factors when using remote teaching and online learning. *

Mark only one oval per row.

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Curriculum	◯	◯	◯	◯	◯
Institution	◯	◯	◯	◯	◯
Socio Economic Conditions	◯	◯	◯	◯	◯
Socio Cultural Conditions	◯	◯	◯	◯	◯
Policy	◯	◯	◯	◯	◯

15. What other external factors should be considered when using remote teaching and online learning?

Remote Teaching and Online Learning Environment

16. Which of the following statements best describe your remote teaching and online learning environment? *

Mark only one oval per row.

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Students should be told the explicit outcomes of the learning so that they can set expectations	◯	◯	◯	◯	◯
Academics should evaluate students to determine whether or not they have achieved the learning outcome	◯	◯	◯	◯	◯
Academics should organise online material and build up gradually from simple to complex concepts	◯	◯	◯	◯	◯
Academics should emphasise interactive, problem-centered activities that require manipulation of objects to encourage active construction/processing of training material to help build lasting memories and deepen understanding	◯	◯	◯	◯	◯
Academics should serve primarily as guides and facilitators of learning, not instructors	◯	◯	◯	◯	◯
Students should be assessed formatively, serving to inform future learning experiences	◯	◯	◯	◯	◯
Students should be encouraged to become self-regulatory, self-mediated, and self-aware	◯	◯	◯	◯	◯

17. How do you think digital education can be designed and developed to facilitate remote teaching and online learning?

Digitalisation Readiness

The following questions will be measuring the digitalisation readiness.

Digitalisation is the adaptation of a system, process, etc. to be operated with the use of computers and the internet.

18. **Academic Technological Access** *

You have access to a networked computer and/or digital technologies for teaching.

Mark only one oval.

- ◯ Strongly Ready
- ◯ Ready
- ◯ Not Ready
- ◯ Strongly not Ready

19. **Student Technological Access** *

Your students have access to a networked computer and/or digital technologies for learning.

Mark only one oval.

- ◯ Strongly Ready
- ◯ Ready
- ◯ Not Ready
- ◯ Strongly not Ready

20. **Academic Digital Skills** *

You make use of digital tools and digital pedagogies (teaching methods).

Digital pedagogy - Knowing how to design, plan and implement the use of digital technologies in all the phases of the teaching process, promoting student-centered approaches and methodologies.

Mark only one oval.

- ◯ Strongly Ready
- ◯ Ready
- ◯ Not Ready
- ◯ Strongly not Ready

21. **Student Digital Skills** *

Your students are able to use digital technologies.

Mark only one oval.

- ◯ Strongly Ready
- ◯ Ready
- ◯ Not Ready
- ◯ Strongly not Ready

22. **Institution Infrastructure Access** *

Your institution has access to reliable infrastructure and ICT resources to facilitate ICT integration into teaching and learning.

Mark only one oval.

- ◯ Strongly Ready
- ◯ Ready
- ◯ Not Ready
- ◯ Strongly not Ready

23. **Academic Infrastructure Access** *

You have access to reliable infrastructure and ICT resources to facilitate ICT integration into teaching and learning.

Mark only one oval.

- ◯ Strongly Ready
- ◯ Ready
- ◯ Not Ready
- ◯ Strongly not Ready

24. **System Readiness** *

The use of digital technologies can be incorporated into the Educational System.

Mark only one oval.

- ◯ Strongly Ready
- ◯ Ready
- ◯ Not Ready
- ◯ Strongly not Ready

25. **Curriculum Readiness** *

The use of digital technologies can be incorporated into your Curriculum.

Mark only one oval.

- ◯ Strongly Ready
- ◯ Ready
- ◯ Not Ready
- ◯ Strongly not Ready

26. **Institution Policy Readiness** *

ICT education policies that are focused and aligned with digital education.

Mark only one oval.

- ◯ Strongly Ready
- ◯ Ready
- ◯ Not Ready
- ◯ Strongly not Ready

27. Are you okay with being contacted at a later stage, to participate in an interview? If yes, please can you provide me with a name and contact number/email address? *

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Google Forms

A4 – Information Sheet for Interview

Dear Sir / Madam,

My name is Fatima Makda. I am a PhD student in the School of Education at the University of the Witwatersrand, Johannesburg. My supervisor is Dr Reuben Dlamini. I am conducting a research study about Online Education Ecosystems. The purpose of the research project is to understand the ways in which digital education can be designed and developed to facilitate remote teaching and online learning. This will assist in the development of a remote teaching and online learning framework. The study title is Online Education Ecosystem: A Proposed Framework for Remote Teaching and Online Learning.

Thank you for your time in completing the questionnaire of this research project previously and volunteering to participate in an interview as well. If you decide to continue to take part, your participation in this research study will last about 30-45 minutes. The interview will take place on a video conferencing platform (MS Teams, Google Meet, Zoom etc.) of your choice at a time that is most convenient for you.

With your permission, I would like to audio record the interview. This data will be retained in a secured environment that only the researcher will have access to. This will be kept for approximately five years from the date of completion of the researchers PhD.

Please be assured that all information you provide during the interview will be kept strictly confidential. The researcher will make use of pseudonyms for both the institution and participants in the research report to attempt to maintain confidentiality and anonymity. With your permission, other researchers may use the data collected from this research study, but your name and any personal information will not be used or passed on.

If you decide to take part in the research study, it should be because you want to volunteer. You do not have to take part. You can stop being in the study at any time. You do not have to answer any questions if you do not want to. You will not get any direct benefits if you choose to join the research study. You will not lose any services, benefits or rights you would normally have if you decide not to join. Taking part in the research study will not cost you anything. The risks for this research study are no more than what happens in everyday life.

This research study will be written up as a research report and possible publications may result in the future. The report will be available on the university library website. If you would like to receive a summary of this report, I will be happy to send it to you.

If you have any questions during or afterwards about this research study, feel free to contact me or my supervisor on the details listed below. If you have any concerns or complaints about the ethical

procedures of this research study, you are welcome to contact the University Human Research Ethics Committee (Non-Medical), telephone +27(0) 11 717 1408, email hrecnon-medical@wits.ac.za.

Yours sincerely,

Fatima Makda

Researcher:
Fatima Makda
Fatima.makda@students.wits.ac.za

Supervisor:
Dr Reuben Dlamini
Reuben.Dlamini@wits.ac.za

A5 – Interview Consent Form

Title of project: Online Education Ecosystem: A Proposed Framework for Remote Teaching and Online Learning

Name of researcher: Fatima Makda

I, …….., agree to participate in this research project.

I agree to the following:

(Please circle the relevant options below)

The research study was explained to me. I understand what this study is about.	YES	NO
I understand that I can volunteer to take part in the study	YES	NO
I agree that the interview may be audio recorded	YES	NO
I agree that direct quotations from my interview may be used by the researcher in their research report/publications	YES	NO
I agree that my participation will remain anonymous (my name will not be used by the researcher in their research report/publications)	YES	NO
I agree that other researchers may use the information I provide in my interview (depending on their own ethics clearance being obtained) but my name and any personal information will not be used or passed on	YES	NO

…… (signature)

…… (name of participant)

…… (date)

…… (signature)

…… (name of researcher/person seeking consent)

…… (date)

A6 – Interview Questions

1. How many years have you been in the education space?
2. What is your current job title?
3. How many years of experience do you have in the virtual teaching and online learning space?
4. Can you please provide a brief overview of your experience with virtual teaching and online learning?
5. In your experience, what are some effective strategies for harnessing digital education to enhance virtual teaching and online learning?
6. What digital technologies or tools do you find most effective for facilitating virtual teaching and online learning experiences?
7. Can you tell me of any innovative teaching methods or approaches that you have found particularly effective in the virtual teaching and online learning context?
8. What can you tell me about teaching presence within a virtual teaching and online environment? Why is it important? What impact does it have?
9. What can you tell me about student wellbeing within a virtual teaching and online environment? Why is it important?
10. What support mechanisms are in place or should be in place to assist students who may face barriers to accessing digital resources?
11. How do you think we can address issues related to access to technology, internet connectivity, and technological infrastructure for virtual teaching environments?
12. How do Societal Imbalances and Economic Conditions impact students' experiences in virtual teaching and online learning?
13. How do institutional policies influence virtual teaching and online learning practices? What are some of the current challenges and their impact?
14. What are some of the political influences and implications towards implementing virtual teaching and online learning at our institution? How does this impact the sustainability of virtual teaching and online learning?
15. From an institutional Ecosystem and Sustainability point of view, what can you say about planning for virtual teaching and online learning? Why is it important? What should be considered?
16. Is there anything else you would like to add or any other insights you think are important to consider in the context of virtual teaching and online learning?